Intellectual capital and asset quality in an emerging banking market

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Abstract

Purpose – This study examines the causal relationship between intellectual capital and asset quality of banks in Ghana.

Design/methodology/approach – Using annual data extracted from audited financial statements of 24 banks from 2006 to 2015, a ratio of non-performing loans to gross loans and advances is employed to estimate asset quality growths while the value-added intellectual coefficient by Pulic (2008, 2004) measures intellectual capital. The panel-corrected standard errors estimation technique is used to estimate panel regressions with asset quality as the dependent variable.

Findings – Asset quality of banks in Ghana is generally not affected by intellectual capital. However, when intellectual capital is divided into its components, the study indicates that there are significant positive relationships between asset quality and two components of intellectual capital. Thus, structural capital and human capital efficiencies positively affect the asset quality of banks.

Practical implications – The findings of the study implore managements of banks to increase structural and human capital investments and efficiencies to improve asset quality. Furthermore, the results have direct implications on developments in financial markets in emerging economies.

Originality/value – The study analyses the link between typical intellectual capital and asset quality of banks which is yet to be empirically examined in an emerging banking market.

Keywords Asset quality, Intellectual capital, VAIC™, Banks, Ghana

Paper type Research paper

1. Introduction

Prior to the current technology era, much attention was placed on tangible productive resources as key value creation drivers. Currently, there is growing interest in intangibles including Intellectual Capital (IC) in business life. It has now become a cliché that intangibles

are pivotal to value creation. Thus, in recent times, successful firms are concerned with the use of intangibles such as technology, knowledge and skills of employees (Holienka and Pilkova, 2014). Willoughby (2013) reiterates the latter and concludes that financial performance of firms usually arises from the accumulation of robust intellectual properties such as trademarks and patents. For instance, in the specific context of the banking industry, Alhassan and Asare (2016) noted that the values of IC of banks within emerging countries are mostly driven by investments in human capital which form the key basis to gaining competitive advantage.

Despite the importance of IC, there seems not to be any consensus in the existing literature on the definition of IC. However, most authors have generally acknowledged that IC is broad and comprises three main components: human capital (education, work related–knowledge, competences etc.), structural capital (information systems, patents, copyrights etc.) and relational capital (customer loyalty, brands, distribution channels, etc.). In this regard, IC may be a means (knowledge) to achieving an end (IC) or even the end-product of a knowledge transformation process (Holienka and Pilkova, 2014; Starovic and Marr, 2008). The knowledge transformation processes contribute immensely to value creation in the banking sector.

The banking sector is one characterized by huge amounts of IC (Kamath, 2014). This appears to suggest that the banking sector is more of knowledge, relationships and skills-based than a labour-intensive one (Branco et al., 2011; Muhammad and Ismail, 2009). Typically, banking operations involve close with customers and rely, to a larger extent, on the integration of information and communication technologies for the development of new products and services (Mention and Bontis, 2013). Although physical capital is essential for banks to operate, it is now being stressed that IC determines the quality of services provided to customers (Goh, 2005). Furthermore, the importance of IC to the banking sector is exacerbated by the increasing complexity, and a more liberal environment, that the banks are currently operating in. In effect, competitiveness in the sector depends largely on the quality of human capital and the ability to leverage on it (Muhammad and Ismail, 2009). Thus, due to the competitiveness and dynamism of the current operating environment of banks, efficiencies of IC are critical for banks to enable them develop cutting-edge strategies towards wealth creation (Joshi et al., 2010).

The strategies of banks which most at times bothers on acquisition and deployment of IC towards value and wealth creation play a role in financial intermediation in terms of re-allocating funds from surplus spending units to deficit spending units (Berger et al., 2010). In recent times, the banking industry in Ghana has channeled its resources, including IC, towards attracting the large number of its unbanked population (Bank of Ghana, 2017a, b) to grow its customer base and deposits. In their quest to gain competitive advantage, these banks have resorted to the operation of cashless bank accounts, branch expansion, mobile banking, bank assurance etc. These services have enabled them to expand the volume of loans advanced to customers and to relax to some extent the terms and conditions required in creating loan assets. The result conceivably is that banks are unable to recoup all their loans and advances leading to the incidence of huge Non-Performing Loans (NPL). Aggressive growths and poor strategic decisions in banks are common elements associated with NPL and hence bank failures. Even before the fall of some banks in Ghana in recent times, Bank of Ghana (2017a, b) indicated that the entire banking system in Ghana is at risk due to the alarming rate of increase in reported NPL.

The operations of banks are thus characterized by high level of risks that require the management of banks' loan assets, i.e. Asset Quality (AQ), involving the evaluation of the banks' assets so as to measure the extent of credit risk that arises from operating activities. AQ in banks has more to do with the quality of loans banks provide. The problems of AQ of banks in Ghana are very pronounced. Deterioration of AQ in banks directly affects their financing and operating performance and the overall performance of the financial sector (Amuakwa-Mensah and Boakye-Adjei, 2015).

Due to the increasing complexity and competitive environment in which banks are currently operating, it becomes necessary for banks to develop and manage their IC (Branco *et al.*, 2011). Though there exist large a number of research papers (Ozkan *et al.*, 2017; Alhassan and Asare, 2016; Willoughby, 2013; Asare *et al.*, 2013; Joshi *et al.*, 2010) on IC and its impact on performance of banks, there seems to be very little emphasis on the nature of the relationship between IC and AQ of banks. Accordingly, the aim of the study is to measure and relate IC and AQ of banks, which as discussed is critical to the vivacity of the banking sector hence the entire economy at large (Mondal and Ghosh, 2012). It therefore becomes highly important to evaluate the extent to which banks in Ghana utilize their IC in value and wealth creation, e.g. in creating loan assets.

The remaining part of the paper is organized as follows: Section 2 provides a general overview of AQ and off balance sheet activities of the banking sector in Ghana; and Section 3 focuses on review of empirical literature. The subsequent section focuses on the methods and data adopted. Section 5 presents the empirical results. The conclusion and implications of the study are covered in Section 6.

2. Asset quality and off balance sheet activities of the banking industry in Ghana
Asset growths and fringe improvements in liquidity have been reported to be the main factors underlying performance in the banking sector in Ghana (Bank of Ghana, 2017a, b). The massive growths in assets were underpinned by improvement in foreign assets and investments portfolio of banks in Ghana. However, the same cannot be said of loans and advances. Despite these, mixed results existed in the quality of loan indicators as per the Bank of Ghana banking sector report for May 2017. For instance, the financial stability report of Bank of Ghana showed that NPL fell from 7.9% in 2006 to 6.9% in 2007. Subsequently, Non-Performing Loans (NPL) deteriorated, rising from 7.7% in 2008 to 17.6% in 2010. The ratio declined to 14.2% in 2011, and to 13.2% in 2012.

For the year 2015, NPL ratio was 6.2%. However, results from the same data showed that the ratio of NPL to capital increased from 10.37% in 2011 to 14.1% in 2014 and further worsened to 26.5% in 2015. Though NPL ratio in the given period fell, the capital for the period was highly at risk. Thus, loans typically have impact on the quality of assets of banks and possess the greatest level of risk on capital. The report finally revealed that as at 2010, 17.6% of outstanding loans have decomposed into NPL. Furthermore, report shows an increase in NPL from 5.74 billion in 2016 to 7.15 billion in 2017, constituting about 24% increase (Bank of Ghana, 2017a, b)

A large portion (66.2%) of the NPL of the banking sector resulted from credit to commerce and finance (39.1%), electricity, gas and water (12.00%) and the services sectors (15.1%). Figure 1 shows a summary of the NPL in the various economic sectors attributed to the 33 banks in Ghana at the end of December, 2016. Though the NPL in recent times have deteriorated, reports suggest that the debt structure of the industry is more likely to improve in the coming years (Bank of Ghana, 2017a, b). Based on the Basel II framework that saw the commencement of internal capital adequacy assessment processes, the banking sector is bound to attain the needed economic capital requirements. This will enable banks to effectively carry out their role as financial intermediaries in Ghana.

3. Literature review
Berger *et al.* (2010) indicate that the role of banks as financial intermediaries is evident in their daily activities of re-allocating funds from surplus spending units to deficit spending units. This specific role of banks contributes towards easing the stress of monitoring that would have otherwise been carried out by borrowers and lenders alike. Thus, costs of transactions

and information asymmetry are greatly eliminated (Diamond, 1984; Benston and Smith, 1976). As a service industry, banks are recognized as an IC intensive- sector (Branco *et al.*, 2011; Muhammad and Ismail, 2009), which makes the recognition and development of IC an important aspect of bank management. The resource-based view theory of firms indicates that firms gain competitive advantage and superior performance through the acquisition, holding and subsequent use of resources, i.e. strategic assets (Alhassan and Asare, 2016; Wernerfelt, 1984). The resources comprise tangible and intangible assets including IC that are used to implement specific competitive and profitable strategies (Riahi-Belkaoui, 2003).

Therefore, per the resource-based view, investments in IC are important in "services-oriented markets" like the banking sector and drive the productive capacity of players in the industry. The theory emphasizes that for a firm to achieve competitive advantage and invariably yield positive outcomes such as good loan assets, it must be able to acquire and/or control its valuable resources (Barney, 2001). One of the major proponents of the theory Wernerfelt (1984) echoed the importance of a firm's intangible resources in pursuing firm growths and profitability.

In the light of that, studies have found evidence to support the role of IC in helping to create competitive advantage in the banking industry (Mondal and Ghosh, 2012). Mondal and Ghosh (2012) used data of 65 Indian banks from 1999 to 2008 to examine the relationship between IC and financial performance. Their results indicate a significant positive relationship between IC and financial performance of banks. Also, using data drawn from banks of Thailand and the Stock Exchange of Thailand, Saengchan's (2007) study had earlier supported the positive effects of IC on the performance of the banks. Willoughby (2013) and Ting and Lean's (2009) study reveals that VAIC and Return on Assets (ROA) are positively related in Malaysia's finance sector. The research results confirmed that IC acts as a major source of corporate advantages of Thailand banks as performance of IC is strongly associated with the profitability of banks. Using data from 200 banking institutions within Luxembourg and Belgium, Mention and Bontis (2013) also found that human capital has both a direct and an indirect impact on business performance. Mohiuddin *et al.* (2006) using 17 sampled commercial banks in Bangladesh for the period 2002 to 2004 had results that are consistent with Mention and Bontis (2013). In assessing the relationship between IC and the performance of some banks in Europe, for instance, Bornemann (1999) like the studies enumerated, also applied the VAIC model to identify a positive relationship between IC and performance of firms in Austria. In another European study, Cabrita and Vaz (2006) established dynamic relationships between the components of IC and the performance of 53 banks in Portugal. Yalama and Coskun (2007) also studied the relationship between VAIC
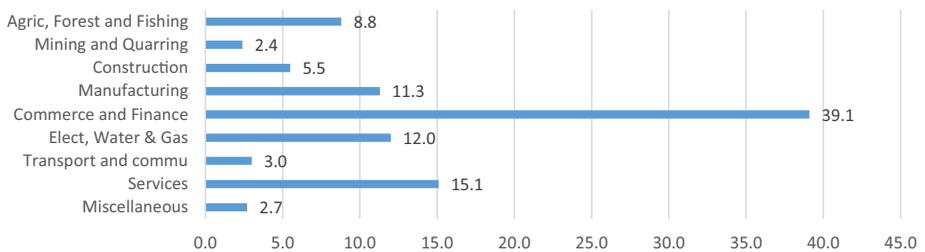

Figure 1.
Economic sector distribution in % by NPLS as at Dec 2016

Source(s): Bank of Ghana (2017)

and the performance of banks in Turkey using data from 1995 to 2004. However, the evidence of Yalama and Coskun (2007) was inconsistent with the findings of the other studies.

The components of VAIC are Capital Employed Efficiency (CEE), Structural Capital Efficient (SCE) and Human Capital Efficient (HCE). Capital employed, structural capital and human capital assets are not always separately identifiable, but tend to be complementary and can overlap significantly (Bismuth and Tojo, 2008). That could be the reason an individual or employee according to Bontis (1998), can have a high level of intellect, but if the firm has poor systems and procedures by which to track his or her actions, the overall IC will not reach its fullest potential. Ozkan et al. (2017) and Kamal et al. (2012) analysed the relationship between the components of IC, i.e. VAIC and financial performance of the Turkish banking sector, using a sample of 44 operating banks between 2015 and 2014. The findings of Ozkan et al. (2017) and Kamal et al. (2012), showed statistical significant relationships between IC and financial performance. Specifically, CEE was found to have more impact on bank financial performance than HCE and SCE. The finding is similar to that of the study of Joshi et al. (2013), carried out for financial institutions in the Australian region. The result was that the performance of banks has relatively been impacted greatly by CEE than HCE. On the contrary, Alhassan and Asare (2016) indicated that HCE has more significant effects on bank productivity in Ghana. These provide indications and directions for banks and policy makers as to which aspect of IC they should channel their investments into in order to boost financial performance.

On Asset Quality (AQ), Kadioglu et al. (2017) in Turkey considered the effect of AQ on bank performance. The study focused on 55 banks from 2005 to 2016. Bank profitability was negatively affected by any increase in provision for NPL to total loans whiles a reduction in the provision for NPL as a ratio of total loans impacted positively on bank profitability. So, existing empirical literature seems to show a significant negative relationship between NPL and bank profitability. Kadioglu et al. (2017) explained that higher NPL signifies lower AQ which translates into lower ROA and ROE. Using a two-way fixed effect panel regression, the findings of the study showed a significant negative relationship between AQ measured by NPL and the ROA and ROE as a measures for bank profitability. Amuakwa-Mensah and Boakye-Adjei (2015) noted that bank specific variables (bank size, loan growth and net interest margin) and macroeconomic variables (real GDP per capita growth and real effective interest rates) have significant effects on the AQ of banks. The impact of bank size on NPL yielded mixed results. The negative relationship between bank size and NPL is explained by the existence of better risk management strategies in larger banks that mostly results in very superior loan portfolios as compared to that of smaller banks (Hu et al., 2006). Those studies (of Rajan and Dhal, 2003; Sinkey and Greenwalt, 1991) that found positive relationships between NPL and performance emphasize that banks that value profitability at the expense of the costs of high risk are more prone to incur higher NPL especially in periods of economic recessions.

In assessing AQ of banks in Nigeria, a research by Lucky and Andrew (2015) concludes that the relationship between AQ and profitability is significant. Return on investment was modelled as a function of bank specific variables (percentage of NPL to total loans, percentage of loan loss to total assets, percentage of NPL to customer deposits and percentage of loan loss to total assets). The findings of Lucky and Andrew (2015) was similar to Adeolu (2014). Managing credit risk is essential for determining profitability of banks. Liquidity positions of banks are threatened if loans, the riskiest of all assets, are not managed to safeguard the interest of investors.

As shown from the litany of literature, extant research (Kadioglu et al., 2017; Ozkan et al., 2017; Lucky and Andrew, 2015; Adeolu, 2014) on AQ does not exist in numbers. However, most of these current studies have simply examined the impact of IC and its components on performance of banks (Asare et al., 2017). Some others have also concentrated on the impact of

IC on productivity (Alhassan and Asare, 2016; Holienka and Pilkova, 2014). On the other hand, a few others have considered the relationship between AQ and performance of firms (Amuakwa-Mensah and Boakye-Adjei, 2015; Lucky and Andrew, 2015). These studies, to the best of the researchers' knowledge, have examined IC and AQ separately in various contexts but have failed to explore the IC and AQ nexus and its impacts on value creation and performance of firms.

The originality of this study is noticeable from its extension of existing literature on IC and AQ of banks; as very little is known of the nature of the relationship between the two constructs. As indicated, IC and AQ are critical to the vivacity of the banking sector and the economy at large (Mondal and Ghosh, 2012). This study is unique as it seeks to establish for the first time the impact of IC on AQ in an emerging banking market. From the analysis of the literature in this section, if IC could improve performance of banks, then the study posits that there is a negative relationship between AQ (a measure of bank performance) and IC. Using the above as the basis, the study hypothesizes that:

H1. There is a negative relationship between Asset Quality and IC i.e. VAIC of banks.

H2. There is a negative relationship between Asset Quality and HCE of banks.

H3. There is a negative relationship between Asset Quality and SCE of banks.

H4. There is a negative relationship between Asset Quality and CEE of banks.

4. Data and methods
This study uses a longitudinal approach and focuses on audited financial statements of banks over a ten-year period (i.e. 2006–2015). The study's population comprises all banks in Ghana. At the end of the year 2015, there were 29 Deposit Money Banks (DMBs) (Bank of Ghana, 2017a) and 24 of them are sampled using the purposive sampling technique. The number of banks sampled, and the time interval preferred for the study were partly restricted by the availability of data and a desire to contribute to existing literature using a longitudinal data approach. The data used for this study was sourced from the banking supervision department of the Bank of Ghana. The data covers audited financial statements from 2006 to 2015 of the banks. Hence, the final sample consist of 240 observations from the 24 different banks.

4.1 Measurement of variables
4.1.1 Asset quality. AQ of bank loans refers to the timely manner with which borrowers are meeting their contractual financial obligations (Alhassan *et al.*, 2014). The ratio of non-performing loans to gross loans and advances as the indicator for AQ proxies for AQ of banks. A higher ratio indicates lower bank AQ [1]. The AQ for bank i at time t is given as:

$$AQ_{i,t} = \frac{SSL_{i,t} + DL_{i,t} + LL_{i,t}}{GLA_{i,t}}$$

where $SSL_{i,t}$, $DL_{i,t}$ and $LL_{i,t}$ represent substandard loans [2], doubtful loans [3] and loss loans [4] respectively, whereas $GLA_{i,t}$ represents gross loans and advances for bank i at time t.

4.1.2 Intellectual capital. This study adopts the Value Added Intellectual Coefficient (VAIC) as proposed by Pulic (2008, 2004) to measure IC of the selected banks in Ghana (see Duho, 2020). VAIC is composed of Human Capital Efficiency (HCE), Structural Capital Efficiency (SCE) and Capital Employed Efficiency (CEE). In the light of the latter, IC resources are not always separately identifiable, but tend to be complementary and can overlap significantly

([Bismuth and Tojo, 2008](#)). HCE hovers around expenditures incurred on employees. However, since these expenditures are not considered as inputs and hence not reported, they are often classified as investments. Investments in employees are evidenced when employees put in their skills and experience (creativity, tolerance, formal training, commitments, flexibility, education etc.) whiles working in the bank. The evaluation of employee engagement with the bank is thus, reflected in bank performance. Investments in human capital are of essence once the skills and experiences of employees are recognized and put to effective use. Such unique skills and experience may be lost to the bank when employees leave the bank. On the other hand, value created from investments in structural capital still remains within the bank even when employees leave the bank. SCE on the other hand depicts value creation in banks that arise from investments in structural capital (organizational cultures, systems, databases, management processes, organizational learning capacities, financial systems etc.) of banks. CEE also shows the value creation arising from investments by shareholders. It shows the contribution of a bank's book value of net assets to value addition of the bank. Overall, the combination of HCE, SCE and CEE shows the whole IC of a bank. The explanations are simplified as follows:

The value addition, VA of a bank is given by:

$$VA = OUT - IN$$

where OUT is the total revenues of a bank made up of interest income and fees and commission income; IN refers to bank operational costs made up of interest, finance and administration expenses (excluding personnel expenses, which are treated as investments but not costs).

VAIC calculates the efficiency of human, structural and financial capital. The equation for computing HCE is given by:

$$HCE = \frac{VA}{HC}$$

where VA is value added defined and HC is the total compensation (salaries and wages) for a bank. The equation for bank Structural Capital (SC) is computed as follows:

$$SC = VA - HC$$

VA and HC are as defined earlier. The equation for structural capital efficiency (SCE) is thus given as:

$$SCE = \frac{SC}{VA}$$

The equation for efficiency of the financial capital employed is defined as:

$$CEE = \frac{VA}{CE}$$

where CEE refers to the Capital Employed Efficiency coefficient; CE is the book value of the net assets of the bank. Generally, the entire value creation efficiency i.e. VAIC is simply the sum of all value creation efficiencies as given by:

$$VAIC^{TM} = HCE + SCE + CEE$$

4.1.3 Control variables. Previous studies show that total assets appear to be the predominant measure for bank size. Therefore, in this study, bank size is measured by a natural logarithm of the bank's fiscal year-end total assets ([Duho, 2020](#); [Asare *et al.*, 2017](#); [Alhassan and Asare, 2016](#));

The number of years the bank has been in existence is used as a surrogate for the age of the banks (see Asare *et al.*, 2013; Whiting and Woodcock, 2011).

4.1.4 Model specification and estimation strategy. Panel regression analysis is done to assess the nature of the relationship between bank AQ and IC. The following panel regression models are specified and tested.

$$AQ_{it} = \beta_0 + \beta_1 VAIC_{it} + \beta_2 BAGE_{it} + \beta_3 BSIZE_{it} + \varepsilon_{it} \quad (1)$$

$$AQ_{it} = \lambda_0 + \lambda_1 HCE_{it} + \lambda_2 SCE_{it} + \lambda_3 CEE_{it} + \lambda_4 BAGE_{it} + \lambda_5 BSIZE_{it} + \varepsilon_{it} \quad (2)$$

where AQ_{it} is the asset quality; β_0 and λ_0 are the constants; $VAIC_{it}$ is the IC level of a bank i in the time t; HCE_{it}, Human Capital Efficiency of a bank i in the time t; SCE_{it}, Structural Capital Efficiency of a bank i in the time t; CEE_{it}, Capital Employed Efficiency of a bank i in the time t; $BSIZE_{it}$ is the size of a bank i in the time t; BAGE is the age of a bank i in the time t ε_{it} is the error term.

The use of panel regression estimation model is important as it enables one to control for unobserved or missing variables (Clarke *et al.*, 2011). Despite the robustness of panel regression models, they are not panacea and may pose some estimation problems (unobserved cross-sectional term, heterogeneity, autocorrelation etc.). Against this background, one simplest estimation model that can be employed is the Ordinary Least Square (OLS). However, analysing panel data using OLS estimation may pose some problems. First, the estimated coefficients of observed variables are likely to be biased if correlation exists between the observed variables and the unobserved cross-sectional or time-variant error terms (Asare *et al.*, 2017). The error term generated by OLS is composite (made up of time-invariant error term ε_{it}), serially correlated and incorrect. Some authors (Beck and Katz, 1995, 2011) have argued that the problems associated with estimating panel data using OLS can be eliminated when OLS-Panel Corrected Standard Errors (OLS-PCSE) is used. The use of OLS-PCSE is thus valid as the estimated regression models confirm the presence of heteroscedasticity and autocorrelation when Breusch and Pagan (1979); Cook and Weisberg (1983) and Wooldridge (2003) tests are employed.

5. Empirical results
The analysis in this section shows some important summary/descriptive statistics across the 24 banks used for the estimated regression results as presented in Table 1. Table 2 presents the test of multicollinearity. The results for the panel regressions are also shown in Table 3.

On the average, the VAIC of the banks as shown in Table 1 is 1.73. This indicates that overall, banks in Ghana have positive average VAIC though relatively low. The mean VAIC obtained is lesser than the values found in other banking markets; Ozkan *et al.* (2017) in Turkey (3.8868), Joshi *et al.* (2010) in Australia (3.80); El-Bannany (2008) for UK (10.80). The most efficient component of VAIC for banks in Ghana is HCE (with a mean value of 0.868) followed by SCE (with a mean value of 0.684) and CEE (with a mean value of 0.176). This is consistent with previous research by Asare *et al.* (2017), Alhassan and Asare (2016), Joshi *et al.* (2013), Joshi *et al.* (2010) that the performance of IC for the banking sector is largely influenced by HCE. This is also the case for Turkish and Malaysian banks (Ozkan *et al.*, 2017; Goh, 2005). Much emphasis should be placed on the competence of human capital in the banking sector of Ghana if the banks wish to create higher IC and thus, increase performance. The vast difference between the maximum (13.402) and minimum (−4.522) values of VAIC of the banks may be explained by the missing values as the standard deviation (2.265) is not spread but still within the domain of the mean (1.733). The same explanation holds for AQ of the banks, showing maximum and minimum values of 22.090 and 0.333 respectively with standard deviation of 4.96. The average Asset Quality (AQ) of the banks is 6.308 for the period 2006–2015.

The test for multicollinearity in Table 2 is carried out to check the presence or otherwise of any form of multicollinearity between the regressors employed. The output results of the test

Variable	Mean	SD	Min	Max	Obs
AQ	6.3083	4.9677	0.3330	22.0900	196
VAIC	1.7336	2.2654	−4.5226	13.4023	196
HCE	0.8684	1.5172	−4.7073	3.2278	196
SCE	0.6846	1.6603	−4.5000	13.5000	196
CEE	0.1768	0.4492	−1.2468	1.5310	196
BSIZE(GH¿'000)	12918.8900	56247.0400	1397.0000	439348.0000	196
BAGE	26.7175	29.4563	1.0000	120.0000	196

Note(s): AQ, Asset Quality; VAIC, Value Added Intellectual Coefficient; HCE, Human Capital Efficiency; SCE, Structural Capital Efficiency; CEE, Capital Employed Efficiency; BSIZE, Bank Size; BAGE, Bank Age
Source(s): Authors' Computations from Data, 2019

Table 1.
Descriptive statistics

	VAIC	HCE	SCE	CEE	BSIZE	BAGE
VAIC	1					
HCE	0.6962	1				
	(0.0000)					
SCE	0.6096	−0.0409	1			
	(0.0000)	(0.5757)				
CEE	0.4077	0.1485	−0.0043	1		
	(0.0000)	(0.0409)	(0.9527)			
BSIZE	−0.0162	0.1768	−0.2667	0.1395	1	
	(0.8351)	(0.0223)	(0.0005)	(0.0713)		
BAGE	0.0477	0.0996	−0.1552	0.2444	0.1714	1
	(0.5157)	(0.1752)	(0.0335)	(0.0007)	(0.0241)	

Note(s): AQ, Asset Quality; VAIC, Value Added Intellectual Coefficient; HCE, Human Capital Efficiency; SCE, Structural Capital Efficiency; CEE, Capital Employed Efficiency; BSIZE, Bank Size; BAGE, Bank Age. p-values are shown in parentheses
Source(s): Authors' Computations from Data, 2019

Table 2.
Test for multicollinearity

	Dependent variable: Asset quality					
	Model 1				Model 2	
	Coeff	Z	$p > z$	Coeff	z	$p > z$
Constant	20.2347	3.5000	(0.0000)	17.9180	3.1500	(0.0020)
VAIC	0.1726	0.5300	(0.5980)			
HCE				−0.7859	1.6800	(0.0930)
SCE				−1.0122	1.8700	(0.0620)
CEE				1.0597	0.7800	(0.4330)
BSIZE	−1.7164	−2.5100	(0.0120)	−0.9657	−1.3300	(0.1820)
BAGE	0.0420	2.9500	(0.0030)	0.0419	3.0000	(0.0030)
R^2	0.0946			0.1514		
Wald χ^2(3/5)	16.1400			20.9300		
Prob $> \chi^2$	0.0065			0.0039		
Banks	24.0000			24.0000		
Observations	129.0000			129.0000		

Note(s): AQ, Asset Quality; VAIC, Value Added Intellectual Coefficient; HCE, Human Capital Efficiency; SCE, Structural Capital Efficiency; CEE, Capital Employed Efficiency; BSIZE, Bank Size; BAGE, Bank Age. p-values are shown in parentheses
Source(s): Authors' Computations from Data, 2019

Table 3.
Regression results

in this case suggest that the largest correlation (0.69) is between VAIC and HCE. This value is marginally less than the threshold of 0.70 and hence can be ignored (Kennedy, 2008). Even so, the regression results presented in Table 3 does not employ both variables in the same regression; the problem of multicollinearity is eliminated.

5.1 Intellectual capital and asset quality of banks

In order to establish the nature of the relationship between IC (and its components) and AQ of banks, two models are estimated. The first model employs VAIC as a composite variable and establishes its relationship with AQ; control variables are considered. The second model considers the relationship between the three components of VAIC and AQ. These are shown in Table 3. The R^2 in both models, though relatively small (of 0.0946 and 0.1514 for Model 1 and Model 2 respectively), shows the low explanatory power of the coefficients in the estimations. Moksony (1990) however posits that a low value of R^2 can be immaterial if the aim of the research is to establish a causal relationship or test a theory as it is in the case of this research.

Bank specific variables are important and affect risky lending behaviours of banks. It is evident in this study that bank specific variables, Bank Size and Bank Age (BSIZE and BAGE) significantly affect AQ of banks. In both Models 1 and 2, BAGE is significant and best explains the AQ of banks. BSIZE is found to be insignificant in Model 2, when VAIC is divided into its components.

The findings in Model 1 indicate that VAIC has insignificant positive impact on AQ of banks. In this instance, each additional unit of VAIC is associated with 0.1726 units of increase in AQ. The null hypothesis that there is a positive relationship between AQ and IC is rejected. This result signifies that IC does have positive effects but insignificant, on quality of loan assets of banks. Factors other than IC as a whole influence the level of Non-Performing Loans (NPL) in banks. Perhaps this is because of the low average VAIC found for the banks (see Table 1). Also, IC assets are not always separately identifiable, but tend to be complementary and can overlap significantly (Bismuth and Tojo, 2008). In the light of this the IC of the banks are perhaps not efficient enough to achieve optimum complementarity; especially on the basis of the low VAIC levels of banks computed in this study. This finding is novel as few if any studies have attempted to establish the nature of the relationship between the two variables under consideration. The results further indicate that BSIZE is negative and statistically significant in determining the AQ of banks. An earlier study by Amuakwa-Mensah and Boakye-Adjei (2015) established a positive and significant relationship between BSIZE and AQ of banks. This study reveals that an increase in BSIZE will result in a decrease in NPL by 0.012, *ceteris paribus*. This seems to suggest that as BSIZE increases, any attempt geared towards expanding the credit base and loan assets of the banks is matched with tighter measures to reduce the risk of clients defaulting. The findings are contrary to Kakozi (2017) which indicated that bank specific variables like size of bank, has no significant impact on AQ of banks. Salas and Saurina (2002) also emphasized that variations in NPL can be explained by the size of bank.

A breakdown of the various components of VAIC and their relationships with the AQ of the banks is shown in Model 2. The findings indicate that the relationship between HCE and AQ is negative and statistically significant. A statistically significant negative relationship is also found between SCE and AQ. In these instances, increase of HCE and SCE each by 1unit is associated with 0.7859 units and 1.0122 units of decreases respectively in AQ. The alternate hypotheses (i.e. H2 and H3) that there are negative relationships between Asset Quality and HCE/SCE are accepted. This indicates that the efficiencies of banks' human capital and structural capital have positive effects on their NPL. The coefficient of CEE is also found to be positive but insignificant and as such does not influence the AQ of banks. The relatively low financial capital bases of the banks in Ghana do not necessarily allow efficiency of capital employed to affect the extent of NPL existing in the books of the banks (see Bank of Ghana, 2017a, b).

6. Conclusion

The study examines the nature of the relationship between AQ and IC of banks in an emerging banking market in Ghana using audited annual financial data for the period 2006 to 2015. The study finds no significant relationship between the IC and AQ of banks; though the relationship between them is positive. However, two of the components of IC, i.e. Human Capital Efficiency and Structural Capital Efficiency have negative and significant relationships with AQ of banks. These results imply that the AQ of banks is highly driven mainly by structural capital and human capital efficiencies and not necessarily by capital employed efficiency. The skills, competence, exposures, experience, innovation, initiatives and all the other attributes of human capital of banks contribute greatly to value creation of banks and affect the quality of loan assets of banks. Also the structural capital of banks like management processes, credit and other policies, internal controls, information technology infrastructures and many others contribute to the quality of loan assets of banks.

Banks in Ghana therefore need to invest more in human capital, in terms of training, education, mentoring programmes, incentive packages etc. towards enhancing quality of loan assets. The study results also prove that investments in structural capital of banks significantly affect assets quality of banks. This suggests that banks that have comprehensive systems and structures like sound organizational cultures, management processes, policies, good internal controls, information technology infrastructures and software packages and many others tend to have relatively better quality loan assets. The insignificant impact of shareholders' investments, capital employed, on the performance of loan assets of banks can be attributed to the fact that the banking business is highly regulated in Ghana and that capital requirements regulation makes it difficult to attribute differences in AQ to banks' capital employed. Besides, the capital employed of the banks until recently were relatively low to enable them to finance a wide range of projects and firms.

In addition, the improvements in loan assets quality of banks on account of development in human and structural capitals may be attributable to the adoption of banking practices in Ghana that offer cheap deposits from depositors for banks to create more money through credits. This perhaps will further result in reducing the laxity of terms and conditions required in giving out loans and hence the decrease in NPL. There is still room for improvements; managements of banks should have incentives and structures to decrease the risks in their loan portfolios.

This study provides a broad understanding of AQ and IC in an emerging banking market context. The use of contemporary IC measurements and recognition methods can enable the banks to value and report on the values of their IC and how they contribute to their value creation, financial performance and stability, e.g. improving bank AQ. From the resource-based theory of the firm, the results do not provide much clue that IC as a composite variable constitutes the vital spark of bank improved AQ. However, human and structural capitals as constituents of IC create the vital spark of bank in respect of AQ. The central bank and other regulatory bodies will need to strengthen their monitoring and control of banking operations to ensure that the constituents of IC are complementary. Their regulations, policies and directives on the human & structural capitals and capital employed should be synchronized or harmonised to ensure improvements in loan assets quality. Based on the resource-based view, management of banks in consonance with the central bank must continue to make substantial investments in IC especially human and structural capitals; monitor and control banking, e.g. boosting career progress or development among management/employees; giving additional non-financial benefits such as health insurance and salary improvements of employees and internalising safe and sound banking systems. The central bank should take incisive decisions on banks that fall foul to established directives (i.e. rules and regulations) to forestall increasing NPL of banks in the presence of increasing IC. A latent limitation of this study is that the results might not be applicable beyond knowledge-intensive firms such as banks in emerging markets. The researchers leave the replication of the relationships

emphasized in this study in developed and other developing banking markets to future research. Other measures of AQ and IC could be used in further studies in other jurisdictions especially in Africa.

Notes

1. See also Alhassan *et al.*, 2014.

2. 25% of this class of non-performing loan is written off.

3. 50% of this class of non-performing loan is written off.

4. 100% is this class of non-performing loan is written off.

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