Examining the Impact of Intellectual Capital Performance on Financial Performance in Islamic Banks

Mehmet Asutay[1] · Ubaidillah[1]

Abstract

This study explores the intellectual capital (IC) performance of Islamic banks (IBs) and examines the impact of intellectual capital on financial performance in terms of profitability and productivity in IBs. The IC features are also examined individually to identify the primary driver of IC performance and their individual impact on the IBs' financial performance. A quantitative method using multi regression analysis is utilised to examine the nexus between IC and the IBs' financial performance indicators. The measurement of IC uses Modified Value-Added Intellectual Coefficient (MVAIC™) which is an extended model of VAIC™. The data were drawn from 49 IBs from 2014 to 2018. The empirical findings indicate that IC is positively significant in impacting IBs' financial performance measures, especially profitability, but inconclusively related to productivity. Furthermore, when the components were analysed separately, the nexus between these components and IBs' financial performance indicators show lesser uniform results. Capital employed efficiency and human capital efficiency are found to be the most influential features of IC in this study, while structural capital efficiency does not show an impact on financial performance. Evidence also demonstrates that all IC components are not significantly related to IBs' productivity indicator. The study offers an extended understanding of IC and its role in IBs and may provide guidance to different stakeholders including regulators and management of IBs to formulate and structure relevant strategies to create, utilize, and maintain IC for the more resilient banking sector, as extensive practical implications are provided for this purpose.

Keywords Intellectual capital · Financial performance · Islamic banks

✉ Mehmet Asutay
    mehmet.asutay@durham.ac.uk

    Ubaidillah
    ubaidillah.ak@gmail.com

1   Durham Centre for Islamic Economics and Finance, Department of Finance, Durham University Business School, Durham University, Durham, UK

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Introduction

In the era of technology with industry 4.0, information, knowledge, and IT are the most essential resources to maintain a competitive advantage in the emerging knowledge-based economies. They are all part of intangible assets or intellectual capital (IC) which are now being the center of attention of most companies including banks, either conventional or Islamic, as they are considered powerful tools to sustain company performance. The post-industrial economy relies more on intangible assets than on physical assets in generating wealth (Mondal & Ghosh, 2012).

The rise of the knowledge-based economy has made the banking industry invest more in information technology, research development, and the relevant human resources to ensure its competitiveness and sustainability. However, banks' performance measurement has conventionally focused on financial metrics such as return on asset (ROA), return on equity (ROE), and leverage. In the current economy where there is extensive use of knowledge management and IC, the traditional financial metrics are insufficient (Al-Musali & Ismail, 2016) and not comprehensive enough (Pulic & Kolakovic, 2003) to comprehensively measure the performance of organizations.

Mention and Bontis (2013) argue that banks, including Islamic banks (IBs), are knowledge-intensive organisations, because their primary resources are intangible assets, and their operations are mostly related to the work of an IC. Banks rely heavily on utilising information technologies to develop and deliver products and services, and human resources to develop sophisticated products and close interaction with customers. Therefore, banks' favourable achievement in a competitive environment is determined by the efficient utilization and investment in IC such as human resources, integrated information technology, brand image, and business process (Ahuja & Ahuja, 2012).

IC researchers such as Mention and Bontis (2013) assert that identification, valuation, and measurement of IC are increasingly crucial for knowledge-intensive firms and such empirical investigation of the relationship is particularly paramount in Islamic banking realm because it is also operating in the same market of conventional banking which is basically a knowledge-intensive sector (Mavridis, 2004; Nawaz & Haniffa, 2017). It is, therefore, essential to investigate the nexus of IC performance (ICP) and the financial performance of IBs.

Islamic finance, by definition, relates to knowledge because it is ontologically based on normative principles of Islam. Therefore, IBs are expected to contribute to knowledge development as part of their objective functions because their institutional logic is shaped by Islamic ontology, which essentialises knowledge. However, it is argued that Islamic banking products mimic conventional banks' and therefore, they do not fulfil Islamic requirements despite being *Shari'ah* compliant (Ahmed, 2014; Asutay, 2007, 2012). It does imply that IBs have not put the necessary resources to develop the relevant capacity to generate authentic products and operational forms from the ontological sources of Islam so that IBs can fulfil development and financial expectations.

This study, therefore, aims to explore the ICP of the sampled IBs and examine the relationship between ICP and their financial performance from 2014 to 2018. The sampled 49 IBs in this study is drawn from ten Muslim countries with a significant presence of Islamic finance for the period in question, as Thomson Reuters Report (2018) classified.

The empirical examination employs Value-Added Intellectual Coefficient (VAIC™) and its subcomponents, namely capital employed efficiency (CEE), human capital efficiency (HCE), and structural capital efficiency (SCE) developed by Pulic (1998, 2000) as IC proxies. In addition, we employ an extra measure, namely relational capital efficiency (RCE) from Ulum et al. (2014) to develop a more comprehensive measure of IC, which is the Modified Value-Added Intellectual Coefficient (MVAIC™). In a departure from the existing literature, this study represents a cross-country context. To measure financial performance, accounting ratios such as ROA and ROE is used to reflect profitability. Furthermore, this study also employs assets turnover ratio (ATO), a representative measure of firms' productivity (Mondal & Ghosh, 2012).

Accordingly, the following research questions are addressed in this study:

(i)   How is the intellectual capital performance of IBs in the top ten countries of Islamic finance?
(ii) What is the degree of relationship between ICP and financial performance of IBs in top ten Islamic finance countries?

The rest of the paper is organised as follows: "Literature Review: Search for Model and Variables" section presents an elaboration of the relevant literature on concept and measurement, while "Hypothesis Development" section explores the empirical literature by mostly focusing on IBs related studies. "Research Methodology" section develops testable hypotheses, while "Findings" section presents aspects of research methodology. "Conclusion and Discussion" section presents and discusses the findings by locating it in the existent literature as well as providing a detailed implication of the results for the IB industry.

Literature Review: Search for Model and Variables

Theoretical and Conceptual Framework

Considering that the new age is determined by "knowledge" and "innovation," IC is widely viewed as one of the highly significant determinants in competitive advantage and value creation for companies (Mention & Bontis, 2013). IC refers to various terms such as intangible or knowledge assets. Although some debates still arise on what IC is, a consensus is taken as it is a multidimensional concept. Edvinsson and Sullivan (1996) describe IC as the knowledge that can be transformed to value. A broader definition of IC is proposed by Zéghal and Maaloul (2010) that IC is collection of experience, information, knowledge, and intellectual property rights controlled by a company that can be utilized in companies' business process to create and drive value. Chen et al. (2014: 414), then, summarizes it as "knowledge-related intangible assets embodied in a company including intellectual property, intellectual competences, and intellectual resources". Furthermore, it can be stated that IC is closely associated with the sustainable competitive advantage and is mainly related to a company's capabilities, resources, and competence.

In reflecting, IC performance is therefore considered as an essential contribution of the firms, in this case banks, to reach competitive advantage. As summarised by Galabova and Ahonen (2011), the competitive advantage related theories can be summarised into two main strands: "market-based" and "resources-based" views, while the former, mainly led by the seminal contributions of Porter (1980), considers the external elements, such as market conditions, business environment and macroeconomy, as important determinants of firm strategy. Therefore, firms' strategies are expected to capture the nature and dynamics of such conditions in developing their competitive edge. In such a strategy development, IC created by the external environment such as the industry in which the firm operates becomes useful for the firm's competitive advantage.

On the contrary, resource-based theory mainly focuses on the internal dynamics of the firms, such as the resources it controls, to develop their strategy for competitive advantage oriented value creation. As Wernerfelt (1984) and Barney (1991) developed, the resource-based theory argues that intangible assets are crucial for maintaining competitive advantage. The resource-based theory "views the economic activity of enterprises as a process through which value is created depending on their ability to define and control input variables (resources), process them efficiently and produce an effective outcome" (Galabova & Ahonen, 2011: 319). Therefore, firms, in the case of this research banks, are expected to develop their strategies for effective and efficient value creation for competitive advantage around resources they have and capabilities through which they can process such resources. Thus, "resource-based theory emphasises on the usage of internal resources, both tangible physical assets and intangible assets which have been internalised and used effectively by firms to achieve competitive and profitable activities" (Kamaluddin & Rahman, 2013: 294). Consequently, "firms should position themselves strategically based on their resources and capabilities rather than on the products and services derived from those capabilities" (Galabova & Ahonen, 2011: 319). Inevitably, in a knowledge-based dynamic business environment, IC then becomes an essential resource to provide a competitive edge to the firms, including banks, which as a knowledge-based resource relates to innovative skills for product, process, and practice development. In summary, resource-based theory "views IC as a strategic resource because firms achieve competitive advantage through its efficient use" (Ousama et al., 2020: 79).

In the contemporary context, the importance of IC, as an essential part of resource-based strategy formation, has been widely recognized, as researchers such as Berzkalne and Zelgalve (2014) assert that employing knowledge in their business operation depends on their ICP, which is a crucial driver in the current economy. Thus, in this changing economy, IC is superior to physical assets. It can be confirmed from Wood (2003: 146) findings that "future prosperity will be based on intellectual capital, the information in people's minds, rather than physical capital or the number of physical resources within a country."

Various definitions of IC have led to the development of specific components of the IC. Pulic (1998) argues that there are two broad components of IC: human capital (HC) and structural capital (SC). Besides, Petty and Guthrie (2000) proposed relational capital as an additional component.

HC refers to knowledge embedded in people Nawaz (2019a). It is an aspect of IC that receives a more significant amount of attention, being grounded on the knowledge and skills produced and kept by a company's employees, which can be further developed with training. Experience and expertise are the other dimensions of HC, which can be enhanced with training programs. HC can be bounded to the individual (micro) (i.e. technical capability, personal character, and creativity) or organisational (macro) levels (i.e. conducive working environment and teamwork) (Joshi et al., 2010). It is, therefore considered that HC is a strategic resource of an organization where the ladders of innovation and development start.

In terms of IBs, HC is important because employees are required to have good knowledge on *Shari'ah* as well as possess conventional knowledge, expertise, and skills to provide such innovative Islamic products and services, as this will strengthen the reputation and credibility of IBs in the industry (Nawaz & Haniffa, 2017).

SC is knowledge created by a company and cannot be moved from the company (Pulic, 1998, 2004), which features organisational cultures, procedures, organizational structures, systems, routines, and databases. SC can include copyright, patents, inventions, and strategy (Joshi et al., 2010). SC is considered as a supportive infrastructure of human capital, encouraging human resources to develop and innovate with the knowledge (Edvinsson & Sullivan, 1996). Besides, SC will enhance employee capability at the organizational level, as SC is recognized as the organisation's backbone.

Mondal and Ghosh (2012) assert that motivated and well-trained employees cannot develop and innovate without effective and proper organizational culture, procedures, and rules. Further, the company's ability to implement computer systems and procedures can help companies explore revenue sources and capture additional business opportunities. However, SC cannot be developed without HC because HC is the main factor in developing SC. Therefore, SC and HC is interdependent each other (Nazari & Herremans, 2007).

RC refers to a company's capability to positively maintain its relationship with external elements to motivate potential wealth creation by utilising HC and SC (Marti, 2001). Companies can achieve more when they have RC stocks, such as customer satisfaction, brand loyalty, strategic alliances, and goodwill. It is imperative that companies create and maintain RC to ensure the sustainability of successful companies.

Existing Models and Studies, Their Limitations, and Search for Variables

Several studies have been carried out in the field of ICP in banking sectors, employing the VAIC™ approach as the main measurement. For example, Joshi et al. (2010) studied ICP of banks in Australia for the period 2005–2007 and concluded that they have a relatively higher HCE than SCE and CEE. Covering the similar period, Kamath (2007) investigated ICP of Indian banking sector from the year 2000 to 2004, comparing ICP of foreign and domestic banks, and confirmed that there is a big difference of the ICP in a different category of banks, and she also found that there is an evident bias in the ICP.

In Indonesia, Ulum et al. (2014), as the pioneer of MVAIC™, studied ICP of the banking sector for 2009–2012 and found that the banks' ICP has a relatively long-range

between −21.41 and 5.20. They classified and ranked the ICP into four categories that are top, good, common, and bad performers. In the case of Malaysia, Ting and Lean (2009) examined the ICP influences towards the financial performance of financial institutions for 1999–1997 and found ICP and financial performance are positively related among the Malaysian financial sectors, and Poh et al. (2018) confirmed the same results for 2007–2016 period. Goh (2005) examined the ICP of Malaysian commercial banks from 2001 to 2003. The findings exhibited that the banks' ability to create value is mostly assigned to HCE. This means that the HC investment makes a relatively bigger return compared to physical, financial, and SC investment. Goh (2005) further stated that the Malaysian domestic banks have lower efficiency than foreign banks. However, in accordance with value generation, foreign banks produce lower value-added compared with domestic banks. In his attempt to study the nexus between IC and financial performance relationship in Tanzanian banks for 2010–2013 by using VAIC™ through its three components (HCE, SCE, and CEE), Isanzu (2015) found a positive relationship for the overall model. However, concerning the components, he found that financial performance is positively correlated with HCE and CEE and negatively related to SCE.

There are limited numbers of research conducted on IC in the case of in IBs. Among others, Nawaz (2019a) offers a novel approach in studying IC by investigating period difference, before and after the financial crisis, in the effect of IC investment and corporate governance measures to the market performance of 47 IBs from various regions from 2005 to 2010. He found that human capital investment is positively impactful on the market value of IBs in the pre- and post-financial crisis period. Nawaz (2019b) also analyses IC and its subcomponents in relation to IBs' financial performance operating in the UK. The discrete analysis of the features suggests a positive association between human capital efficiency and financial and physical capital employed efficiency and performance. Furthermore, Nawaz and Haniffa (2017) investigated the determinants of IBs' financial performance from IP perspective, who studied 64 Islamic financial institutions from 18 countries for 2007–2011. The findings indicate that VAIC™ has a significant positive relationship to financial performance proxied as ROA. As for discrete effect to accounting performance, HCE and CEE demonstrate a highly positive connection to performance. In contrast, SCE reveals no significant impact on accounting performance. In conclusion, the value creation capability of Islamic finance institutions is highly reliant to HCE and CEE.

Investigating IC and productivity relationship, Aziz and Hashim (2017) explored IC determinants of 16 Malaysian IBs from 2009 to 2016 using correlation research design and concluded the banks depend heavily on the CEE component of intellectual capital, followed by HCE, SCE, and RCE. The findings suggest that sampled IBs' leverage and risk play an essential role in determining intellectual capital.

Considering Indonesia is an emerging Islamic finance market, several studies have subjected the Indonesian IBs to IC performance-related explorations. For example, Siswanti et al. (2017) examined IC and corporate governance on the financial performance of Indonesian IBs for the 2010–2015 period. Their results show that IC of the sampled banks has a significant impact on their financial performance and

sustainable business practices. In a later study, Siswanti and Sukoharsono (2019) repeated a similar study as Siswanti et al. (2017) but for the 2010–2016 period. They found that IC has a significant positive impact on financial performance and business sustainability for the sampled Indonesian IBs.

The IBs in the GCC region have been examined for their intellectual capital performance concerning some other factors. Among others, Buallay et al. (2019) examined the financial and market performance nexus of IC performance of Islamic and conventional banks in the GCC region. They found different results for both bank types, as IC seems to play a positive role in the financial and market performances in Islamic banks, while in the case of conventional banks, IC is positive and significant for the operational and financial performances. In a later study, Ousama et al. (2020) examined the relationship between intellectual capital performance and financial performance of 31 GCC IBs from 2011 to 2013 by using the VAIC model and its components. They reported that IC is positively related to financial performance in their sample, while SC did not produce a significant impact compared to CE and HC. In a similar most recent study focusing also on the GCC Islamic and conventional banks, Akkas and Asutay (2022a) used the VAIC model to examine the impact of IC on the financial performance of 24 Islamic and 32 conventional banks for the period of 2012–2020. Their findings mirror Ousama et al. (2020), showing that Islamic and conventional banks performed similarly concerning VAIC, HCE, and CEE. However, Islamic banks are unperformed on the impact of SC on their financial performance compared to conventional banks.

In continuing with the comparative examination of the GCC Islamic and conventional banks, Buallay et al. (2020) shifted the focus on bank efficiency of IC between 2012 and 2016. Their finding produced evidence for the positive impact of intellectual capital efficiency on the sampled banks' financial and market performance for the period in question. By shifting the subject focus, Musibah and Alfattani (2013) examine the nexus between IC and corporate social responsibility (CSR) in GCC IBs by employing data from 53 Islamic banks from 2007 to 2011. They found that IC in the form of VAIC is negatively related to the CSR performance of the sampled banks. In terms of the components, they found that CEE and CSR are positively correlated, and HCE is negatively related to CSR, while no significant relationship could be located for SCE.

In examining Islamic and conventional banks' IC and financial performance in an established Islamic market, Ul Rehman et al. (2012) sampled 20 Pakistani banks for 2010, three of which were IBs. By using VAIC™ and using both ROA and ROE for financial performance, they found that all the components of VAIC have positive relationship with financial performance, while they could not locate any significantly distinct result for IBs in comparison with other bank categories. In a similar study in Pakistan, Khan et al. (2015) examined the IC and financial performance of five Islamic banks for 2009–2014. Their results demonstrate that IC has a positive and significant impact on financial performance. Among the IC components, HCE and CEE, similar to other studies, shows a direct relationship with financial performance, while this was not possible in the case of SCE.

Extending the literature through an empirical study in 27 Bangladeshi private banks for 2013, including IBs, Hasan et al. (2017) examined the nexus between IC and profitability. Their results indicate that VAIC and its components have a significant relationship with profitability. However, the IB sample demonstrated distinction by providing evidence for different components of VAIC being significant compared to conventional banks. By also employing VAIC method, Weqar et al. (2021) examine the impact of IC on the financial performance of Bombay Stock Exchange listed companies for the 2009–2018 period. They find that VAIC has an insignificant relationship with the profitability and productivity of the sampled companies. Among the components, the capital employed efficiency positively correlates with the profitability of the selected financial companies.

By turning the attention to microfinance institutions, Ahamad et al. (2022) investigate the effect of IC and its components on the financial and social efficiency of 661 microfinance institutions from 86 countries for the period 2010–2018. They find that the three components of the IC have a significant positive effect on the financial efficiency of the sampled microfinance institutions.

Lastly, it should be noted there is also a growing literature on generating IC related data through disclosure analysis and then examining its relationship with the financial performance of sampled banks. Such recent studies include Akkas and Asutay (2022b), Mamun and Aktar, (2020), Belal et al. (2019), Kamath (2017), and Sharma and Dharni (2017). Using data generated through an IC disclosure index, Rehman et al. (2021) aim to determine the quality of the communicated information on IC components of banks from the ten largest banks from the BRICS countries by developing for 2015–2019. They found that institutional and resource-based factors have an impact on the IC disclosure practices of the sampled banks. However, similar to the detailed surveyed studies above, this study utilises actual and lived data rather than disclosed information.

Hypothesis Development

As identified above, resource-based theory suggests that in a knowledge-based era, firms can generate superior business performance by recognizing intangible assets such intellectual capital as pivotal factors to develop and maintain their competitive advantage (Barney, 1991). In fact, Mention and Bontis (2013) further argue that the key to companies' success and prosperity is by leveraging knowledge assets. Such a central role of IC as described by Mention and Bontis (2013) and Barney (1991), in terms of value generation, should be assessed by appropriate tools to estimate the degree to which traditional financial performance measures comprehensively capture the participation of IC elements like innovative ideas, customer relation, and human resources.

The present research, therefore, empirically explores the matter by identifying the nexus between a relevant IC measure and three widely exploited measures of a firm's financial performance, namely, ROA and ROE to represent profitability and ATO which is productivity representative. This study, which is predicated on resource-based theory, prognosticates an affirmative relationship between the financial performance measures and the ICP of IBs. Thus, the proposed principal hypothesis is:

H₁: The greater the banks' IC's performance, the greater will be the banks' financial performance.

The existing body of knowledge suggests that IC is comprised of HC, SC, and RC. HC investment will develop employee capabilities and is said to have a direct influence on firms' financial performance as it will increase operational efficiency in taking advantage of physical and intangible assets. However, it remains questionable in the literature that such influence on firms' performance is firmly confirmed (Mondal & Ghosh, 2012). Therefore, it becomes interesting to empirically check if HC investment will have confirmable influences on financial performance or vice versa.

To have quality human capital, structural capital such as good corporate rules and procedures shaping good corporate culture, need to be in place as the structure of the firms in the knowledge base era, so that highly motivated and skilled personnel can express the capability in a supportive environment. Supposedly, strong SC is supportive of increasing firms' productivity and minimizing the cost of services or products provided by the IBs (Bozbura, 2004). Hence, SC is crucial for firm financial performance.

As defined previously, RC refers to the association between firms and the customers, which is an essential dimension influencing the inward connection of the firms and the customers or other external stakeholders (Nazari & Herremans, 2007). Furthermore, it is the cumulative experience shaping customers' trust and knowledge that form the very essence of the relationship between customers and firms. RC has a supporting role in boosting publicity of IBs which in turn is expected to be able to escalate IBs productivity.

To examine the discrete effect of IC features, hypothesized is built upon a different component concerning financial performance, as follows:

H₁(a): Companies with greater HC efficiency tend to have higher financial performance.
H₁(b): Companies with greater SC efficiency tend to have higher financial performance.
H₁(c): Companies with greater RC efficiency tend to have higher financial performance.

It should also be reiterated that the IC cannot stand alone to create value as it requires a minimum amount of tangible or financial capital, especially in the finance sector (Pulic, 1998). Regarding the financial capital and physical capital employed efficiency, Chen et al. (2005) found CEE to impact firms' financial performance. Thus, the nominated hypothesis is as follows:

H₁(d): Companies with greater tangible capital efficiency tend to have higher financial performance.

Research Methodology

Measurement of IC and its Aspects

There are several measurement methods of IC. Value-Added Intellectual Coefficient (VAIC™), created by Pulic (1998), is the most commonly used methods and recommended by some researchers (Al-Musali & Ismail, 2016) to assess intellectual capital performance (ICP). In addition, VAIC™ uses data from audited financial statements that is feasible to obtain, making it straightforward, simple, objective, verifiable, and comparable (Nimtrakoon, 2015). Further, RC as a component added by Ulum et al. (2014) to develop Modified VAIC (MVAIC™), which is employed in this study. MVAIC™ is a systematic approach designed to allow all relevant stakeholders, from management to investors, to evaluate and monitor firms' intellectual capital efficiency, reflecting their capability to create value-added by employing their resources.

VAIC™ is formulated to predicate information on efficiency measure of value creation of a company's intangible and tangible assets. Pulic (1998, 2000) asserts that IC and capital employed are two primary resources to create and enhance added value for the company. Since IC consists of human capital and structural capital, therefore, VAIC™ is the sum of human capital efficiency (HCE), structural capital efficiency (SCE), and capital employed efficiency (CEE). As a performance indicator, the banks' ICP is better when VAIC is higher (Young et al., 2009), as expressed in Eq. (1):

$$VAIC^{TM} = HCE + SCE + CEE \tag{1}$$

The VAIC model above can be defined as (Nimtrakoon, 2015):

$$VA = OUT - IN \tag{2}$$

where *VA* is the value-added of a company; *OUT* the total revenues; and *IN* the total expenses excluding employee costs.

Pulic (2004) reformulate the total value-added computation by extending using more feasible information from the financial statement as follows:

$$VA = OP + EC + D + A \tag{3}$$

where *OP* is operating profits; *EC* is total employee expenses; *D* is depreciation; and *A* is the amortization. As for *CEE*, it is defined as follows:

$$CEE = VA/CE \tag{4}$$

where CEE is the capital employed efficiency; CE, the capital employed both physical and financial capital, measured by total assets deflated by intangible assets. As regards to HCE, it is defined as follows:

$$HCE = VA/HC \tag{5}$$

where HCE is the human capital efficiency and HC the human capital, measured by total employee expenditures. As for SCE, is defined as:

$$SCE = SC/VA \tag{6}$$

where SCE is the structural capital efficiency; SC the structural capital, which is measured by VA – HC. ICE is defined as:

$$ICE = HCE + SCE \tag{7}$$

where ICE is intellectual capital efficiency. In the end, VAIC™ is the value-added intellectual coefficient as defined as:

$$VAIC^{TM} = ICE + CEE \tag{8}$$

While VAIC™ model is extensively utilised in the literature, there is some concern for its limitations. Therefore, Ulum et al. (2014) modified the original model to develop a more comprehensive measure by adding relational capital (RC) as part of ICE, which is redefined as MVAIC™™ as depicted in Fig. 1.

The calculation of MVAIC™, which is the Modified Value-Added Intellectual Coefficient, follows the following definitions:

$$MVAIC^{TM^{TM}} = ICE + CEE \tag{9}$$

where ICE is defined as:

$$ICE = HCE + SCE + RCE \tag{10}$$

where RCE is defined as in Eq. (11):

$$RCE = RC/VA \tag{11}$$

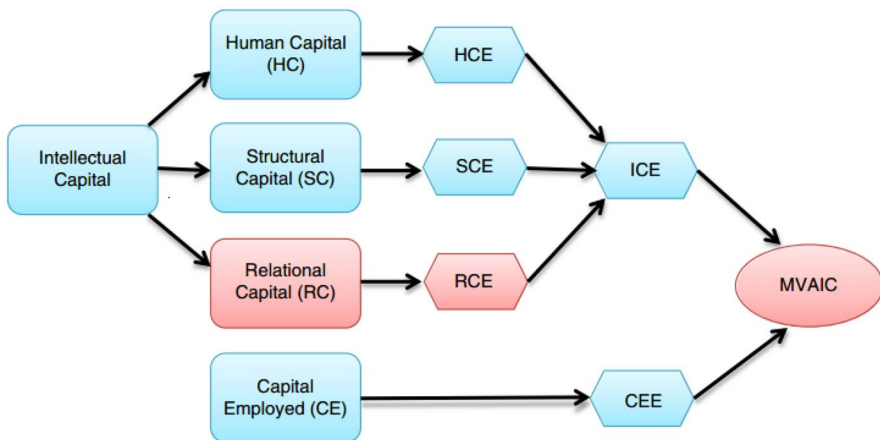where RC is the marketing expenses and RCE is the relational capital efficiency.

Fig. 1 The formulation of MVAIC™. *Source*: Ulum et al. (2014: 110)

Empirical Modelling and Variable Definition

To test the relationship between IC and financial performance, following Ulum et al. (2014) and Mondal and Ghosh (2012), based on the measurement and the model above several regression models were developed as described below. Model 1, 2, and 3 examines the relationships between ROA, ROE, and ATO and the collective measure of IC (MVAIC™), while models 4, 5, and 6 are used to analyse each of the four features of MVAIC™ and the dependent variables.

To investigate the impact of productivity on profitability, an independent variable of ATO (measure of productivity) is employed in the models where ATO is not the dependent variable. The models are demonstrated in the following regression equations:

$$\text{Model 1}: ROA = \alpha + \beta_1 \left(MVAIC^{TM}\right)_{i,t} + \beta_2(ATO)_{i,t} + \beta_3(LTA)_{i,t} + \beta_4(DE)_{i,t} + \varepsilon \tag{12}$$

$$\text{Model 2}: ROE = \alpha + \beta_1 \left(MVAIC^{TM}\right)_{i,t} + \beta_2(ATO)_{i,t} + \beta_3(LTA)_{i,t} + \beta_4(DE)_{i,t} + \varepsilon \tag{13}$$

$$\text{Model 3}: ATO = \alpha + \beta_1 \left(MVAIC^{TM}\right)_{i,t} + \beta_2(LTA)_{i,t} + \beta_3(DE)_{i,t} + \varepsilon \tag{14}$$

$$\text{Model 4a}: ROA = \alpha + \beta_1(CEE)_{i,t} + \beta_2(ATO)_{i,t} + \beta_3(LTA)_{i,t} + \beta_4(DE)_{i,t} + \varepsilon \tag{15}$$

$$\text{4b}: ROA = \alpha + \beta_1(HCE)_{i,t} + \beta_2(ATO)_{i,t} + \beta_3(LTA)_{i,t} + \beta_4(DE)_{i,t} + \varepsilon \tag{16}$$

$$\text{4c}: ROA = \alpha + \beta_1(SCE)_{i,t} + \beta_2(ATO)_{i,t} + \beta_3(LTA)_{i,t} + \beta_4(DE)_{i,t} + \varepsilon \tag{17}$$

$$\text{4d}: ROA = \alpha + \beta_1(RCE)_{i,t} + \beta_2(ATO)_{i,t} + \beta_3(LTA)_{i,t} + \beta_4(DE)_{i,t} + \varepsilon \tag{18}$$

$$\text{Model 5a}: ROE = \alpha + \beta_1(CEE)_{i,t} + \beta_2(ATO)_{i,t} + \beta_3(LTA)_{i,t} + \beta_4(DE)_{i,t} + \varepsilon \tag{19}$$

$$\text{5b}: ROE = \alpha + \beta_1(HCE)_{i,t} + \beta_2(ATO)_{i,t} + \beta_3(LTA)_{i,t} + \beta_4(DE)_{i,t} + \varepsilon \tag{20}$$

$$\text{5c}: ROE = \alpha + \beta_1(SCE)_{i,t} + \beta_2(ATO)_{i,t} + \beta_3(LTA)_{i,t} + \beta_4(DE)_{i,t} + \varepsilon \tag{21}$$

$$\text{5d}: ROE = \alpha + \beta_1(RCE)_{i,t} + \beta_2(ATO)_{i,t} + \beta_3(LTA)_{i,t} + \beta_4(DE)_{i,t} + \varepsilon \tag{22}$$

$$\text{Model 6a}: ATO = \alpha + \beta_1(CEE)_{i,t} + \beta_2(LTA)_{i,t} + \beta_3(DE)_{i,t} + \varepsilon \tag{23}$$

$$\text{6b}: ATO = \alpha + \beta_1(HCE)_{i,t} + \beta_2(LTA)_{i,t} + \beta_3(DE)_{i,t} + \varepsilon \tag{24}$$

$$\text{6c}: ATO = \alpha + \beta_1(SCE)_{i,t} + \beta_2(LTA)_{i,t} + \beta_3(DE)_{i,t} + \varepsilon \tag{25}$$

$$6d: ATO = \alpha + \beta_1(RCE)_{i,t} + \beta_2(LTA)_{i,t} + \beta_3(DE)_{i,t} + \varepsilon \tag{26}$$

where:

ROA	return on assets
ROE	return on equity
ATO	asset turnover
MVAIC™	Modified Value-Added Intellectual Coefficient
HCE	human capital efficiency
SCE	structural capital efficiency
RCE	relational capital efficiency
CEE	capital employed efficiency
LTA	log of total assets
DE	leverage ratio (debt to total assets)

Dependent Variables

Regarding the measurement, there is no adequate empirical evidence or any clear theoretical view assuring the superiority of one measure over other measures (Mondal & Ghosh, 2012). To meet the purpose of the study and following previous studies, therefore, the most commonly employed indicators are chosen and applied. Therefore, to assess IBs' financial performance, three dependent variables, commonly employed in many studies, are used separately, namely ROA and ROE to reflect profitability and ATO to reflect productivity. Nimtrakoon (2015) asserted that financial barometers remain the most accepted and widely favoured model to evaluate business performance as it reflects the achievement of economic goals of any forms of banks or any other business entities. Firer and Mitchell (2003) and Firer and Stainbank (2003) are among many researchers utilising ROA and ROE as reflections of profitability, ATO as a mirror of productivity, and market to book ratio as proxy of market value, which are all based on accounting figures.

ROA Displays the degree of firms' capability to generate profit from utilising their assets. It is drawn and calculated, in this study, from the ratio of net profit divided by book value of average total assets.

ROE Evinces firms' capability to realize a net profit concerning its internal stockholders' investment. It is perceived as an essential indicator for investors, which is computed from a ratio of net profit divided by the book value of average total equity.

ATO Is utilised to estimate firms' productivity, measuring firms' efficiency to make use of their assets to produce sales or revenue. To calculate it, the income of IBs is divided by total assets. Mondal and Ghosh (2012) argue that despite its validity to reflect banks' productivity, ATO might be exercised as its comparability in different empirical studies.

Independent Variables

The improved version VAIC™ methodology developed by Pulic (1998, 2004) which is modified by Ulum et al. (2014) by adding relational capital (RC) variable into the original model, namely MVAIC™, is exercised as the independent variable in the current study. MVAIC™ as a composite measure and its discrete features will be used accordingly in the models as independent variables. Correspondingly, IBs with a higher value of MVAIC™ tend to have better value generation because of managing efficiently all available resources, such as HC, SC, RC, and financial and physical capital.

Control variables

To isolate the effect of other considerate variables that might contribute to financial performance, three following control variables are included in the models, as each is described below (Mondal & Ghosh, 2012):

DE is computed by dividing total debt with book value total assets. It is financial leverage to control the effect of debt on the firms' financial performance as well as the impact of debt in creating more wealth.
LTA is employed to control the impact of IBs' size on the firms' performance. Book value of total assets, as depicted in the financial statements, are converted into the natural log of total assets.
ATO is used as control variables in some models where ATO is not positioned as a dependent variable. It is to measure the degree of productivity affecting the profitability of IBs.

Data and Sources

In this study, the sampled 49 Islamic commercial banks were drawn from the top ten countries in Islamic finance from 2014 to 2018 based on Thomson Reuters Index, which are listed in Table 1.

The financial data applied in this empirical study are obtained from electronically published financial reports of all sampled IBs listed in the ten countries for 5 years period, namely 2014–2018. The period was chosen based on the assumption that the economic condition in all countries was relatively stable during this period, particularly after the financial crisis.

The sampling of IBs is also based on the rationale of whether the data were available for the period in question. Thus, IBs failed to meet this requirement were eliminated from the sample. In addition, only Islamic commercial banks are considered.

Empirical Process

The estimation of *MVAIC™* is used to rank and compare *ICP* of selected IBs. The steps in calculating *ICP* using *MVAIC™* method is as follows:

Table 1 Sampled Islamic commercial banks

No	Country	Number of eligible samples	
1	Malaysia	14	Affin Islamic Bank
			Al Rajhi Bank
			Alliance Islamic Bank
			Bank Islam Malaysia
			Bank Muamalat
			CIMB Islamic
			Hong Leong Islamic
			HSBC Amanah Malaysia
			Kuwait Finance House Malaysia
			Maybank Islamic
			OCBC Al-Amin
			Public Islamic Bank
			RHB Islamic Bank
			Standard Chartered Saadiq
2	Bahrain	6	Bahrain Islamic Bank
			First Energy Bank
			International Investment Bank
			Khaleeji Commercial Bank
			Liquidity Management Center
			Venture Capital Bank
3	UAE	5	Abu Dhabi Islamic Bank
			Ajiman Bank
			Al Hilal Bank
			Emirates Bank
			Noor Bank
4	Qatar	4	Barwa Bank
			Masraf Al Rayan
			Qatar International Islamic Bank
			Qatar Islamic Bank
5	Pakistan	2	Bank Islamic Pakistan
			Meezan Bank Limited
6	Oman	1	Nizwa Bank
7	Jordan	2	Islamic International Arab Bank
			Jordan Islamic Bank
8	Indonesia	10	Bank BCA Syariah
			Bank BNI Syariah
			Bank BRI Syariah
			Bank Bukopin Syariah
			Bank Mandiri Syariah
			Bank Muamalat Indonesia

Table 1 (continued)

No	Country	Number of eligible samples	
			Bank Panin Dubai Syariah
			Bank Victoria
			BTPN Syariah
			Maybank Syariah
9	Turkey	3	Al Baraka
			Kuwait Turkish Participation Bank
			Turkey Finance Participation Bank
10	Sudan	2	Al Jazeera Sudanese Jordanian Bank
			United Capital Bank

Step (1): Calculate Value Added (*VA*).

Step (2): Calculate Intellectual Capital Efficiency (*ICE*).

Step (3): Calculate Capital Employed Efficiency (*CEE*).

Step (4): Derivation of *MVAIC™*.

Step (5): Create a ranking and comparison for IBs based on *ICP* means measured with *MVAIC™*.

The result of the average value in all countries will be sorted based on MVAIC™ performance and classified into four categories (Ulum et al., 2014):

  (i)   Top performers: *MVAIC™* score ≥ 3.50
  (ii)   Good performers: *MVAIC™* score 2.5 to 3.49
  (iii)   Common performers: *MVAIC™* score 1.5 to 2.49
  (iv)   Bad performers: *MVAIC™* score < 1.5

Step 6: The correlation analysis is applied by using Pearson Correlation test to determine the level of correlation between all tested variables, which are *ROA*, *ROE* and *ATO* of the IBs and the *MVAIC™* and its features. Subsequently, the multiple regression analysis is performed to discover the relationship strength between the variables and find out the element among the various IC components having strong influence on the *ROA*, *ROE*, and *ATO* of observed IBs.

Findings

Descriptive Analysis

In this section, the analysis of the results is presented in country level for the sampled period 2014–2018. The mean value of the variables concerning the intellectual capital performance; CEE, HCE, SCE, RCE, and MVAIC™ is shown in Table 2, which is arranged according to the MVAIC™ rank. As can be seen, IBs operating in Malaysia on average have the most favourable level of efficiency (with MVAIC™ = 11.286) with CEE, HCE, SCE, and RCE at 0.174, 10.396, 0.690, and 0.027, respectively. It is

Table 2 IC performance of IBs in the sampled countries

	CEE	HCE	SCE	RCE	MVAIC
Malaysia	**0.174**	**10.396**	**0.690**	**0.027**	**11.286**
2014	0.189	8.417	0.708	0.038	9.352
2015	0.167	8.710	0.644	0.027	9.547
2016	0.167	10.176	0.670	0.024	11.036
2017	0.166	11.694	0.701	0.024	12.585
2018	0.178	12.985	0.725	0.021	13.910
Qatar	**0.044**	**6.899**	**0.839**	**0.010**	**7.792**
2014	0.042	6.397	0.824	0.013	7.277
2015	0.041	6.296	0.828	0.013	7.179
2016	0.048	8.020	0.852	0.007	8.927
2017	0.041	6.797	0.844	0.010	7.692
2018	0.046	6.982	0.848	0.008	7.884
Sudan	**0.273**	**4.218**	**0.714**	**0.018**	**5.223**
2014	0.229	4.039	0.747	0.013	5.027
2015	0.243	3.655	0.724	0.016	4.639
2016	0.248	2.714	0.596	0.029	3.588
2017	0.268	3.237	0.690	0.024	4.218
2018	0.378	7.445	0.811	0.009	8.643
Jordan	**0.044**	**3.205**	**0.684**	**0.013**	**3.946**
2014	0.039	2.836	0.640	0.017	3.533
2015	0.042	3.173	0.680	0.015	3.910
2016	0.046	3.402	0.704	0.014	4.167
2017	0.047	3.393	0.705	0.010	4.155
2018	0.047	3.222	0.689	0.011	3.968
UAE	**0.250**	**2.596**	**0.600**	**0.016**	**3.462**
2014	0.240	2.424	0.567	0.023	3.253
2015	0.304	2.585	0.613	0.018	3.519
2016	0.233	2.468	0.583	0.014	3.299
2017	0.237	2.764	0.618	0.013	3.633
2018	0.235	2.741	0.618	0.012	3.606
Turkey	**0.309**	**2.163**	**0.528**	**0.020**	**3.020**
2014	0.338	2.353	0.575	0.023	3.289
2015	0.317	2.190	0.541	0.015	3.063
2016	0.297	2.032	0.503	0.023	2.855
2017	0.312	2.117	0.514	0.018	2.960
2018	0.280	2.126	0.506	0.023	2.935
Pakistan	**0.422**	**2.077**	**0.480**	**0.031**	**3.009**
2014	0.428	2.107	0.492	0.024	3.052
2015	0.418	1.924	0.416	0.027	2.784
2016	0.444	2.073	0.488	0.025	3.029
2017	0.413	2.274	0.558	0.028	3.273
2018	0.406	2.005	0.446	0.051	2.909

Table 2 (continued)

	CEE	HCE	SCE	RCE	MVAIC
Indonesia	**0.167**	**1.527**	**0.435**	**0.041**	**2.170**
2014	0.228	1.888	0.365	0.061	2.543
2015	0.206	0.598	0.496	0.041	1.341
2016	0.283	2.151	0.451	0.029	2.913
2017	-0.081	1.053	0.465	0.027	1.464
2018	0.201	1.943	0.399	0.046	2.590
Bahrain	**0.011**	**1.052**	**0.643**	**0.024**	**1.730**
2014	0.062	2.882	0.286	0.035	3.264
2015	0.030	1.194	1.292	0.017	2.532
2016	0.030	1.382	0.557	0.026	1.994
2017	-0.069	-0.798	0.782	0.021	-0.063
2018	0.002	0.601	0.297	0.022	0.922
Oman	**0.031**	**1.050**	**-0.851**	**0.156**	**0.386**
2014	0.009	0.185	-4.393	0.473	-3.726
2015	0.025	0.561	-0.781	0.156	-0.039
2016	0.035	1.135	0.119	0.077	1.367
2017	0.043	1.506	0.336	0.039	1.923
2018	0.044	1.864	0.464	0.034	2.406
Mean	**0.164**	**4.781**	**0.586**	**0.028**	**5.559**
Max.	0.444	12.985	1.292	0.473	13.910
Min.	−0.081	−0.798	−4.393	0.007	−3.726

followed by Qatar, Sudan, Jordan, and UAE as the top 5 of the sampled countries with average MVAIC™ 7.792, 5.223, 3.946, and 3.463, respectively.

As shown in Table 2, the main contributor to efficiency in Malaysia is HCE, with an average of 10.396, and it is steadily increasing from 2014 at 8.417 to 2018 at 12.985. It reflects the higher and serious commitment of investment in human capital as a mandate from Malaysia's Knowledge-Based Economy Master Plan 2002 where intellectual capital is the focus and prime mover to Malaysian economy to realize the objectives of the nation's vision 2020 (Mustapha & Abdullah, 2004). Moreover, in recent years, Aziz and Hashim (2017) stated that the Malaysian Islamic banking sector faced high competitive pressure in providing top quality and innovative products to customers cost-effectively and efficiently, thus, the IC investment need to be prioritized.

The last five observed countries are Turkey, Pakistan, Indonesia, Bahrain, and Oman. Oman has the lowest average MVAIC™ with 0.386, with CEE, HCE, SCE, and RCE at 0.031, 1.050, −0.851, and 0.156, respectively. Oman also has the lowest SCE among the IBs studied. However, even though their MVAIC™, CEE, HCE, and SCE values are not meeting satisfactory level, IBs in Oman has the highest values of RCE at 0.156 which is the new subcomponent of IC explored in this research. It suggests that Oman needs extra effort to generate, improve, and maintain value creation efficiency in other aspects of intellectual capital.

Among the GCC countries included in the sampled countries; as shown in Table 2, Qatar, UAE, Bahrain, and Oman; Qatar has the highest MVAIC™ value at 7.792. Their value for CEE, HCE, SCE, and RCE are 0.044, 6.899, 0.839, and 0.010, respectively. While UAE on average scores, the second-highest in this study with MVAIC™ at 3.462. This finding is aligned with Al-Musali and Ismail (2016) who find that Qatar's commercial banks owned the highest VAIC™ and the UAE sit in the second rank compared to the other countries in the GCC region in the period 2008–2010. It implies that Qatar and the UAE can still maintain the value creation efficiency until the current years.

Overall, IBs' HCE is the primary mover of IC performance compared to CEE, SCE, and RCE. This finding is harmonious with some studies who reported that performance of HCE is better than another subcomponent of the intellectual capital of IBs in different countries (Nawaz & Haniffa, 2017), in commercial bank in the GCC (Al-Musali & Ismail, 2016), in Turkey (Ozkan et al., 2017), in Malaysia (Goh, 2005; Ting & Lean, 2009), in Japan (Mavridis, 2004), and Indonesia (Ulum et al., 2014).

Based on IC performance in Table 2, we classify the sampled countries into four categories: four countries as top performers with MVAIC™ score ≥ 3.50, those are Malaysia, Qatar, Sudan, and Jordan. The second category is good performers with MVAIC™ score 2.5 to 3.49, consisting of the UAE, Turkey, and Pakistan. Countries with MVAIC™ score 1.5 to 2.49 are classified into common performers, which are Indonesia and Bahrain. Finally, the bad performers with MVAIC™ score lower than 1.5, which is Oman.

Descriptive Statistics

Table 3 reports descriptive statistics for selected IBs' characteristics, including mean, standard deviation, minimum, maximum, skewness, and kurtosis for IBs for all the independent and dependent variables used in the primary analysis for 5 years panel data.

For the dependent variables, ROA and ROE for overall profitability performance of sampled IBs are positive but not demonstrating a sound performance as indicated by their mean values at 0.006 and 0.043, respectively. Due to the wide range of minimum and maximum values of the variables, which are 0.311 to 0.235 for ROA and −3.533 to 0.297 for ROE. It shows that IBs can still generate profit but not significant enough to be called good performance. In the case of ATO, IBs show a slightly better performance than previous variables, with mean value 0.061.

For the continuous independent variables reflecting intellectual capital in Table 3, it is reported that MVAIC™ is 5.56, indicating that the sampled IBs were able to utilize their IC to generate value. All subcomponent of IC also shows positive means, where HCE has the highest value for 4.781 shadowed by SCE at 0.586, CEE at 0.164 and RCE having the lowest value at 0.029. This confirms that human capital is the principal contributor to the intellectual capital formation, while relational capital is the least.

Table 3 shows the result of residuals of standard examination on skewness and kurtosis that demonstrated some complication with the normality assumption for all of the variables. However, according to Pallant (2016: 57), this skewness problem can be ignored as with justifiably substantial samples, such as more than 200

Table 3 Descriptive statistics of performance measures and continuous independent variables

	Mean	Std. Deviation	Minimum	Maximum	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
N	245	245	245	245	245	245	245	245
MVAIC	5.559	8.236	−11.200	52.181	3.319	0.156	12.971	0.310
CEE	0.164	0.263	−3.045	0.882	−7.285	0.156	91.582	0.310
HCE	4.781	8.075	−11.810	50.947	3.412	0.156	13.494	0.310
SCE	0.586	0.502	−4.393	3.910	−3.415	0.156	48.060	0.310
RCE	0.029	0.042	−0.010	0.473	6.119	0.156	55.267	0.310
ROA	0.006	0.040	−0.311	0.235	−2.773	0.156	25.544	0.310
ROE	0.043	0.249	−3.533	0.297	−12.375	0.156	176.790	0.310
ATO	0.061	0.043	−0.042	0.318	3.537	0.156	17.752	0.310
LTA	21.809	1.618	17.640	24.720	-0.521	0.156	−0.538	0.310
DE	0.718	0.274	0.060	0.970	-0.919	0.156	−0.797	0.310

samples, will not make a substantive distinction in the analysis, and the risk of an underestimate of variance caused by kurtosis problem is also reduced. Therefore, as this study uses 245 samples, the regression analysis can be carried out.

As can be seen in the Pearson correlation matrix in Table 4, in between IC variables, HCE has a significant relationship with SCE ($r=0.243$, $p<0.01$), HCE has a significant negative relationship with newly added variable RCE ($r=-0.133$, $p<0.05$), and SCE and RCE have a significant negative relationship ($r=-0.603$, $p<0.01$).

As the relationship between IC variables and financial performance, CEE has significant positive relationship with ROA ($r=0.431$, $p<0.01$), ROE ($r=0.900$, $p<0.01$), and ATO ($r=0.331$, $p<0.01$), HCE has significant relationship with ROA ($r=0.204$, $p<0.01$), ROE ($r=0.223$, $p<0.01$), but negative relationship with ATO ($r=-0.123$).

Table 4 Correlation matrix

	ROA	ROE	ATO	MVAIC	CEE	HCE	SCE	RCE	LTA	DE
ROA	1									
ROE	0.483**	1								
ATO	0.335**	0.081	1							
MVAIC	0.203**	0.242**	−0.115	1						
CEE	0.431**	0.900**	0.331**	0.136*	1					
HCE	0.204**	0.223**	−0.123	0.998**	0.112	1				
SCE	−0.183**	−0.084	−0.074	0.293**	−0.096	0.243**	1			
RCE	−0.027	0.024	0.013	−0.161*	0.025	−0.133*	−0.603**	1		
LTA	0.110	0.176**	−0.344**	0.441**	0.138*	0.434**	0.196**	−0.052	1	
DE	0.057	0.110	0.083	0.178**	0.290**	0.173**	−0.014	0.035	0.307**	1

*Correlation is significant at the 0.05 level (2-tailed)

**Correlation is significant at the 0.01 level (2-tailed)

SCE has a negative significant relationship with ROA ($r = -0.183$, $p < 0.01$), and negative relationship with ROE ($r = -0.084$), and ATO ($r = -0.074$). Finally, the last variable of IC is RCE has negative relationship with ROA ($r = 0.027$) but has positive relationship with ROE ($r = 0.024$) and ATO ($r = 0.013$) but not significant.

Findings also revealed that CEE has the strongest relationship with all financial performance variables, followed by HCE, RCE finally, SCE. In short, the result indicates that IC is believed as important and strongly related to financial performance.

The Impact of Intellectual Capital on Financial Performance

Table 5 displays the results based on financial performance, ROA, ROE, and ATO, of all 49 IBs of 10 selected countries for five years from 2014 to 2018. The models examine the association between intellectual capital efficiency, MVAIC™, and financial performance of IBs measured with profitability, ROA and ROE, and productivity, ATO. The R^2 of all models' empirical results show the value of 0.243, 0.156, and 0.089 for model 1, model 2, and model 3, respectively. The F value of model 1 and model 3 for panel data are less than 0.05, which are statistically significant, indicating all coefficients in the models are sound, while model 3 has F value of more than 0.05.

Firstly, for the impact of ROA, MVAIC™ is reported to have a significant positive influence on ROA at 10% significance. One control variable, debt-equity ratio, has significant ($p < 0.01$) and negative effect on ROA, while the other control variables are not statistically significant in model 1. It implies that IBs can increase their value by utilising their intellectual capital and financial resource-based efficiently to attain a higher return on assets (ROA).

In model 2, the independent and control variables are not statistically significant in relationship with ROE, where MVAIC™ has a positive effect on ROE and the three control variables (ATO, LTA, and DE) have negative impact on ROE. These findings imply that MVAIC™ is not impactful on the IBs' profitability based on ROE. It is consistent with Puntillo (2009) who revealed IC and ROE is not strongly related.

Table 5 Results for MVAIC™ and financial performance

	Model 1, ROA	Model 2, ROE	Model 3, ATO
Constant	0.214 (0.354)	1.361 (1.276)	0.250*** (0.0517)
MVAIC	0.00456* (0.00250)	0.0269 (0.0198)	0.000401 (0.000322)
ATO	0.0872 (0.394)	−1.861 (2.190)	
LTA	−0.00559 (0.0160)	−0.0340 (0.0386)	−0.00840*** (0.00237)
DE	−0.163*** (0.0511)	−0.854 (0.679)	−0.0103 (0.0125)
Observations	245	245	245
Number of bank	49	49	49
R-squared	0.243	0.156	0.0893
Prob > F / chi2	0.0001	0.3605	0.0002

Robust standard errors in parentheses

*$p < 0.1$; **$p < 0.05$; ***$p < 0.01$

As for productivity measure, insignificant positive influence exists in the interaction from MVAIC™ to ATO that can be observed in the third column of Table 5. Logged assets (LTA) as a measure of banks' size has a significant negative effect on ATO at 1% significance level, and DE has an insignificant negative impact on ATO. It can be concluded based on this result that MVAIC™ is not crucial in affecting the performance variable that is productivity (assets turnover ratio, ATO) which is confirming the findings reported by Aziz and Hashim (2017) studying IBs in Malaysia from 2009 to 2016.

Based on the results that MVAIC™ strongly affects ROA and slightly affects ROE and ATO, it can be concluded the positive effects are found in all cases of MVAIC™ affecting both profitability and productivity measures of IBs in the period 2014–2018. Therefore, H_1 is supported that the greater the IBs' IC's performance, the greater will be the IBs' financial performance. The overall results are in alignment with previous studies of IC in Islamic banking sector such as Nawaz (2017, 2019b), Nawaz and Haniffa (2017), and Ousama and Fatima (2015) as well as IC studies in conventional banking sector such as Al-Musali and Ismail (2016) and Mondal and Ghosh (2012). The aggregated outcome from especially regression model 1 tends to focus MVAIC™ as a driver of banks' intellectual efficiency in top ten countries and as such lend support to our estimates implying that IBs with higher IC performance tend to have greater financial performance, *ceteris paribus*.

The Relationship Between Subcomponent of IC and Financial Performance

Supporting the main model, three models with its sub-models are used to measure the segregated impact of IC components on the financial performance of IBs. Models 4, 5, and 6 are the same as model 1, 2, and 3, but this time, the composite measure MVAIC™ is substituted with the independent variables related to the four features of MVAIC™, namely, CEE, HCE, SCE, and RCE. Model 4 is used to examine the IC components to financial performance based on ROA, while model 5 examines ROE, and model 6 is for testing effects of IC components to productivity. Tables 6, 7, 8, and 9 exhibit the multiple

Table 6 Results for CEE

	Model 4a, CEE to ROA	Model 5a, CEE to ROE	Model 6a, CEE to ATO
Constant	− 0.0702 (0.350)	− 0.760* (0.412)	0.193** (0.0769)
CEE	0.0541** (0.0247)	1.077*** (0.0418)	− 0.00135 (0.00309)
ATO	0.229 (0.399)	− 0.577 (0.546)	
LTA	0.00850 (0.0153)	0.0385* (0.0206)	− 0.00469 (0.00374)
DE	− 0.183*** (0.0493)	− 0.248** (0.109)	− 0.0413** (0.0164)
Observations	245	245	245
Number of bank	49	49	49
R-squared	0.218	0.951	0.064
Prob > *F*	0.0009	0.0000	0.0052

Robust standard errors in parentheses

*$p < 0.1$; **$p < 0.05$; ***$p < 0.01$

Table 7 Results for HCE

	Model 4b, HCE to ROA	Model 5b, HCE to ROE	Model 6b, HCE to ATO
Constant	0.217 (0.352)	1.073 (1.066)	0.205*** (0.0738)
HCE	0.00505* (0.00286)	0.0238 (0.0166)	0.000258 (0.000320)
ATO	0.102 (0.378)	−1.662 (2.046)	
LTA	−0.00584 (0.0158)	−0.0175 (0.0293)	−0.00546 (0.00362)
DE	−0.159*** (0.0538)	−0.921 (0.758)	−0.0359** (0.0160)
Observations	245	245	245
Number of bank	49	49	49
R-squared	0.266	0.132	0.068
Prob > F	0.0002	0.2904	0.0036

Robust standard errors in parentheses

*$p < 0.1$; **$p < 0.05$; ***$p < 0.01$

regression results of MVAIC™ features and financial performance. The statistical association between the components of MVAIC™ and financial indicators provides some interesting insights.

Results of the model 4a, 5a, and 6a relating to CEE in Table 6 shows that R^2 equals 0.218, 0.951, and 0.064, respectively. These numbers indicate that the model can describe 21.8%, 95%, and 6% on the variance of observed dependent variables for the samples. In terms of F statistic, all results are statistically significant.

The outcomes reveal that CEE has a significant positive relationship with ROA ($p < 0.05$) and ROE ($p < 0.01$), while CEE has a negative but statistically insignificant relationship to ATO as shown in model 6a. The findings indicate that CEE has a strong effect on both profitability measures, ROA and ROE, but no indicative impact on productivity; thus, hypothesis $H_1(d)$ is accepted. The nexus of CEE and ROA is supported by Ozkan et al. (2017) and Nawaz and Haniffa (2017)'s findings, and Buallay (2019)'s recent study supports that CEE strongly affect ROE in his study of Kuwaiti IBs.

Table 8 Results for SCE

	Model 4c, SCE to ROA	Model 5c, SCE to ROE	Model 6c, SCE to ATO
Constant	−0.183 (0.386)	−0.661 (0.862)	0.208** (0.0801)
SCE	−0.0234 (0.0215)	−0.0860 (0.0699)	0.00308 (0.00298)
ATO	0.338 (0.363)	−0.695 (1.613)	
LTA	0.0159 (0.0171)	0.0780 (0.0524)	−0.00550 (0.00391)
DE	−0.229*** (0.0670)	−1.258 (0.934)	−0.0401** (0.0151)
Observations	245	245	245
Number of bank	49	49	49
R-squared	0.199	0.084	0.081
Prob > F	0.0023	0.3397	0.001

Robust standard errors in parentheses

*$p < 0.1$; **$p < 0.05$; ***$p < 0.01$

Table 9 Results for RCE

	Model 4d RCE to ROA		Model 5d RCE to ROE		Model 6d RCE to ATO	
Constant	0.00217	(0.419)	− 0.409	(0.909)	0.211***	(0.0765)
RCE	− 0.0562	(0.104)	0.383	(0.730)	− 0.0266	(0.0242)
ATO	0.182	(0.443)	− 1.113	(1.864)		
LTA	0.00761	(0.0181)	0.0648	(0.0543)	− 0.00546	(0.00376)
DE	− 0.239***	(0.0548)	− 1.260	(0.932)	− 0.0413**	(0.0168)
Observations	245		245		245	
Number of bank	49		49		49	
R-squared	0.113		0.062		0.070	
Prob > F	0.0002		0.5509		0.0021	

Robust standard errors in parentheses

*$p < 0.1$; **$p < 0.05$; ***$p < 0.01$

Table 7 presents the supporting evidence for the relationship of HCE to financial performance, that HCE is impactful to financial performance especially measured by ROA at 10% significance level; thus, $H_1(a)$ is supported. However, the relationship of HCE to ROE and ATO is inconclusive but still displays positive coefficient. It implies that investment in HCE, such as employee training and education, will strongly affect profitability (ROA) but not necessarily affect profitability (ROE) and productivity, ATO.

For ROA, the findings support the most current research from Nawaz (2019a) who found that human capital in IBs has a significant influence on the firm's performance. As for ROE, it is contrary to Poh et al. (2018)'s result but consistent with Puntillo (2009)'s study. While for productivity, it is in line with Mondal and Ghosh (2012) result that HCE and ROE was not significant.

The results in Table 8 show no significant effect of SCE on profitability (ROA and ROE) and productivity (ATO), which implies that structural capital investment is less effective in producing and enhancing value in Islamic banking leads to improved financial performance. Therefore, the proposed hypothesis $H_1(b)$ is rejected. It is in line with what Nimtrakoon (2015) found when testing the relationship of SCE to ROA of firms from ASEAN countries and with Mention and Bontis (2013)'s results when examining the banking sector in Luxemburg and Belgium. It might imply that infrastructure and facility investment made to facilitate human to create and develop knowledge to increase financial performance cannot directly affect on a standalone basis.

The results of the distinct variable, namely RCE, of this study is presented in Table 9. Similarly, RCE possess no significant impact on any of the performance measures of IBs from 2014 until 2018. It means that the investment of IBs in marketing has not given a meaningful impact on IBs' financial performance during 2014–2018. Therefore, $H_1(c)$ is not supported. It is consistent with prior findings by Mention and Bontis (2013) that RCE has no significant effects on business performance.

Regarding the control variables, empirical findings indicate that productivity (ATO) does not significantly influence financial performance measures as depicted in all regression result of the models. As for bank size, measured by log natural total assets

(LTA), the regression produced almost the similar results in all models excluding in model 3 and model 5a, which posit that IBs size has strong negative effect to productivity and strong positive impact to ROE. DE, the last control variable, displays a strong negative impact on financial performance in almost all models.

Conclusion and Discussion

Critical Reflections on the Results

This research has examined the nexus between IC and financial performance measured by profitability and productivity in IBs. The results show that IC is an essential feature of IBs' profitability but inconclusive as a determinant of IBs' productivity. The results also show that the CEE and HCE are significant variables affecting IBs' profitability, while SCE and RCE are insignificant. It means that the higher the CEE and HCE, the higher profitability. It confirms the resource-based theory (Barney, 1991; Wernerfelt, 1984) that intangible assets, in this case, intellectual capital, are crucial to maintain a competitive advantage in a knowledge-based dynamic business environment.

The other result is IC performance of top ten Islamic countries that rank Malaysia as the best country where IBs can utilise their IC efficiently, and Oman has the least efficiency usage of intellectual capital. Malaysia has proven that they have been paying attention to the appropriate driver to attain and sustain their ambition to be the Islamic financial hub, as Abuazoum et al. (2013) also found that knowledge sharing custom is a determinant of success in Malaysian IBs. Since only one IB was sampled from Oman, it needs to benchmark its strategy to ensure the Islamic banking sector's sustainable growth in a proper guided way.

Overall, the empirical results confirm that in all sampled IBs in top ten Islamic finance countries, MVAIC™ has a positive relationship to financial performance based on ROA, ROE and ATO. Thus, intellectual capital investment plays a significant and critical role in creating value for the companies, especially to compete and grow in the highly knowledge-based sector and era. Moreover, globalization has put IBs into the wide-reaching competition, competing with conventional banks and any non-banking institutions providing similar services such as financial technology firms. However, concerning the analysis of segregated features of MVAIC™ to financial performance variables, the results vary across models in the observed samples during the studied period. As detailed in this chapter, all MVAIC™ features are tested individually along with control variables concerning each of the financial measures.

The results endorse the findings of Buallay (2019) examining IC efficiency impact to operational, financial, and market performance of Islamic and conventional banks in the GCC countries, and Nawaz and Haniffa (2017) findings stated that IC and financial performance has a significant positive relationship in IBs of 18 different countries during 2007–2011. Further, this study lends support to other IC research in the context of conventional banking, such as Al-Musali and Ismail (2016), Mavridis (2004, 2005) as well as Mention and Bontis (2013).

Consequently, it is evidenced that MVAIC™, which reflects total efficiency or intellectual ability, can create, and boost the value of IBs, which in turn can increase

financial performance. In other words, the higher the IC performance of IBs, the greater their financial performance. Hence, based on IC's crucial effect as proven from this study, IC must be treated as strategic assets as it is a distinctive resource of competencies belongs to firms. As explored in detail, this study is framed through resource-based theory, which conceptualises that intangible assets are crucial in maintaining competitive advantage in a knowledge-based dynamic business environment. Regarding the IC's superiority to tangible assets, Mavridis (2004) submitted that banks utilising their IC resources in a more efficient and effective manner than physical resource become the best performing banks.

For the individual analysis of each MVAIC™ components, CEE is recognized as positively impactful on IBs financial performance, especially profitability, but no significant effect on productivity. It suggests that sampled IBs have utilised their capital resources to create and enhance value leading to better financial performance. Its result is expected as IBs are in the financial service sector where the need for financial capital is strong to provide primary services to customers such as financing. It also implies that to gain sound profitability and stay competitive, IBs need to acquire more financial capital.

As the lead indicator of IC, the human capital shows a significant positive effect on the financial performance of IBs, indicating that IBs have a significant commitment to improving their human resources. This validates some research findings, such as Linda et al. (2017) and Nawaz (2017, 2019a), revealing that banks with the higher human capital investment will have higher ability to generate sound financial performance. Goh (2005) argued that although physical and financial capital is an important resource for banks, it is the human capital resource that determines the quality of services provided to customers. As IBs are distinct from conventional banks, the challenge in investing in HC is higher because employees are expected to possess not only conventional banking-related skills and knowledge but also, to have strong knowledge of Islamic jurisprudence as this will leverage the IBs' reputation and credibility in the market. Together with intelligence and creativity, employees could carry out their work in the best way possible. Arguably, this distinctive knowledge formation should be the competitive advantage of human resources that can lead to the superior sustainable performance of IBs.

With regard to HC, viewed from Islamic worldview, human capital is both prolific and noble. It is prolific because human capacities, knowledge, and productive skills will always grow and develop through its utilization and become the real intangible assets to be used as tools for development and growth. It is unlike other modes of economic production such as machine and money that can vanish through consumption. It is believed that human resources are the ultimate determinant of character and pace of economic and social development, not capital or material resources (Hashi & Bashiir, 2009).

Compared to CEE, HCE has a lower significant effect on financial performance for IBs, indicating IBs is more reliant on CEE than on HCE to generate financial performance. It supports Nawaz and Haniffa's (2017) findings where CEE scores more in ROA-based regression results, compared to the score of HCE. However, both CEE and HCE possess the same effect on financial performance which is significantly positive.

In contrast, SCE does not display a significant impact on IB's financial performance in the sampled countries. It is contrary to Mention and Bontis (2013), who asserted that there is an insignificantly positive association between SCE with firms' performance. It reveals a condition where IBs' attempt is not adequate enough to codify the knowledge strength in the company that can be a basis for further development of SC. SC can be supportive of implementing and deploying more innovative ideas, services, and products in IBs so it can be more competitive in the market. The lack of structural effects on IBs' performance further reveals that SC investment has not maximally created value to Islamic banking operations. It might be caused by the priority taken by managers who empirically invest more to human capital but lack in providing organizational structure, procedures, or system that are adequate to support their work. Consequently, SC declines and causes a reduction in IBs' overall performance. To have a highly competitive advantage value, IBs are required to improve their IT infrastructure, particularly in mobile banking, as currently, the financial world is now advancing in mobile internet services. Important to note, that new *shariah* based product need to be continuously developed along with the IT investment as it is the core difference of IBs to conventional banks, which in turn expected to have a higher impact on IBs financial performance.

The results of RCE reveal no significant effects on IBs financial performance. It is affirmative to the prior research conducted by Mention and Bontis (2013), who established that RC in conjunction with firms' performance is insignificantly positive. IBs should begin to invest more in building relationships with their customers to produce higher value-added. IBs' strategic policies should therefore consider the involvement of customers in decision-making so that the services and products can meet the customers' demand and need that can increase customers' satisfaction and lead to higher financial performance. IBs, in conclusion, need give more attention to structural and relational capital as its state is now still minimum, while it is believed in the long term, these two variables can significantly contribute, improve, and sustain IBs' financial performance.

Considering that emergence of IBs is attributed to knowledge rather than practice, the knowledge economy base is more pronounced. In other words, "rather than observation-based theory and institution, Islamic finance is entirely a knowledge-based emergence, which essentialises the importance of knowledge as a base and its development as an intellectual capital formation" (Akkas & Asutay, 2022b: 2). In the Islamic cognitive system, continuous knowledge development is considered part of the development path of individuals. Thus, within the Islamic cognitive system, "knowledge is considered more important than any type of wealth and property, which can be developed through innovation and research. Thus, knowledge whereby innovation is essentialised by Islam for the development of individuals, organisations and societies" (Akkas & Asutay, 2022a: 3). Consequently, knowledge development in Islamic banks is expected to lead to innovation and hence contribute to developing a more extensive knowledge economy in the societies in which Islamic banking is prevailing. Therefore, in line with Islamic normativeness, Islamic banks are expected to be at the forefront of knowledge development rather than mimic and mirror conventional banks (Asutay, 2013) and become knowledge consumers. This is particularly important as those countries leading in Islamic finance, such as

Malaysia and the GCC countries, have identified their future as knowledge economies. Hence, Islamic banks should develop their innovative capacity to contribute to the aimed knowledge economy in those countries.

Significance of the Study

This research's significance stems from drawing IB samples from top ten Islamic finance countries as representative of global IBs. Secondly, this study utilises Modified VAIC as the measurement of ICP, which is considered the enhanced version of the original VAIC™ model developed by Pulic (1998, 2004). This will contribute to the existing research gap.

IC in banking industries have been researched but mostly for conventional banks (*see* Al-Musali & Ismail, 2016; Kamath, 2007; Mavridis, 2004). There is a scarcity of research investigating the IC of IBs and its relation to financial performance. Thus, there is a reasonable motivation to examine IC in IBs to contribute and narrow the literature gap by empirically investigating the ICP of IBs concerning their financial performance in top ten Islamic finance prevailing countries.

This study, hence, contributes to the bourgeoning literature in several ways. Firstly, it is useful for IBs and financial authorities to know the state of intellectual capital performance in the countries to formulate a better policy for betterment in the Islamic finance sector. Secondly, it helps to identify the trend of IBs' IC performance to encourage the management to pay more attention to IC investment and reporting and simultaneously, it can be helpful for other users to better comprehend the components of IC in IBs. Additionally, examining the nexus between ICP and financial performance is expected to guide all IBs' stakeholders to better manage IBs from a new perspective. Moreover, this study is also likely to be accessible and available for all regulators to formulate policies per national and international objectives. Furthermore, the study contributes to the existing literature regarding the performance of IC, specifically concerning IB sector in leading Islamic finance countries. Lastly, it serves as a useful reference for future research especially relating to Islamic finance.

Concerning the incremental contribution to the literature, most of the studies reviewed in the literature review section ("Existing Models and Studies, Their Limitations, and Search for Variables" section) utilised the VAIC™ model to measure IC. In contrast, this study used the MVAIC™, the modified version of VAIC™, by taking into account the relevant stakeholder to evaluate and monitor firms' intellectual capital efficiency, reflecting their capability to create value-added by employing their resources. While it has its own limitations, as discussed below, using MVAIC™ expanded the power of the empirical framework by also capturing the impact of the stakeholders. This should be considered as a better formulation given the global sustainable development agenda. In addition, compared to most of the studies, this study covers a larger sample (49 IBs were drawn from top ten countries where there is a systemic presence of Islamic finance) and most recent data (2014 to 2018), which, therefore, constitutes the additional novelty of this study.

In comparison, being one of the most recent studies, Nawaz et al. (2021) assembled their data from 64 IBs operating in different regions during the period 2007–2014,

while Ousama et al. (2020) covered 31 GCC IBs for 2011–2013 period, and Buallay's (2019) data included 21 IBs with a total 59 GCC banks for the 2012–2016 period. As for Nawaz (2017), he covered 47 IBs for the 2006–2007 and 2009–2010 period, while Nawaz and Haniffa (2017) assembled data for the 2007–2011 period for 64 IBs in 18 jurisdictions. Similarly, Nawaz (2019a) included 47 IBs for the 2005–2010 period. Thus, as can be seen, even when compared to the most recent studies, this research presents an analysis based on the most current and up-to-date data. Furthermore, in the sampling process, this study opted for a systematic criterion of selecting the sample banks. Thus, rather than pragmatically selecting sampled based on data availability, this study opted for IBs where Islamic finance has a systemic presence. This methodological approach to sampling should be considered as an important systematic contribution. Moreover, in terms of a number of banks, this study sampled larger banks compared to most of the literature covered except for Nawaz et al. (2021) and Nawaz and Haniffa (2017).

Policy Implications

Regarding the practical implications, the findings established that intellectual capital is highly significant to IBs, which implies that IBs require multitalented human resources to operate in a *Shariah*-compliant manner. IBs are encouraged to invest relatively more in IC to nourish human resources that meet the ethical commitments underlying their ethical business model.

In terms of IC performance among top ten Islamic finance countries, the results suggest that there is a need to share knowledge in managing intellectual capital among the countries. Collaborative actions among IBs in intra- and intercountry must be strengthened to enhance the impact value of IBs. It is to leverage all countries to be classified as top performer countries in managing intellectual capital.

Limitations and Future Research

Lastly, similar to any other study, this study has its limitations. First, the sample size is less than ten percent of the population due to the difficulty in obtaining relevant information from all the Islamic banks, such as unavailability of the latest financial reports and unavailability of data of particularly marketing or publicity expenses. For future research, it is recommended that sampled IBs and the countries should be increased to improve representation.

Another fundamental limitation of this research lies in the MVAIC™ model that has been criticised as not fully representing the full size of intellectual capital. This is due to the fact that SCE component in MVAIC™ is not just built between VA-HC ratio or VA/SC. Consequently, it complicated as the efficiency from SC will be high only if the efficiency of HC is low. Future research can consider using other models such as Nazari and Herremans (2007)'s extended VAIC or (Ulum, 2013) E-VAIC plus. Both models separate the size of SC from HC and VA as Pulic's model. SC in both models is measured using innovation capital and process capital (Ulum et al., 2016). We hope to extend this initial study with a larger sample size and with one of the abovementioned models.

Data Availability Data for this study were derived from public domain resources.

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