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# Does Income Diversification Moderate Intellectual Capital–Performance Nexus? – An Empirical Analysis from Bangladesh

- Tabassum Chowdhury[*]
- S. M. Sohrab Uddin[**]

**Abstract**

Intellectual capital, as a knowledge-based resource, is essential for enhancing the performance of knowledge driven organization such as banks. Additionally, for the improvement of the commercial banks, they are now diversifying their income to non-banking activities. Thus, this study empirically analyses how income diversification contributes in shaping the link of intellectual capital to the performance of banks of Bangladesh by using an annual panel dataset of 30 banks from the period of 2013 to 2023. The empirical results from regression analysis show that the intellectual capital has a notable contribution in enhancing the bank performance. In addition, income diversity negatively influences the association between intellectual capital and its individual constituents, and bank's performance. Bank managers can think of efficient intellectual capital management to ensure the competitive advantage as well as focus more on core activities for the enhancement of the performance of banks.

**Keywords:** Bank Performance, Income Diversification, Intellectual Capital and Value-added Efficiency.
**JEL Classification:** O340, C390

## 1. Introduction

In the current technological era, the most important resources for maintaining a competitive edge in the growing knowledge-driven economy are information, knowledge, and technology. They are all regarded as dimensions of intellectual capital, also known as intangible assets, which are currently the focus of most businesses, including banks, because they have been identified to be effective instruments for maintaining business success (Asutay & Ubaidillah, 2024). The resource-based view opines that intellectual capital is a key driver for not only competitive edge but also a crucial component for generating company's value,

[*] Tabassum Chowdhury is an Assistant Professor, School of Business Administration, East Delta University, Chattogram, Bangladesh, Email: tabassum@eastdelta.edu.bd and [**]S. M. Sohrab Uddin is a Professor, Department of Finance, Faculty of Business Administration, University of Chittagong, Chattogram, Bangladesh, Email: sohrab@cu.ac.bd. The views expressed in this paper are the authors' own.

thereby guaranteeing better financial performance (Smriti and Das, 2018; Sannino et al., 2021).

From the advent of the knowledge driven economy, banks have been seen as incredibly creative and integrated organizations that make use of both technological and human resources (Nadeem et al., 2017). Banks are knowledge driven organization and it is crucial for banks to utilize the intangible resources. They should emphasis on the growth and improvement of intellectual capital through of human resources, product brands, information technology, and other assets so that it can offer better and quick services to the customers and attain greater performance and thereby meeting the needs of stakeholders (Meles et al., 2016; Tran and Vo, 2018, Ousama et al., 2020, Sannino et al., 2021). Thus, by offering best financial products and services and building strong relationship with clients, effective intellectual capital management affects the bank financial performance positively (Ul Rehman et al., 2024).

It is evident that one of the primary determinants of banking performance nowadays is intellectual capital (Rehman et al., 2022). To become successful, banks are now providing the best and extensive services to their client. That is why, banks have invested heavily in their personnel, operations, systems, and brands. In this instance, intellectual capital will help banks to become more successful and efficient by providing the greatest array of knowledge and information, thereby preserving the competitive advantage over time (Nguyen et al., 2023). Although, numerous literatures have explored to link the intellectual capital to banks performance across many industries and regions (Mollah & Rouf, 2022; Bayraktaroglu et al., 2019), the evidence is showing mixed trend and also inconclusive (Mohapatra et al., 2019; Ousama et al., 2019; Mondal and Gosh, 2012). According to several studies, intangible asset is positively linked to financial performance (Majumder et al., 2023; Le et al., 2022; Tiwari & Vidyarthi, 2018), whereas other findings, conversely, suggested that it has not that much effect on the performance (Dalwai et al., 2021).

The dynamic capabilities theory contends that company specific resources, business alternatives, and environmental conditions combinedly contribute for attaining the advantage over competitors and improving the financial conditions

in the long run (Teece and Pisano, 2003). This theory also highlights the necessity of looking at contingent elements that affect the correlation between organizational efficiency and intellectual capital. Additionally, research demonstrate that various strategic measures can be used to utilize intangible resources (Combs et al., 2011, Githaiga, 2023). Current literature also states that intellectual capital is strongly correlated with diversification. Githaiga et al. (2023) explained that banks having high intellectual capital are more focused on the expansion of goods and services and this will boost income because they have knowledgeable staff, advanced technological infrastructure, efficient internal procedures, along with essential market insight. Given this context, intellectual capital, income diversification, and bank performance are significantly correlated, which is not that much discussed in the prior empirical literature.

In Bangladesh, the literature related to intellectual capital is yet to draw (Faruq et al., 2023). The contribution of banking sector in Bangladesh is more dominant in the economy than that of the capital market (Das & Pati, 2025). As banks are service oriented organization, they are heavily dependent on intangible resources. Intellectual capital is needed for banks to become successful. To meet the continuous demand of the customers, they are offering innovative services to them. Moreover, following the global trend, Bangladesh has experienced an acceleration of banking by expanding the activities into non-traditional activities in recent years (Phan et al. 2023). In this perspective, it is needed to recognize how income diversification moderates the linkage of intellectual capital to the performance of the Bangladeshi banking sector.

Thus, the study adds value by incorporating income diversification, a moderator, on the connection of intellectual capital to the financial results of bank. In addition to that, it is one of few papers which explores the role of income diversity in linking intellectual capital or intangible asset to the financial conditions of banks from Bangladesh perspective.

There are four sections in the paper's later part. Section-2 highlights a review of the existing studies. Section-3 provides data and methods. Findings and relevant analyses are discussed in Section-4 and in Section-5, the paper is concluded with some policy implications and also directions for further research.

## 2. Review of Literature and Hypotheses

### 2.1 Intellectual Capital

Intellectual capital is explained as the knowledge, which is shifted to value (Edvinsson and Sullivan, 1996). Zéghal and Maaloul (2010) opined that it is the mixture of knowledge, expertise, information system, and rights on intellectual property, which are under the control of a company and that can be applied to generate and enhance company's value. The main constituents of intellectual capital have developed from the numerous explanations of intellectual capital. As explained by Pulic (1998), human capital and structural capital are the two main constituents. Furthermore, relational capital was suggested by Petty and Guthrie (2000) as an additional element.

Human capital reflects people's intuitive knowledge regarding workers' capacities, competencies, expertise, creativeness, and inventiveness (Kim and Lee, 2010). The most important aspect of intellectual capital, according to the literature presently available, is human capital, which demonstrates the capacities, expertise, information, and experience of personnel of the firm (Roslender & Fincham, 2004, Majumder et al., 2023). It also symbolizes the knowledge that can only be managed by the businesses, as it leaves the company along with employees (Sannino et al., 2021). As a result, organizations with the significant investment in the development of human capital becomes more successful (Githaiga, 2023). Structural capital, which includes organizational cultures, processes, structures, systems, practices, and records, is knowledge that a corporation creates and cannot remove (Pulic, 1998, 2004). Copyright, patents, creations, and policy can be the elements of it (Joshi et al., 2010). This capital is also crucial in the human capital framework (Asutay & Ubaidillah, 2024). Furthermore, according to Marti (2001), relational capital is the ability of a business to maintain an effective interaction with external factors for encouraging the creation of wealth by utilizing the other two capital. It indicates how an organization communicates and shares information with external stakeholders, including suppliers, consumers, investors, and shareholders (Johnston and Lane, 2018). A number of scholars afterwards substituted relational capital for customer capital (Ul Rehman et al., 2024; Cosma et al., 2019), emphasizing value

addition and ensuring connections with stakeholders in the long run (Ferraris et al., 2020; Helfat & Peteraf, 2015).

### 2.2 Intellectual Capital and Bank Performance

Numerous investigations are available to know how intellectual capital is connected to the performance of banks and have revealed notable conclusions (Le et al., 2022; Baima et al., 2020; Sharabati et al., 2010). In these studies, following the study of Pulic (2004), value-added intellectual coefficient or VAIC has been used to quantify the intellectual capital. Regardless of geographical location, intellectual capital significantly boosts company's profitability. In Indian context, intellectual capital enhances bank's performance as investigated by Vishnu and Kumar Gupta (2014). By using Skandia Navigator Model (SNM), Chinnasamy et al., (2024) proved that in India and Gulf Corporation Council (GCC) countries, financial performance was improved through intellectual capital. Furthermore, Lu et al. (2014) provide the same findings in Chinese companies. Majumder et al. (2023) examined 318 observations on banks and confirmed that intangible asset in Bangladesh has a considerable favorable influence on bank performance. Soewarno and Tjahjadi (2020) derived the similar strong correlation between intangible asset and bank profitability after evaluating the data on publicly listed banks in Indonesia. Similar result was reached by Xu and Liu (2021) in China, Maji and Saha (2024) in India, Sayed and Nefzi (2024) in Saudi Arabia as well as Kweh et al. (2019) in Malaysia. The following hypothesis is drawn in line with the above-mentioned works along with the research-based theory that validates the existence of intangible asset to achieve excellence in the banks' services:

*H1. More intellectual capital will boost bank performance.*

#### 2.2.1 Components of Intellectual Capital and their Effect on Bank Performance

Financial condition and profitability are higher for banks that are attentive to the development and enhancement of intangible asset constituents (Sannino et al. 2021). According to Ozkan et al. (2017), VAIC and it's elements, capital employed efficacy, human capital efficacy, and structural capital efficacy, were used to investigate their influence on banks profitability. They found no notable

effect of structural capital efficiency on financial viability but human capital efficacy and capital employed efficiency are noticeably related to the profitability of bank. Ousama et al. (2020) inspected the financial data of 37 banks on countries under GCC and demonstrated the favorable result of human capital efficacy and capital employed efficacy on performance. Nonetheless, structural capital efficiency was not noticeably connected to bank performance. Ul Rehman et al. (2024) discovered that the efficiency of structural capital ensures a favorable impact on financial performance but other two efficiency values, that is, human capital and capital employed have no influence on profitability of banks in the southeast Asian region. Nadeem et al. (2017) followed the generalized method of moments **(**GMM**)** method and discovered all elements of VAIC had significant effects on the profitability in emerging economies. A similar investigation was executed in Indonesian industries by Soetanto and Liem (2019), who used the GMM approach in conjunction with dynamic panel regression analysis. According to their findings, structural capital efficacy and capital employed efficacy were crucial to the process of formation of value. Asutay and Ubaidillah (2024) illustrated that for Islamic banks, efficiency of human capital and capital employed were crucial for the higher performance. In the context of India, Mohapatra et al. (2019) presented the favorable influence of human capital efficiency but structural capital efficacy is adversely connected to the performance, and Maji and Saha (2024) confirmed that human capital and structural capital were crucial for banks. Conversely, Soewarno and Tjahjadi (2020) stated that human capital efficacy negatively connected to profitability of Indonesian banks although structural capital efficacy and capital employed efficacy had strong effects on it. Sayed and Nefzi (2024) also confirmed that for Saudi Arabia. Rehman et al. (2022) opined the notable role of human capital efficiency on the financial results of emerging economies banks. Le and Nguyen (2020) found that each of the elements of VAIC were positively connected to the performance of the Vietnamese banks

The aforementioned studies provide empirical support for the concept utilizing VAIC and the three components are inconsistent and require more investigation.

The hypotheses are formulated as follows;

*H2. Human capital efficiency of bank is positively connected to profitability.*

*H3. Structural capital efficiency of bank will boost profitability.*

*H4. Capital employed efficiency of bank will enhance profitability.*

**2.3 Income Diversification on Bank Performance**

Banking sector is looking for income diversification as a result of trade openness, competition, and the relaxation of bank regulations. Thus, banks involve in activities other than core banking activities such as trading, brokerage, and underwriting, which in turn boost the other income than interest income (Nguyen et al., 2023). The key point for income diversity in theoretical framework is that, according to current portfolio theory, it reduces risk and produces consistent operational income because of imperfect correlated income streams (Markowitz, 1952; Sharma & Anand, 2018). Research indicates that the non-banking activities reduce risk (Pennathur et al., 2012), and increase the profitability of banks (Paltrinieri et al., 2021; Doan et al., 2018; Meslier et al., 2014). Alternatively, studies show that income diversity lessens profitability and exposes banks to income instability (DeYoung & Roland, 2001; Delpachitra & Lester 2013). Given the contradictory findings from banks worldwide, more investigation is needed to provide insight on how income diversification is linked to bank performance for Bangladeshi banks.

*H5. Income diversification significantly influences the bank profitability.*

**2.4 Income Diversification, as a Moderating Variable, on the Nexus between Intellectual Capital and Bank Performance**

The empirical investigation about the role of intangible asset on the financial result of bank has not been comprehensive, nor has it resulted in a consensus among scholars regarding the conclusion to be drawn. According to the concept of dynamic capacities, higher performance and a competitive advantage cannot be achieved just by possessing intellectual capital resources (Eisenhardt & Martin, 2000). To strengthen and restructure their current resources and create

new, long-term competitive advantages, businesses require innovative tools. Examining moderating factors is necessary to understand the intricate connection between bank strategy and performance. According to the research conducted by Jeandry and Fajriyanti (2023), income diversity may affect the strength and direction of the linkage of intellectual capital to bank performance. Additionally, the proponents of strategic management advise organizations for diversification so that the resources and competencies will be utilized properly and in return, competitive edge will be earned (Githaiga, 2023; Merino et al., 2014). Also, diversification enables businesses to effectively arrange and use their resources (Ramanathan et al., 2016; Githaiga, 2023). Wahyuningtias and Kusumawardhani (2024) supported that the interaction of income diversity and intellection capital improved the performance. In order to cover the decline in interest income, banks need to relate the intangible resource to the non-banking activities in consideration of the difficulties connected to traditional activities (Githaiga, 2023). From this perspective, this study is intended to find the role of income diversity on the effect of intellectual capital on the financial result of the bank.

*H6. Income diversification positively moderates the link of intellectual capital to bank performance.*

## 3. Research Methods

### 3.1 Data and Sample

This study has concentrated on the secondary annual data from the year 2013 to 2023 of 30 banks, which covers 330 bank-year observations. Each data has been gathered from the audited annual report of the corresponding banks. Convenience sampling technique has been applied while collecting bank data.

### 3.2 Test of Normality, Heteroscedasticity and Multicellularity

In order to run the ordinary least squares (OLS) regression, test of normality of the data and heteroscedasticity is critical as it may affect the results (Abdelhaq et al., 2025). After applying the Shapiro-Wilk test, the p value is substantial at 1%, which ensures the absence of normality in the data set for both ROA and ROE. Moreover, the Breusch-Pagan test is conducted to check the

heteroscedasticity. For the dependent variable ROA, no heteroscedasticity is identified, but for variable ROE, there is the presence of heteroscedasticity. To minimize the effect the normality and heteroscedasticity, robust regression has been applied in the study as adopted by Abdelhaq et al., (2025). Moreover, regarding multicollinearity test, the Variance Inflation Factor (VIF) is conducted for the independent variables, which are smaller than 5. This in turn reveals that there is no multicollinearity among variables (Kim, 2019), as portrayed in Table-1.

**Table 1. Values of VIF for independent variables**

| Variables | Size | CAR | IDIV | VAIC | INF | GDP | HCE | SCE | CEE |
|---|---|---|---|---|---|---|---|---|---|
| VIF | 1.29 | 1.25 | 1.12 | 1.08 | 1.06 | 1.04 | 2.07 | 1.19 | 2.02 |

Source: Authors' calculation

### 3.3 Regression Models

The following main models in Panel A have been developed in linking the income diversity on the nexus of intellectual capital to bank's performance. Panel B represents the models for robustness. Following the earlier research of Nguyen et al. (2023) and Githaiga (2023), the interaction effect of VAIC and the components of VAIC and income diversification have been introduced.

Panel A:

Model 1:$$ROA_{it} = \beta_0 + \beta_1(Size)_{it} + \beta_2(CAR)_{it} + \beta_3(GDPgrowth)_t + \beta_4(INF)_t + \beta_5(VAIC)_{it} + \beta_6(IDIV)_{it} + \beta_7(VAIC * IDIV)_{it} + e_{it}$$

Model 1(a):$$ROA_{it} = \beta_0 + \beta_1(Size)_{it} + \beta_2(CAR)_{it} + \beta_3(GDPgrowth)_t + \beta_4(INF)_t + \beta_5(HCE)_{it} + \beta_6(SCE)_{it} + \beta_7(CEE)_{it} + \beta_8(IDIV)_{it} + \beta_9(HCE * IDIV)_{it} + \beta_{10}(SCE * IDIV)_{it} + \beta_{11}(CEE * IDIV)_{it} + e_{it}$$

Panel B:

Model 2: $$ROE_{it} = \beta_0 + \beta_1(Size)_{it} + \beta_2(CAR)_{it} + \beta_3(GDPgrowth)_t + \beta_4(INF)_t + \beta_5(VAIC)_{it} + \beta_6(IDIV)_{it} + \beta_7(VAIC * IDIV)_{it} + e_{it}$$

$$\text{Model 2(a)}: ROE_{it} = \beta_0 + \beta_1(Size)_{it} + \beta_2(CAR)_{it} + \beta_3(GDPgrowth)_t + \beta_4(INF)_t + \beta_5(HCE)_{it} + \beta_6(SCE)_{it} + \beta_7(CEE)_{it} + \beta_8(IDIV)_{it} + \beta_9(HCE * IDIV)_{it} + \beta_{10}(SCE * IDIV)_{it} + \beta_{11}(CEE * IDIV)_{it} + e_{it}$$

where,

To quantify the performance of the banks which are dependent variables, Return on Assets (ROA) has been used and for robustness, Return on Equity (ROE) has been included (Githaiga, 2023; Nguyen et al., 2023; Sannino et al. 2021).

## Intellectual Capital

VAIC and the constituents namely human capital efficacy, structural capital effectiveness, and efficiency in capital employed are the proxy variables for assessing intellectual capital, as independent variables, adopted from Pulic (2000). The VAIC is designed by using Value Added (VA) of the intellectual capital. VA is found by subtracting operating expenses (OE) except personnel cost from Operating Income (OI) (Ul Rehman, 2024). The VA efficiency comprises three constituents that are capital employed efficacy, human capital efficacy, and structural capital efficacy. The calculations are adopted from Pulic, (1998), (2000), and Firer and Williams (2003):

$$VA = OI - OE$$

$$VAIC = \text{human capital efficiency} + \text{structural capital efficiency} + \text{capital employed efficiency}$$

Human capital efficacy, which measures the addition of value by the employment of human capital, is taken by dividing the VA by the total personnel cost (TPC).

$$\text{Human capital efficiency (HCE)} = VA/TPC$$

The next one is the structural capital efficiency and it demonstrates the extent to which Structural Capital (S) contributes to the formation of value for the organization. The SC is divided by VA. SC value is taken by subtracting TPC from VA.

$$Structural\ capital\ efficiency\ (SCE) = SC/VA$$

$$SC = VA - TPC$$

Then capital employed efficiency is taken and it displays the value generated for each amount spent in the tangible capital. It is found by dividing the VA by the net assets (Githaiga, 2023).

$$\text{Capital employed efficiency (CEE)} = \text{VA/ net asset}$$

## Income Diversification

Income diversification (IDIV) has used as a moderator, which is estimated by dividing the non-interest income (NII) by operating income (OI), adopted from Chowdhury et al. (2024).

$$IDIV = NII / OI$$

### 3.4 Control Variables

Country and bank-level control variables are included in this study following Chiorazzo et al., (2008) and Sanya and Wolfe (2011). Bank size (SIZE) is assessed by taking the log value of total assets, to measure bank-level control variable to account for variations in bank due to size. In order to account for variations in bank capital, the capital adequacy ratio (CAR) is included (Lee et al., 2020; Moudud-Ul-Huq et al., 2018). gross domestic product (GDP) growth rate and inflation rate (INF), for macro-level controls, have been used as per Stiroh & Rumble (2006) and Chowdhury et al. (2024).

## 4. Results and Analysis

### 4.1 Descriptive Statistics

Table-2 summarizes the analysis on the selected variables. The performance of banks, calculated by ROA and ROE, has an average value of 0.013 and 0.192 with a variation of 0.0006 and 1.789. The mean value for VAIC is 3.420. Among the element, human capital efficacy, structural capital efficacy, and capital employed efficacy have mean, which are 2.769, 0.620, 0.300 respectively. It is

found that the mean value of human capital efficacy is the highest. On the other hand, IDIV has an average value of 0.61, implying a significant focus on income diversity.

**Table 2: Descriptive Statistics**

| Variables | Observations | Mean | SD | Min | Max |
|---|---|---|---|---|---|
| ROA | 330 | 0.013 | 0.006 | 0.003 | 0.023 |
| ROE | 330 | 0.192 | 1.789 | -1.753 | 32.444 |
| VAIC | 330 | 3.420 | 1.326 | -5.351 | 8.040 |
| Human capital efficiency | 330 | 2.769 | 1.244 | -6.448 | 7.139 |
| Structural capital efficiency | 330 | 0.620 | 0.293 | -1.844 | 2.634 |
| Capital employed efficiency | 330 | 0.030 | 0.012 | -0.058 | 0.055 |
| IDIV | 330 | 0.614 | 0.729 | -3.734 | 11.147 |
| GDP | 330 | 0.064 | 0.011 | 0.034 | 0.079 |
| INF | 330 | 0.065 | 0.013 | 0.055 | 0.099 |
| SIZE | 330 | 26.183 | 0.991 | 22.509 | 28.319 |
| CAR | 330 | 0.142 | 0.150 | -0.228 | 1.964 |

**Source:** Authors' Calculation

### 4.2 Regression analysis

Model-1 represents how control variables influence the bank profitability measured by ROA and shown in Table-3. The findings portrayed a substantial negative influence of the size on performance. It is suggested that smaller banks perform better than the larger banks (Majumder et al., 2023; Gazi et al., 2024; Chowdhury & Salman, 2021). Moreover, capital adequacy ratio has a strong, significant at 1%, effect on the performance (Chowdhury & Salman, 2021). Other control variables have no notable influence on the profitability of Bangladeshi banks.

Model-2 depicts the influence of intangible asset portrayed by VAIC on bank's performance, ROA. The results showed a favorable linkage between intangible asset and bank profitability ($\beta = 0.0028$). As a result, the first hypothesis, H1 has been accepted. The results indicated that increased intellectual capital management capability helps banks establish sustainable operations, which in turn improves the financial performance. Similar result was found by Maji and Goswami (2016), Tiwari and Vidyarthi (2018), Nguyen et al., (2023), and Githaiga (2023). These studies confirmed that bank performance is highly influenced by intangible asset. On the other hand, among the control variables,

size and capital adequacy ratio have adverse impact on the profitability, which suggests that small sized bank with less capital adequacy performs better in the context of Bangladesh. More capital to mitigate the risk may reduce the profitably (Gazi et al., 2022).

**Table 3: Regression Results**

| | **Model 1** | **Model 2** | **Model 3** | **Model 4** | **Model 5** | **Model 6** | **Model 7** |
|---|---|---|---|---|---|---|---|
| | ROA | ROA | ROA | ROA | ROA | ROA | ROA |
| Constant | 0.0747*** (0.0098) | 0.0484*** (0.0093) | 0.0147** (0.0058) | 0.0475*** (0.0094) | 0.0182*** (0.0064) | 0.0494*** (0.009) | 0.0085 (0.0063) |
| Independent variable: VAIC and components | | | | | | | |
| VAIC | | 0.0028*** (0.0002) | | 0.003*** (0.0002) | | 0.0038*** (0.0003) | |
| HCE | | | 0.0005** (0.0002) | | 0.0012*** (0.0003) | | 0.0028*** (0.0007) |
| SCE | | | 0.0072*** (0.0007) | | 0.0004 (0.0009) | | 0.005*** (0.0013) |
| CEE | | | 0.4893*** (0.0217) | | 0.4354*** (0.023) | | 0.5305*** (0.0589) |
| Moderating variable | | | | | | | |
| IDIV | | | | -0.003*** (0.0007) | -0.004*** (0.0007) | -0.004*** (0.0007) | 0.0079*** (0.002) |
| Interaction effect | | | | | | | |
| VAIC*IDIV | | | | | | -0.002*** (0.0003) | |
| HCE*IDIV | | | | | | | -0.0021** (0.001) |
| SCE*IDIV | | | | | | | -0.008*** (0.0014) |
| CEE*IDIV | | | | | | | -0.0209 (0.0965) |
| Control variables | | | | | | | |
| SIZE | -0.003*** (0.0004) | -0.002*** (0.0003) | -0.001*** (0.0002) | -0.002*** (0.0003) | -0.001*** (0.0002) | -0.002*** (0.0003) | -0.001*** (0.0002) |
| CAR | 0.0494*** (0.0031) | -0.0054** (0.0023) | -0.0010 (0.0014) | -0.007*** (0.0022) | -0.0033** (.00015) | -0.011*** (0.002) | -0.0016 (0.0015) |
| GDP | 0.0173 (0.0289) | 0.0064 (0.0276) | -0.0258 (0.0167) | -0.0097 (0.0265) | -0.0307* (0.0178) | -0.0332 (0.0248) | -0.044*** (0.0162) |
| INF | 0.0142 (0.0246) | 0.0195 (0.0237) | 0.0230 (0.0143) | 0.0119 (0.0228) | 0.0269* (0.0151) | 0.0297 (0.0214) | 0.0267* (0.0137) |
| Observations | 330 | 330 | 330 | 330 | 330 | 330 | 330 |
| R-squared | 0.5884 | 0.3547 | 0.7832 | 0.3866 | 0.7184 | 0.5063 | 0.7867 |

**Notes:** Standard errors are in parentheses. *** p<0.01, ** p<0.05 and * p<0.10
Source: Authors' calculation

Model-3 portrays the link of the constituents of intellectual capital to the performance of banks. Table-3 exhibits that human capital efficacy, structural capital efficacy, and capital employed efficacy have substantial impact on the performance of banks. It reveals that efficiency in the management of human capital, structural capital, and capital employed is the significant driver to enhance the performance of the banks. It is noticeable that banks of Bangladesh have utilized human capital and capital employed properly as significant factors to leverage the performance, which align with the evidence of Mollah and Rouf (2022), Smriti and Das (2018), and Maji and Goswami (2016). Not only that, organizational culture, system, and structure are also connected to the performance of the banks, which also aligns with the results of Hamdan (2018) and Xu and Liu (2020). Thus, hypothesis H2, H3, and H4 are accepted.

The results exhibited in Model 4 indicate the influence of the intellectual capital (VAIC), control variables, and income diversity on ROA. It is found that, with $\beta = -0.003$ and at 1% significant level, income diversification is adversely related to the financial performance. That means focusing on the activities other than core banking activities may in turn lead to vulnerability of banks. The results are validated by similar findings reported by Githaiga (2023), Duho et al., (2020), and Alhassan (2016), where it is evident that diversification diminishes the profitability. Moreover, VAIC is positively connected to the performance of banks.

The outputs on the interaction effect are represented in Model 6 and Model 7. It is revealed that income diversity negatively moderates the connection of intellectual capital indicated by VAIC on banks' profitability. Thus, focusing on the diversification of income may degrade the intellectual capital and bank performance association. This result is validated by Nguyen et al., (2023) and Githaiga (2023). Moreover, as reported in Model 7, income diversity also negatively moderates the linkage of human capital efficacy and structural capital efficacy to the performance of banks. The reason behind this could be the lack of capabilities and skills required in the organizational structures, systems, and human capital needed to diversify the income. Conversely, the linkage of capital employed efficacy and bank performance is not substantially moderated by

income diversity. This could be described by the reason that banks have to maintain minimum amount of capital to maintain the risk management requirement. Hence, income diversification strategy may not affect the linkage of capital employed efficacy and performance of banks in Bangladesh, as supported by the findings of Nguyen et al., (2023) and Githaiga (2023). The summary results are exhibited in Table-4.

**Table 4: Summary decisions**

| Hypothesis | Decisions |
|---|---|
| H1. More intellectual capital will boost bank performance. | Supported with p<0.01 |
| H2. Human capital efficiency of bank is positively connected to profitability. | Supported with p<0.05 |
| H3. Structural capital efficiency of bank will boost profitability. | Supported with p<0.01 |
| H4. Capital employed efficiency of bank will enhance profitability. | Supported with p<0.01 |
| H5. Income diversification significantly influences the bank profitability. | Supported with p<0.01 |
| H6. Income diversification positively moderates the link of intellectual capital to bank performance | Rejected |

Source: Constructed by the authors.

### 4.2.1 Robustness of results

This study has applied another measurement of performance, ROE, to check the robustness of the result. According to Model 1 in Table A1, bank size and CAR are negatively connected to ROE. In addition, VAIC is positively linked to ROE. Similar results are found while applying the performance measurement ROA. Regarding the elements, capital employed efficacy and structural capital efficacy are substantially as well as positively linked to ROE, similar to the results found with ROA. However, unlike ROA, human capital efficiency is negatively connected to ROE in Model 3. The possible reason for the adverse connection could be the lack of efficiency in managing human capital, that is, proper competencies to generate profit (Soewarno & Tjahjadi, 2020). Like ROA, income diversification is negatively linked to ROE, which means less diversified banks perform better. Regarding the interaction effect, income diversity negatively moderates all the constituents of intellectual capital. The alternative

performance variable shows almost similar results shown in Table 3, which confirms the robustness of the result.

## 5. Conclusion and Policy Implications

The research reveals how income diversification contributes in linking the intellectual capital to the performance of the commercial banks of Bangladesh from 2013 to 2023. To begin with, intellectual capital will boost bank performance. The parts of this intangible asset, which includes human capital efficiency, structural capital efficiency, and capital employed efficiency, are also substantially as well as positively linked to the financial results of banks. Additionally, the findings discover that income diversity is adversely linked to bank performance. Finally, the results confirmed that, as a moderating variable, income diversity lessens the overall effect of this capital on how well banks perform. To be specific, income diversification negatively moderates the human capital efficacy and structural capital efficacy. However, no effect on capital employed efficacy is found.

Policymakers along with bank managers may benefit from the study. It is evident that intellectual capital offers competitive edge in their efforts for greater bank performance, as evidenced by the strong positive association between bank profitability and intellectual capital (Tiwari and Vidyarthi, 2018; Nguyen et al., 2023, and Githaiga 2023). Second, as income diversification negatively affects the performance, the diversity to non-banking activities may cause volatility on profitability. Moreover, legal expenses may be increased because of the different regulatory environment of managing non-traditional activities rather than the regular core activities (Allen & Jagtiani, 2000). Thus, banks should focus on their core activities and for diversification, they should research on proportion of different activities. Thirdly, the contribution of income diversification on human capital efficacy, structural capital efficiency, and bank performance indicates that management has to assess how non-banking operations affect the creations of value of bank using intangible asset efficiency. This paper will contribute to the existing resource-based view theory and modern portfolio theory by

incorporating income diversity on the efficacy of intangible asset and performance of banks in Bangladesh.

## 6. Limitations and Directions for Future Studies

This study has some drawbacks. It focusses on only the banking sector of Bangladesh. Future research can include cross-country analysis and other financial as well as non-financial sectors. Moreover, in this study, three elements of intellectual capital efficacy following VAIC method, such as human capital efficacy, structural capital efficacy, and capital employed efficacy are included. Future studies can incorporate other components of VAIC to connect them to the profitability of banks. This research has incorporated the accounting-based performance measurement. Therefore, other parametric and non-parametric measures of efficiency can be expanded for assessing the performance of banks.

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# Appendix

## Table A1: Regression Results Using ROE

| | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 | Model 7 |
|---|---|---|---|---|---|---|---|
| | ROE | ROE | ROE | ROE | ROE | ROE | ROE |
| Constant | 0.367*** | 0.1533* | -0.1276* | 0.1093 | -0.0794 | 0.1069 | -0.163** |
| | (0.0944) | (0.087) | (0.0748) | (0.0813) | (0.0755) | (0.0835) | (0.0771) |
| Independent variables: VAIC and components | | | | | | | |
| VAIC | | 0.02*** | | 0.016*** | | 0.015*** | |
| | | (0.002) | | (0.0021) | | (0.0027) | |
| HCE | | | -0.01*** | | -0.0034 | | 0.0098 |
| | | | (0.0026) | | (0.0031) | | (0.008) |
| SCE | | | 0.21*** | | 0.120*** | | 0.274*** |
| | | | (0.0096) | | (0.0136) | | (0.0191) |
| CEE | | | 2.64*** | | 2.0537*** | | 4.0926*** |
| | | | (0.2688) | | (0.2706) | | (0.7348) |
| Moderator | | | | | | | |
| IDIV | | | | -0.12*** | -0.073*** | -0.12*** | 0.1568*** |
| | | | | (0.0062) | (0.0082) | (0.0067) | (0.0168) |
| Interaction effect | | | | | | | |
| VAIC*IDIV | | | | | | 0.003 | |
| | | | | | | (0.0031) | |
| HCE*IDIV | | | | | | | -0.028*** |
| | | | | | | | (0.0107) |
| SCE*IDIV | | | | | | | -0.107*** |
| | | | | | | | (0.0182) |
| CEE*IDIV | | | | | | | -2.5004** |
| | | | | | | | (1.2266) |
| Control variables | | | | | | | |
| SIZE | -0.01*** | -0.0051 | 0.0017 | 0.0006 | 0.0038 | 0.0008 | -0.0008 |
| | (0.0035) | (0.0032) | (0.0027) | (0.003) | (0.0028) | (0.0031) | (0.0028) |
| CAR | -0.08*** | -0.06*** | -0.022 | -0.11*** | -0.05*** | -0.11*** | -0.037** |
| | (0.0229) | (0.021) | (0.0177) | (0.0189) | (0.0179) | (0.0189) | (0.0183) |
| GDP | 0.1097 | -0.0437 | -0.2165 | -0.3191 | -0.3255 | -0.3068 | -0.426** |
| | (0.2786) | (0.2546) | (0.2035) | (0.2261) | (0.2047) | (0.2273) | (0.2017) |
| INF | 0.2719 | 0.3262 | 0.2691 | 0.3879** | 0.309* | 0.3784* | 0.3654** |
| | (0.2372) | (0.2179) | (0.1745) | (0.1939) | (0.1741) | (0.196) | (0.1703) |
| Observations | 330 | 330 | 330 | 330 | 330 | 330 | 330 |
| R-squared | 0.0454 | 0.2116 | 0.6636 | 0.5978 | 00.6658 | 0.6092 | 0.763 |

**Notes:** Standard errors are in parentheses. *** p<0.01, ** p<0.05 and * p<0.10
Source: Authors' calculation