

Does intellectual capital affect bank performance? Evidence from Bangladesh

Intellectual
capital and
bank
performance

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Abstract

Purpose – This paper attempts to evaluate the impact of intellectual capital on bank performance in Bangladesh.

Design/methodology/approach – The authors analyze an unbalanced longitudinal data of 32 banks, which cover 318 observations of bank-year from 2010 to 2019. The study employs a dynamic panel model with the two-step system generalized methods of moments (SGMM).

Findings – The results show that bank performance is significantly positively affected by the intellectual capital (IC) in Bangladesh. In addition, the findings show that capital employed efficiency (CEE) is an essential determinant of bank performance rather than structural capital efficiency (SCE) and human capital efficiency (HCE) for the Bangladeshi banking sector.

Originality/value – This work is unique as no one has explored the impact of intellectual capital on Bangladesh's bank performance. The findings suggest that business owners, managers and policymakers who want to improve the efficiency of their organizations should spend continuously on IC and expand their investment into CEE, which includes both financial and physical resources, in order to obtain better bank performance.

Keywords Intellectual capital, VAIC, Performance, Dynamic panel model, SGMM

Paper type Research paper

1. Introduction

During the last few decades, knowledge-based resources have considered a crucial discussion matter due to changes in the competitive, dynamic and complex global economy. The recent global financial crisis 2007-08 and corporate scandals have raised several questions in the mind of bank regulators regarding performance management. Bank dominates financial markets and is considered as the nerve of the financial system in developing countries. Thus, the developing countries should pay more attention to the banking sectors due to their significant role in providing finance, ensuring depositors' safety and stimulating the economy (ElBannan, 2015). In achieving a sustainable competitive advantage, the current research on knowledge-based resources has been widely used intellectual capital (IC) as a useful research topic. Intellectual capital has been considered a prime source of sustainable competitive advantage in today's socioeconomic environment (Bueno, Salmador, & Merino, 2008).



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Therefore, many researchers from several academic disciplines such as accounting, finance and management have invested substantial time in IC worldwide over the last decades. While some studies are theoretical, that is, conceptualization of IC (Bontis, 1998; Stewart & Ruckdeschel, 1998; Wu & Tsai, 2005), some studies explore the association between IC and firm characteristics (Al-Musalli & Ismail, 2012; El-Bannany, 2008; Liang, Huang, & Lin, 2011) and some studies relate to performance measurement based on IC (Pulic, 2000; Stewart & Ruckdeschel, 1998). Finally, the fourth strand of related literature has devoted to exploring the association between IC and firm performance (Chen *et al.*, 2005, 2014; Curado, Guedes, & Bontis, 2014; Firer & Mitchell Williams, 2003). However, although many researchers investigated IC, their investigation of IC and performance association is confined to a few industries and geographical locations (Mention & Bontis, 2013). In Bangladesh, there are no studies found regarding IC and bank performance despite the significant contribution of the banking sector in the country's economic growth and the world.

To the best of our knowledge, this is the first study that aims to shed a new insight by investigating the effect of intellectual capital on bank performance in Bangladesh by using VAIC technique developed by Pulic (2000). The study uses an unbalanced panel data of 32 banks in Bangladesh from 2010 to 2019, covering 318 bank-year observations. We use a two-step system GMM technique to answer the two specific research questions:

RQ1. Does intellectual capital (measured by VAIC) impact bank performance?

RQ2. How do the different components of VAIC influence bank performance behavior?

The present empirical research fills up the gaps to contemporary literature in various ways. First, this is a unique study investigating how intellectual capital affects bank performance in a developing economy like Bangladesh. The reason for choosing a developing economy is that there is scant research regarding IC and bank performance on that economy. Also, different countries' different banking practices represent various research findings due to economic, political and national culture variances. Moreover, the results from the developed economy may not apply to a developing economy like Bangladesh. Second, the study complements some studies. In Bangladesh, most of the research on knowledge management is related to only intellectual capital reporting (Abhayawansa & Azim, 2014; Chowdhury, Rana, Akter, & Hoque, 2018; Khan & Khan, 2010; Nurunnabi, Hossain, & Hossain, 2011), but a missing link is found on the linkages between IC and bank performance. Thus, the present study will fill up the gap as a complementary study. Finally, the study considers the investigation period from 2010 to 2019 to be necessary, as the period includes data from the post-financial crisis period to the starting point of Covid-19 pandemic.

The remaining analysis is structured as follows. Section 2 explains the literature and hypotheses development. Section 3 talks about the research methodology, while Section 4 explains the findings. Section 5 offers summary and policy implications.

2. Literature review and hypotheses development

The resource-based (RB) theory focuses on intangible resources' critical function (Barney, 1991). A company's strategic edge relies on the successful use of tangible and intangible assets. In addition, the RB principle implies that the success of a company depends largely on both intangible and tangible assets. While tangible and intangible assets are perceived to be the company's strategic assets, the RB principle's concentration would focus mainly on intangible resources (Reed, Lubatkin, & Srinivasan, 2006). According to Youndt, Subramaniam, and Snell (2004), intangible assets create value, which essentially provides a strategic edge that is permanent. According to Kolachi and Shah (2013), in any firm, IC plays a key role in both developing and industrialized countries. To explain the relation between IC and bank performance, the analysis uses this justification. We propose that IC greatly

generates value for the business's performance regardless of the geographical region. In this regard, [Vishnu and Kumar Gupta \(2014\)](#) find a significant positive association between IC and performance in India. Moreover, the same findings are presented by [Lu, Wang, and Kweh \(2014\)](#) in Chinese firms. The following hypothesis is predicted:

H1. IC has a significant positive impact on performance in commercial banks in Bangladesh.

[Pulic \(1998\)](#) considers physical capital and financial funds crucial resources of IC, which is similar to resource-based theory. Thus, capital employed efficiency (CEE) is an essential factor considered in the VAIC model. [Chen, Cheng, and Hwang \(2005\)](#) find that CEE is significantly positively associated with ROA. [Hang Chan \(2009\)](#) examines the impact of intellectual capital on organizational performance and finds a significant positive relationship with all performance proxies. [Bontis, Janošević, and Dženopoljac \(2015\)](#) investigate Serbian hotels, and they argue that capital employed is a significant component of IC, which affects the productivity of the investigated hotels. Some Indian researchers find a significant association between CEE and performance ([Maji & Goswami, 2016](#); [Tripathy, Gil-Alana, & Sahoo, 2015](#); [Venugopal & Subha, 2012](#)). [Ozkan, Cakan, and Kayacan \(2017\)](#) investigate the Turkish banking industry and find CEE strongly impacts performance. Therefore, the previous studies show that CEE is a significant positive factor for performance. Based on the above empirical study results, the study formulates a hypothesis as follows:

H2. Capital employed efficiency has significant positive impacts on performance in commercial banks of Bangladesh.

The resource dependency (RD) theory indicates human capital (HC) is the resource of an organization ([Barney, 1991](#)). In the existing literature, it is widely considered that HC shows abilities, skills, knowledge and experience of individuals in the organization, which is the most significant component of IC ([Roslender & Fincham, 2004](#)). Based on RD theory, [Pfeffer and Salancik \(2003\)](#) claim that a firm has to depend on strategic resources of the other firm because every firm has not all available strategic assets, and so, a long-term association should be built with the suppliers of strategic resources. Therefore, a firm has to maintain a linkage with the external environment, which is the nerve centre of relational and social capital. Linking to the RD theory with the firm's human capital, [Abeysekera \(2010\)](#) argues that firm can make effective communication with the external environment when it holds efficient resources such as learning environment and human capital. This argument is supported by [Mitchell Williams \(2001\)](#), who opines that a firm should use its human resources efficiently to raise its performance. RD theory indicates two perspectives. First, it reflects on the essence of keeping long-term relationships with different stakeholders of the firm. Secondly, the theory also suggests the essence of efficient human resources. This investigation uses RD theory to examine human capital efficiency and its impact on performance. Consistent with [Mitchell Williams \(2001\)](#), the study formulates the following hypothesis:

H3. Human capital efficiency has significant positive impacts on performance in commercial banks of Bangladesh.

According to the organizational learning theory, a firm can continuously build up its competitive advantage by continuously exercising the learning process ([Njuguna, 2009](#)). An organization should follow the learning process consistently because of many reasons. For example, by making investments in research and development, a firm can get an idea about its products' market demand and customer preferences. Thus, a firm can respond to the customer by providing an innovative product ([Goh, 2003](#)). [Njuguna \(2009\)](#) claims a firm can acquire new knowledge by continuous learning process, and then it can transform it into

innovation. So, the new wealth of knowledge gained by the learning process is treated as the firm's intellectual property. Intellectual property is the final result of investments in research and development and termed structural capital (Keong Choong, 2008; Stewart & Ruckdeschel, 1998). Therefore, OL's theory may also be considered to analyze the essential position of structural capital in the mechanism of value creation. Tripathy *et al.* (2015) and Maji and Goswami (2016) find that ROA is strongly affected by the structural capital efficiency (SCE). In India, Soriya and Narwal (2015) claim that employee productivity is influenced by SCE. Nimtrakoon (2015) suggests that SCE and financial performance are highly and significantly correlated. The same results are found by Rehman, Rehman, Rehman, and Zahid (2011). Based on the above empirical study results, the study formulates a hypothesis as follows:

H4. Structural capital efficiency has significant positive impacts on performance in commercial banks of Bangladesh.

3. Research methodology

3.1 Data and sample

The study comprises a panel data of 32 banks from Bangladesh's banking sector over the period from 2010 to 2019. Data relating to performance, intellectual capital and bank control variables were collected from the audited financial statements as well as annual reports available on the banks' websites and Dhaka Stock Exchange. The control variables regarding macroeconomic factors were collected from the database of the World Bank (data.worldbank.org). Table 1 shows the descriptions of the sample under the study.

3.2 Definition of variables

3.2.1 *Dependent variable.* Performance: We use ROA as a measure of bank performance. ROA indicates the operational performance, which means generating returns from the per unit of assets employed (Majumder & Rahman, 2011).

3.2.2 *Independent variable.* The independent variable of this study is intellectual capital, which is computed by using the value-added intellectual coefficient (VAIC) technique developed by Pulic (1998) as presented in Table 2.

3.2.3 *Bank-specific and macroeconomic control variables.* This study uses six bank-specific control variables, namely capital, bank size, credit risk, cost inefficiency, income

Table 1.
Sample design

<i>Panel A: Sample</i>	
Total banks	57
Less: Newly established banks and banks with missing data	25
Total sample banks considered for the study	32
<i>Panel B: Sample categorization</i>	
State-owned banks	4
Conventional private banks	22
Islamic private banks	6
Total number of sample banks in this study	32
<i>Panel C: Bank-year observations</i>	
Total observations under the study: 32 sample banks × 10 years (2010-2019)	320 bank-years
Less: Bank-year observations with missing data	2 bank-years
Total bank-year observations	318 bank-years
Source(s): Table created by authors	

Variables	Notation	Definition of variables	References
<i>Dependent variable</i>			
Performance	ROA	Return on assets, i.e. net income/total assets	Zeitun & Gang Tian (2007)
<i>Independent variable</i>			
Intellectual capital	VAIC	Value-added intellectual coefficient (VAIC = capital employed efficiency + human capital efficiency + structural capital efficiency)	Pulic (1998, 2000)
<i>Components of the independent variable</i>			
Capital employed efficiency	CEE	The percentage of value-added over capital employed (value added = output – input; where output indicates total interest revenue earned by a bank in a year and input indicates interest paid on deposits and borrowings plus total operating expenses except personnel expenses incurred by a bank in a year and capital employed refers to book value of assets)	Pulic (1998, 2000)
Human capital efficiency	HCE	The percentage of value-added over human capital (human capital refers to the personnel expenses)	Pulic (1998, 2000)
Structural capital efficiency	SCE	The percentage of structural capital over value-added (structural capital = VA – HC; where VA refers to value-added and HC indicates to human capital)	Pulic (1998, 2000)
<i>Bank-specific control variables</i>			
Capital	CAR	Capital adequacy ratio, i.e. regulatory capital/risk-weighted assets	Soedarmono & Tarazi (2016)
Bank size	BS	Natural logarithm of total assets	Dong, Meng, Firth, & Hou (2014)
Credit risk	NPLTL	Non-performing loans/total loans	Agoraki, Delis, & Pasiouras (2011)
Cost inefficiency	CINEFF	Total cost/total income	Rahman, Hamid, & Khan (2015)
Income diversification	IDIV	Non-interest income/total income	Jiang, Tang, Law, & Sze (2003)
Leverage	LEV	Total liabilities/total assets	Akter, Majumder, & Uddin (2018)
<i>Macroeconomic control variables</i>			
Gross domestic product	GDP	Annual GDP growth rate (%)	Majumder & Li (2018), Majumder & Uddin (2017)
Inflation	INF	Inflation, GDP deflator (annual %)	Tan (2016)

Source(s): Table created by authors

Table 2.
Definitions and sources of variables

diversification and leverage (see Table 2). The study also uses two macroeconomic control variables, namely gross domestic product (GDP) and inflation. The proxies of these variables are presented in Table 2.

3.3 Dynamic panel model specification with generalized methods of moments (GMM)

The present study specifies two econometric models: model 1 examines hypothesis H1, where the dependent variable performance, that is, return on assets (ROA_{it}) is a function of the aggregate measure of intellectual capital, that is, the value-added intellectual coefficient

(VAIC_{it}) and various other bank-specific and macroeconomic control variables such as capital (CAR_{it}), bank size (BS_{it}), credit risk (NPLTL_{it}), cost inefficiency (CINEFF_{it}), income diversification (IDIV_{it}), leverage (LEV_{it}), gross domestic product (GDP_t) and inflation (INF_t). The study tests hypotheses H2, H3, and H4 using model 2; where the components of the VAIC are used as independent variables. The dependent variable, and all control variables used in model 2 are the same as in model 1.

$$\text{Model 1 : } ROA_{it} = \beta_0 + \beta_1 ROA_{it-1} + \beta_2 VAIC_{it} + \beta_3 CAR_{it} + \beta_4 BS_{it} + \beta_5 NPLTL_{it} \\ + \beta_6 CINEFF_{it} + \beta_7 IDIV_{it} + \beta_8 LEV_{it} + \beta_9 GDP_t + \beta_{10} INF_t + \varepsilon_{it}$$

$$\text{Model 2 : } ROA_{it} = \beta_0 + \beta_1 ROA_{it-1} + \beta_2 CEE_{it} + \beta_3 HCE_{it} + \beta_4 SCE_{it} + \beta_5 CAR_{it} \\ + \beta_6 BS_{it} + \beta_7 NPLTL_{it} + \beta_8 CINEFF_{it} + \beta_9 IDIV_{it} + \beta_{10} LEV_{it} \\ + \beta_{11} GDP_t + \beta_{12} INF_t + \varepsilon_{it}$$

In the above models, the subscript *i* reflects the cross-sectional dimension across banks; *t* refers to time, that is years, and ε_{it} denotes the random error. The descriptions of all the variables and their references are depicted in Table 2.

By following the previous study (Rezgallah, Özataç, & Katircioğlu, 2019), the present study uses GMM with dynamic panel estimation technique for the analysis. It offers a number of benefits over other methods of panel estimation. Firstly, it can deal with samples with short periods. Secondly, endogeneity bias may be accounted for. Thirdly, it reduces of the sample heterogeneity issues (Ali & Azmi, 2016). GMM has two features; one is difference GMM as developed by Arellano and Bond (1991), and another one is system GMM (Arellano & Bover, 1995; Blundell & Bond, 1998). But the difference GMM provides inconsistent results if the lagged level of the regressors for the first-differenced variables is serially correlated, which may provide weak instruments (Arellano & Bover, 1995; Blundell & Bond, 1998). Hence, to overcome the weaknesses of the difference GMM, this study employed system GMM. Besides the first differencing, system GMM exploits the lagged levels of the variables as instruments for the equation in first differences, and variables in differences are instrumented with the lags of their own. Blundell and Bond (1998) find that system GMM estimator provides better results than difference-GMM. However, we use a two-step system GMM estimator for this study.

4. Results and discussion

4.1 Descriptive statistics

Table 3 shows the descriptive statistics of all the variables. The table shows that the mean value of bank performance (ROA) is 0.012, maximum value 0.024, minimum value 0.001 and standard deviation 0.006, indicating that some banks earn below the average. The average value of HCE is 3.643, which is near the average value of VAIC, that is 4.382. The standard deviation of VAIC and HCE are indicates that these variables are widely dispersed.

4.2 Diagnostic tests

Firstly, this study uses Pearson's correlation to search for a multi-collinearity problem. Table 4 illustrates the matrix of Pearson's correlation coefficient. The results reveal that the highest association between the independent variables is -0.62 in equation one between cost inefficiency (CINEFF) and value-added intellectual capital (VAIC), and -0.67 in equation two between cost inefficiency (CINEFF) and structural capital efficiency (SCE).

Variables	N	Mean	Standard deviation	Minimum	Maximum
<i>Dependent variable</i>					
ROA	318	0.012	0.006	0.001	0.024
<i>Independent variable</i>					
VAIC	318	4.382	1.270	2.559	7.366
<i>Components of VAIC</i>					
CEE	318	0.041	0.011	0.018	0.061
HCE	318	3.643	1.179	2.034	6.472
SCE	318	0.698	0.089	0.508	0.845
<i>Bank-specific control variables</i>					
CAR	318	0.117	0.015	0.090	0.149
BS	318	11.793	0.720	10.557	13.247
NPLTL	318	0.056	0.045	0.016	0.199
CINEFF	318	0.732	0.072	0.596	0.878
IDIV	318	0.275	0.086	0.119	0.448
LEV	318	0.919	0.019	0.879	0.954
<i>Macroeconomic control variables</i>					
GDP	318	6.248	0.619	5.000	7.100
INF	318	6.989	0.801	5.700	8.200

Note(s): All variables are winsorised at the 5% level

Source(s): Table created by authors

Table 3.
Descriptive statistics

Gujarati (2009) conclude that if the association value between the two independent variables is over 0.80, then multicollinearity in the regression poses a severe issue. Thus, our analysis indicates no concerns with multicollinearity. Secondly, the endogeneity problem was tested by the Durbin-Wu-Hausman examination. The analysis then uses the Breusch Godfrey LM test to check the serial connection. The study also uses a White analysis to evaluate the problem of heteroscedasticity. Our tests deny the null hypothesis that there is no endogeneity, serial correlation and heteroscedasticity in both models. Thus, the results of the diagnostic tests imply that the presence of endogeneity, serial correlation and heteroscedasticity in this study indicates GMM is the best technique for the study analysis, as explained in Section 4.3.

4.3 Regression analysis

4.3.1 The impacts of intellectual capital on bank performance. The empirical results of the impact of intellectual capital, that is, the value-added intellectual coefficient (VAIC) on bank performance (ROA) in model 1, are listed in Table 5. At the same time, model 2 records the effects of various VAIC components on the bank performance (ROA). This study mainly emphasizes the empirical results which are obtained using system GMM model in Table 5. Bond (2002) argues that a reasonable system GMM estimator should be able to generate an estimated coefficient on the lagged dependent variable that is less than estimates generated from OLS and significantly larger than the one obtained from fixed-effects regression method. As presented in Table 5, the estimated value for the coefficient of lagged bank performance (ROA_{t-1}) is 0.19 for model 1, and 0.17 for model 2; which are less than from OLS [1] and larger than fixed-effects regression method [2]. Hence, the use of system GMM is appropriate for this study. The F-test result ($F = 244.78$ for model 1 and, $F = 415.16$ for model 2) shows the overall significance of the model. The Hansen test results ($P = 0.139$ for model 1 and $P = 0.179$ for model 2) indicate that the study failed to reject the null hypothesis that

Table 4.
Pearson correlation
matrix

	VAIC	CEE	HCE	SCE	CAR	BS	NPLTL	CINEFF	IDIV	LEV	GDP	INF
VAIC	1											
CEE	0.51***	1										
HCE	0.99***	0.49***	1									
SCE	0.95***	0.57***	0.64***	1								
CAR	0.09	0.14***	0.08	0.10*	1							
BS	-0.39***	-0.39***	-0.38***	-0.41***	-0.032	1						
NPLTL	-0.49***	-0.41***	-0.48***	-0.58***	-0.23***	0.47***	1					
CINEFF	-0.62***	-0.66***	-0.61***	-0.67***	-0.13**	0.23***	0.33***	1				
IDIV	-0.08	0.21***	-0.07	-0.17***	-0.13**	0.19***	0.49***	-0.20***	1			
LEV	-0.35***	-0.41***	-0.35***	-0.36***	-0.34***	0.045	0.30***	0.38***	-0.05	1		
GDP	-0.20***	-0.26***	-0.19***	-0.22***	0.01	0.19***	0.09*	0.23***	-0.11**	0.10*	1	
INF	0.22***	0.21***	0.21***	0.22***	-0.09*	-0.21***	-0.09	-0.15***	-0.09*	-0.03	-0.08	1

Note(s): Total number of observations 318; ***correlation is significant at 1% level (2-tailed); **correlation is significant at 5% level (2-tailed); *correlation is significant at 10% level (2-tailed); All variables are winsorized at the 5% level

Source(s): Table created by authors

Variables	Model-1		Model-2	
	Coefficient	Robust S.E.	Coefficient	Robust S.E.
ROA _{t-1}	0.19*	0.090	0.17**	0.086
VAIC	0.011**	0.005	—	—
CEE	—	—	0.227***	0.066
HCE	—	—	0.001	0.001
SCE	—	—	0.006	0.007
CAR	0.049***	0.011	0.024*	0.012
BS	-0.021*	0.011	-0.019*	0.010
NPLTL	-0.027**	0.012	-0.029**	0.013
CINEFF	-0.028***	0.006	-0.016**	0.008
IDIV	0.015***	0.004	0.007	0.005
LEV	-0.036***	0.010	-0.012	0.012
GDP	0.008***	0.001	0.012**	0.006
INF	-0.001	0.001	-0.007	0.008
F-Test	244.78***		415.16***	
Hansen Test ¹	P = 0.139		P = 0.179	
AR(1) ²	Z = -4.02	P = 0.000	Z = -3.99	P = 0.000
AR(2) ³	Z = 0.27	P = 0.68	Z = 0.24	P = 0.72
No. of instruments	11		13	
Observations	286		286	

Note(s): A two-step system GMM dynamic panel estimators is the estimation technique. The dependent variable is bank performance measured by ROA. *, ** and *** denote significance at 10%, 5% and 1% levels, respectively. ¹Test of overidentifying restrictions (H₀: overidentifying restrictions are valid). The tests accept the null hypothesis that overidentifying restrictions are valid. ²Arellano-Bond test for the first-order autocorrelation (H₀: no autocorrelation). ³Arellano-Bond test for the second-order autocorrelation (H₀: no autocorrelation). The AR(1) and AR(2) test findings show that autocorrelation exists in the first-order but not in the second-order. All variables are winsorised at the 5% level

Source(s): Table created by authors

Table 5.
The impacts of intellectual capital on bank performance (Using System GMM)

instrumental variables used in the system GMM model are valid. All models demonstrate a significant positive coefficient for the lagged dependent variable (ROA_{t-1}), which shows the degree of persistence of the two models and the dynamic nature of the model formulation. This implies that the past financial performance of Bangladeshi banks has significant impact on the current one. This result also indicates that the past financial performance should be taken into consideration while controlling the dynamic relationship between intellectual capital and bank performance.

In model 1, the study finds that VAIC has a significant positive influence on bank performance, suggesting that intellectual capital is an important determinant of bank performance. In other terms, the analysis concludes that banks with better IC results appear to have stronger financial performance, *ceteris paribus*. The findings of the analysis support hypothesis 1 (H1). This research results are in line with [Al-Musali and Ismail \(2014\)](#), [Meles, Porzio, Sampagnaro and Verdoliva \(2016\)](#) and others' previous studies. This analysis aims to draw the relation between the VAIC sub-components and performance in model 2. The analysis finds that CEE and bank performance have a significant positive association, confirming hypothesis 2 (H2). The outcome is compatible with the research performed by [Mehralian, Rajabzadeh, Reza Sadeh and Reza Rasekh \(2012\)](#), [Ismail and Karem \(2011\)](#), [Firer and Mitchell Williams \(2003\)](#) and [Al-Musali and Ismail \(2014\)](#). No significant association between HCE, SCE and bank performance is identified in this analysis, which does not support hypotheses 3 and 4 (i.e. H3 and H4), respectively. The results indicate that by using CEE, that is physical and financial assets, rather than HCE and SCE, Bangladesh's commercial banks will gain higher profits.

Regarding the control variables, this study finds that bank capital, income diversification and GDP have significant positive impacts on the bank performance (ROA); in contrast, bank size, credit risk, cost inefficiency and leverage have significantly negatively impacts on bank performance. With regard to the effect of inflation, in both models, the findings suggest an insignificant impact on performance.

4.3.2 Robustness of results. We conducted a robustness test by flipping the regression approach from GMM to ordinary least squares (OLS) and fixed-effect regression methods which are not presented here due to space constraints. OLS output indicates the desired substantial positive impact on bank performance by value-added intellectual capital (VAIC) and CEE. We find that HCE has a substantial positive correlation with bank efficiency, whereas using GMM is negligible. We noticed a similar association with bank performance with respect to the control variables as in previous methods, with the exception of inflation, which suggests insignificant use of GMM but significant negative use of pooled OLS. Thus, as seen in [Table 5](#), the alternate approach shows almost identical findings, confirming our findings' robustness. Also using fixed-effect regression, we find the similar association between intellectual capital and bank performance as shown in [Table 5](#), using system GMM with slightly varying co-efficient which confirms the robustness of the findings.

5. Conclusions

5.1 Summary of the findings

This study is intended to investigate the impact of intellectual capital on the performance of banks in Bangladesh. The research takes into account an unbalanced collection of panel data from a survey of 32 Bangladeshi commercial banks from 2010 to 2019. Data obtained from the audited financial accounts and fiscal reports were evaluated using a two-step system GMM method using the dynamic panel model. Return on assets (ROA) is used in the current paper as a performance indicator. In contrast, value-added intellectual coefficient (VAIC) and VAIC elements are used as indicators of intellectual capital, such as capital employed efficiency (CEE), human capital efficiency (HCE) and structural capital efficiency (SCE). Some bank-specific and macroeconomic control variables, such as capital (CAR), bank size (BS), credit risk (NPLTL), cost inefficiency (CINEFF), income diversification (IDIV), leverage (LEV), gross domestic product (GDP) and inflation (INF), are also included in the analysis. The study found that VAIC has a significant positive influence on the profitability of banks in Bangladesh. We also notice that the capital employed efficiency (CEE) is the most crucial element of VAIC and has a significant positive effect on the sample banks' profitability. We find that bank capital, diversification of income and GDP have significant positive effects on bank profitability with respect to the control variables. In contrast, bank size, credit risk, cost inefficiency, leverage and inflation are negatively linked to performance.

5.2 Contribution and policy implications

It is thought that this is the first research performed in Bangladesh to make use of the VAIC for the assessment of IC. In addition to adding to the existing literature on the advancement of IC development in connection to financial performance, it also contributes to the understanding of IC research. For practitioners in the banking industry, our findings have a number of ramifications that they should consider. Our results indicate that IC is a critical element in improving bank performance. According to the findings of the research, only CEE had a significant impact on bank performance when compared to the other two IC components. In this case, financial capital plays a significant role in enhancing bank

performance of Bangladesh (also consistent with Oppong & Pattanayak, 2019; Bontis *et al.*, 2015). In this study, the findings supported the premise of the firm's RB theory, which states that physical or financial resources may provide above-average returns (Barney, 1991). Because of this, managers seeking to enhance the efficiency of their businesses should spend constantly in IC and increase their investment in CEE, which includes financial and physical resources, in order to achieve improved company performance as quickly as possible.

5.3 Limitations and direction for future research

This study faces some limitations. The study considers only one country, that is. Bangladesh, and one industry, that is bank. Other financial institutions (such as insurance companies, leasing companies and investment trusts) are ignored in this study. Also, there are different measures of intellectual capital, such as balanced scorecard, Tobin's Q, market-to-book ratio, not included in this study. Bank performance also can be measured in different ways. We suggest that the future researcher can do cross-country analysis and consider other variables to get in-depth knowledge about the association of various determinants with bank performance. Another limitation of this study is that it only considers the direct relationship between intellectual capital and bank performance. Thus, the researcher may examine the indirect relationship by considering moderating and mediating variables. Also, the future researcher can do meta-analysis (Majumder, Akter, & Li, 2017, 2019) to get exact relationship on the variables to solve the controversial and mixed findings. Regardless of the limitations, we expect this study to be worthy for the bank regulators, policymaker academicians, researchers and others.

Notes

1. The output using OLS is not presented here to save space.
2. The output using fixed-effects regression method is not presented here to save space.

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Further reading

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