

# THE EFFECT OF INTELLECTUAL CAPITAL ON FINANCIAL PERFORMANCE IN INDONESIAN BANKING: EVIDENCE FROM THE VAIC MODEL

Amelia Virnindhita<sup>1</sup>, Erna Sulistyowati<sup>2</sup>.

<sup>1,2</sup>) Universitas Pembangunan Nasional Veteran Jawa Timur, Surabaya, Indonesia

E-mail: <sup>1</sup>) [22013010113@student.upnjatim.ac.id](mailto:22013010113@student.upnjatim.ac.id), <sup>2</sup>) [ernas.ak@upnjatim.ac.id](mailto:ernas.ak@upnjatim.ac.id)

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## Abstract

*This study aims to examine the effect of intellectual capital on the financial performance of banking companies listed on the Indonesia Stock Exchange (IDX) during the 2022–2024 period. Intellectual capital is measured using the Value Added Intellectual Coefficient (VAIC) model, which consists of Value Added Capital Employed (VACA), Value Added Human Capital (VAHU), and Structural Capital Value Added (STVA), while financial performance is proxied by Return on Assets (ROA). This study employs a quantitative approach using secondary data obtained from the annual reports and financial statements of 40 banking companies, resulting in 120 observations. Panel data regression analysis is used, with the Fixed Effect Model (FEM) selected based on the results of the Chow test and Hausman test. The results indicate that VACA has no significant effect on ROA, whereas VAHU and STVA have a positive and significant effect on ROA. In addition, VACA, VAHU, and STVA simultaneously affect financial performance. These findings suggest that human capital and structural capital efficiency are more closely associated with financial performance than capital employed efficiency. The study provides empirical evidence regarding the role of intellectual capital in supporting the financial performance of banking companies.*

**Keywords:** Intellectual Capital, VAIC, Financial Performance, Banking.

## 1. INTRODUCTION

The rapid growth of digital technology has increased the importance of intangible resources as a source of competitive advantage in the banking industry. This transformation has become increasingly important since the COVID-19 pandemic, which disrupted economic activities and affected various sectors, including banking (Adawiyah & Lisiantara, 2022). As a result, banking companies were required to strengthen their operational strategies, improve service efficiency, and accelerate digital transformation to maintain business sustainability and enhance financial performance (Ronggo et al., 2022).

Digitalization has become a crucial driver of competitiveness within Indonesia's banking industry while also supporting broader economic growth (Indrayani et al., 2025). The integration of digital technologies allows banks to offer more efficient and customer-

oriented services. Therefore, adopting digital transformation initiatives is no longer optional but necessary for banks to sustain their competitive position.

The rapid development of digital financial services is demonstrated by the significant increase in digital banking and electronic money transactions. According to Bank Indonesia, digital banking transactions grew from IDR 52,545 trillion in 2022 to IDR 63,433 trillion in 2024. Likewise, the value of electronic money transactions increased markedly from IDR 399.6 trillion to IDR 2.5 quadrillion over the same period. This trend highlights the expanding adoption of digital financial services within society and the growing importance of digitalization in the banking sector.

The utilization of digital services not only improves operational efficiency but also has the potential to enhance profitability. The growth of digital transactions can increase fee-based income through a higher frequency of digital transactions (Hidayat et al., 2021). However, the success of digital transformation is determined not only by technology adoption but also by a company's ability to manage its resources effectively.

Recent studies indicate that digital technologies alone are insufficient to ensure sustainable improvements in banking performance. The positive contribution of digitalization depends on the development of human capital, employees' digital competencies, organizational support systems, and the efficient utilization of organizational resources. In the banking sector, human capital is required to operate and adapt to digital technologies, structural capital provides the systems, procedures, and infrastructure necessary to support digital operations, while capital employed must be managed efficiently to ensure that investments in digital technologies create value. Therefore, the benefits of digitalization can be fully realized only when banks are capable of effectively managing human capital, structural capital, and capital employed. This indicates that intangible resources play a crucial role in supporting digital transformation and improving financial performance (Nomoz, 2025).

Resource Based Theory, proposed by Barney (1991), serves as the theoretical foundation of this study. The theory emphasizes that a firm's long-term success is influenced by its ability to manage and exploit strategic resources that possess unique characteristics, including value, rarity, inimitability, and non-substitutability (Agustia et al., 2021). These resources encompass physical and non-physical assets, competencies, information, and knowledge that enable organizations to achieve their goals effectively (Ulum, 2017).

Intellectual capital plays a vital role in strengthening the competitiveness and performance of banking companies. As an intangible resource, it consists of knowledge, competencies, experience, information, and organizational capabilities that help firms create value and achieve their objectives (Ramadhani & Sulistyowati, 2023). To evaluate intellectual capital, this study applies the Value Added Intellectual Coefficient (VAIC) approach, which is represented by VACA, VAHU, and STVA (Hidayah et al., 2024). These measures reflect the extent to which companies efficiently utilize their capital employed,

human resources, and organizational structures in producing value added (Olawajun & Msomi, 2021).

A body of prior research has explored the relationship between intellectual capital and financial performance; however, the findings remain inconclusive. Previous studies have reported inconsistent results regarding the influence of individual intellectual capital components on financial performance. For example, (Ali et al., 2022) found that Value Added Capital Employed (VACA) positively affects financial performance, whereas (Olawajun & Msomi, 2021) reported no significant effect. Likewise, (Siswanti et al., 2022) documented a positive relationship between Structural Capital Value Added (STVA) and financial performance, while (Zhang et al., 2021) obtained contrasting results. These inconsistencies suggest that the effects of VACA, VAHU, and STVA on financial performance may vary across different contexts and therefore require further investigation.

In addition, several contextual gaps remain in the existing literature. Many previous studies were conducted in different countries or industrial sectors, limiting their applicability to Indonesia's banking industry, which has experienced rapid digital transformation and increasing competition in recent years. Furthermore, limited empirical evidence specifically focuses on the post-pandemic period. The years 2022–2024 represent a unique phase characterized by economic recovery and accelerated digitalization, which may influence the contribution of intellectual capital to financial performance. Therefore, further research is needed to provide updated evidence regarding the impact of VACA, VAHU, and STVA on the financial performance of banking companies listed on the Indonesia Stock Exchange during the 2022–2024 period.

The rapid digital transformation of Indonesia's banking industry, the limited evidence available for the post-pandemic period, and the inconsistent findings regarding the effects of individual VAIC components provide the main motivation for this research. This study examines the relationship between intellectual capital and the financial performance of banking companies listed on the Indonesia Stock Exchange during the 2022–2024 period. Intellectual capital is represented by VACA, VAHU, and STVA, while financial performance is measured using Return on Assets (ROA). By focusing on Indonesia's banking sector during the post-pandemic era, this study aims to enrich the existing literature and provide updated empirical evidence on the contribution of intellectual capital to the profitability of banking companies.

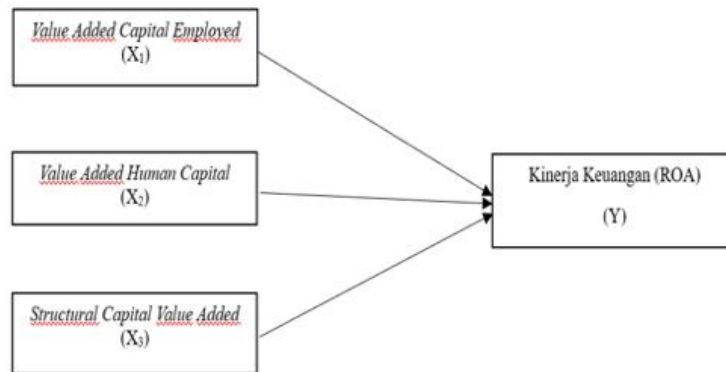
### 1.1 Hypothesis Development

Based on the theoretical framework and previous empirical studies, the hypotheses of this study are formulated as follows:

H1: Value Added Capital Employed (VACA) affects financial performance.

H2: Value Added Human Capital (VAHU) affects financial performance.

H3: Structural Capital Value Added (STVA) affects financial performance.



**Figure 1.** Conceptual Framework

## 2. RESEARCH METHOD

This study employed a quantitative approach to examine the effect of intellectual capital on the financial performance of banking companies listed on the Indonesia Stock Exchange during the 2022-2024 period. The population consisted of 47 listed banks, from which 40 companies were selected using purposive sampling based on predetermined criteria (Sugiyono, 2023). As a result, a total of 120 firm year observations were included in the analysis.

The study utilized secondary data obtained from annual reports and financial statements. Financial performance was measured using ROA, while intellectual capital was represented by VACA, VAHU, and STVA. The operational definitions of the variables are presented in Table 1.

**Table 1.** Variable Measurement

| Variable                  | Indicator                                                                                                                                                                                                                                         |
|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Y (Financial Performance) | $ROA = \frac{\text{Net Income}}{\text{Total Assets}} \times 100\%$                                                                                                                                                                                |
| X1 (VACA)                 | $VACA = VA/CE$ <p>Notes:<br/>           Value Added (VA) = Output (Total Revenue and Other Income) – Input (Operating Expenses and Other Operating Expenses, excluding Employee Expenses)<br/>           Capital Employed (CE) = Total Equity</p> |
| X2 (VAHU)                 | $VAHU = VA/HC$ <p>Notes:<br/>           Human Capital (HC) = Employee Expenses</p>                                                                                                                                                                |
| X3 (STVA)                 | $STVA = SC/VA$ <p>Notes:<br/>           Structural Capital (SC) = VA-HC</p>                                                                                                                                                                       |

**Source:** Data Processed, 2026

The data were analyzed using panel data regression with the assistance of EViews 13 software. The appropriate estimation model was determined through the Chow, Hausman, and Lagrange Multiplier tests. Hypothesis testing was conducted using the coefficient of determination ( $R^2$ ), F-test, and t-test. The F-test was used to examine the simultaneous effect of the independent variables on financial performance, while the t-test was used to assess their individual effects. The regression model is specified as follows:

$$ROA_{it} = \alpha + \beta_1 VACA_{it} + \beta_2 VAHU_{it} + \beta_3 STVA_{it} + \varepsilon_{it}$$

### 3. RESULTS AND DISCUSSION

#### 3.1 Descriptive Statistics

Descriptive statistical analysis was used to examine the general characteristics of the variables included in this study. The results, based on 120 observations, are presented in Table 2.

**Table 2.** Descriptive Statistic

| Variable                     | Mean     | Minimum  | Maximum  | Std. Dev |
|------------------------------|----------|----------|----------|----------|
| Financial Performance<br>(Y) | 1.777750 | 0.040000 | 11.43000 | 1.622145 |
| VACA (X1)                    | 0.190017 | 0.012000 | 0.544000 | 0.118520 |
| VAHU (X2)                    | 2.722700 | 1.039000 | 13.88400 | 1.627272 |
| STVA (X3)                    | 0.576817 | 0.038000 | 5.781000 | 0.523570 |

**Source:** Data processed using EViews 13 (2026)

Table 2 presents the descriptive statistics of the research variables based on 120 observations. Financial Performance (ROA) has a mean value of 1.777750, while the mean values of VACA, VAHU, and STVA are 0.190017, 2.722700, and 0.576817, respectively. These findings suggest that banking companies utilized intellectual capital components to support value creation and operational performance. Among the three components, VAHU exhibits the highest average value, indicating the prominent role of human capital in the banking industry.

#### 3.2 Model Selection Tests

A series of model selection procedures were conducted to identify the most appropriate panel data regression model. These procedures included the Chow test and Hausman test, the results of which are presented in Table 3.

**Table 3.** Results of Panel Data Model Selection Tests

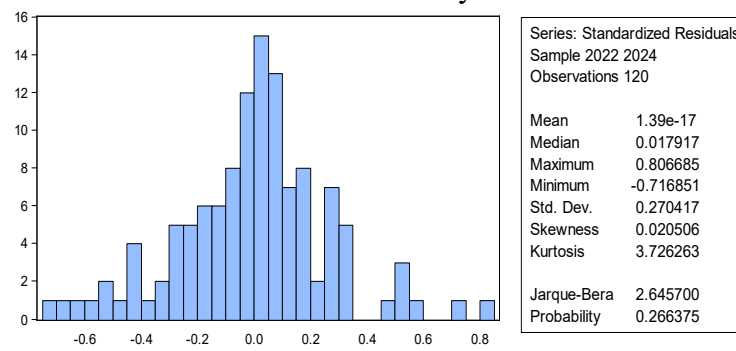
| Model        | Prob.  | Selected Model |
|--------------|--------|----------------|
| Chow Test    | 0.0000 | FEM            |
| Hausman Test | 0.0000 | FEM            |

**Source:** Data processed using EViews 13 (2026)

Based on the outcomes of the model selection tests, namely the Chow test, Hausman test, and Lagrange Multiplier test, the Fixed Effect Model (FEM) was chosen as the preferred panel data estimation model for this study.

### 3.3 Normality Test

**Table 4.** Normality Test



**Source:** Data processed using EViews 13 (2026)

As reported in Table 4, the Jarque-Bera test produced a probability value of 0.266375, which is greater than 0.05. This finding indicates that the residuals follow a normal distribution, suggesting that the normality assumption of the panel data regression model has been fulfilled.

### 3.4 Multicollinearity Test

**Table 5** Multicollinearity Test.

|           | VACA (X1) | VAHU (X2) | STVA (X3) |
|-----------|-----------|-----------|-----------|
| VACA (X1) | 1.000000  | 0.413602  | 0.476383  |
| VAHU (X2) | 0.413602  | 1.000000  | 0.795647  |
| STVA (X3) | 0.476383  | 0.795647  | 1.000000  |

**Source:** Data processed using EViews 13 (2026)

As shown in Table 5, the correlation coefficients among the independent variables range from 0.413602 to 0.795647. Since all values are below the threshold of 0.90, no serious multicollinearity issue is detected. Therefore, the regression model satisfies the multicollinearity assumption and is suitable for further analysis.

### 3.5 Heteroscedasticity Test

**Table 6.** Heteroscedasticity Test

|                                                      |          |                     |        |
|------------------------------------------------------|----------|---------------------|--------|
| Heteroskedasticity Test: Glejser                     |          |                     |        |
| Obs*R-squared                                        | 4.939538 | Prob. Chi-Square(3) | 0.1763 |
| <b>Source:</b> Data processed using EViews 13 (2026) |          |                     |        |

Table 6 shows that the Obs\*R-squared probability value from the Glejser test is 0.1763, exceeding the 0.05 threshold. Thus, no heteroskedasticity issue is detected, and the regression model satisfies the homoscedasticity assumption.

### 3.6 Coefficient of Determination ( $R^2$ )

**Table 7.** Coefficient of Determination ( $R^2$ )

|                    |           |
|--------------------|-----------|
| R-squared          | 0.934740  |
| Adjusted R-squared | 0.899144  |
| S.E. of regression | 0.336172  |
| Sum squared resid  | 8.701887  |
| Log likelihood     | -12.83551 |
| F-statistic        | 26.25953  |
| Prob(F-statistic)  | 0.000000  |

**Source:** Data processed using EViews 13 (2026)

Table 7 shows an Adjusted R-squared value of 0.899144, indicating that 89.91% of the variation in ROA can be explained by VACA, VAHU, and STVA. Meanwhile, the remaining 10.09% is attributable to other factors not included in the research model.

### 3.7 F-Test

According to Table 7, the Prob. (F-statistic) value is 0.000000, which is lower than the 0.05 significance threshold. This result demonstrates that VACA, VAHU, and STVA jointly have a significant effect on ROA. Thus, the model confirms that the intellectual capital components collectively contribute to variations in financial performance.

### 3.8 t-test

**Table 8.** Hypothesis Testing (t-test)

| Variable  | Coefficient | Std. Error | t-Statistic | Prob.  | Conclusion      |
|-----------|-------------|------------|-------------|--------|-----------------|
| VACA (X1) | -0.051636   | 0.137182   | -0.376405   | 0.7077 | Not Significant |
| VAHU (X2) | 0.486700    | 0.226014   | 2.153408    | 0.0344 | Significant     |
| STVA (X3) | 0.420252    | 0.128427   | 3.272307    | 0.0016 | Significant     |

**Source:** Data processed using EViews 13 (2026)

Based on Table 8, the t-test results indicate that VAHU and STVA have a significant effect on ROA, while VACA does not significantly affect ROA. Therefore, H2 and H3 are accepted, whereas H1 is rejected.



## Discussion

### **The Effect of Value Added Capital Employed (VACA) on Financial Performance**

The results indicate that VACA does not have a significant effect on ROA in banking companies listed on the Indonesia Stock Exchange during the 2022–2024 period. This finding suggests that the efficiency of capital employed was not a major determinant of profitability throughout the observation period. Although the banking industry is subject to strict capital regulations, including the Core Capital-Based Bank Group (KBMI) framework established under Financial Services Authority Regulation No. 12/POJK.03/2021, a higher level of capital does not automatically lead to improved financial performance (POJK, 2021). In the banking sector, capital employed primarily functions as regulatory capital intended to maintain financial stability, support risk management, and comply with minimum capital requirements. Therefore, the availability of larger capital resources does not necessarily translate into higher profitability or improved ROA.

This finding is further supported by the descriptive statistics, which show a gradual decline in the average VACA value during the study period. The finding indicates that capital employed was not the primary determinant of ROA during the observation period. Instead, the contribution of capital to profitability depends on the bank's ability to perform its intermediation function efficiently, allocate funds to productive assets, and maintain asset quality. If capital is not accompanied by effective lending activities and prudent risk management, increases in capital employed may not significantly improve financial performance.

From the perspective of Resource Based Theory, competitive advantage is derived not merely from the possession of resources but from a firm's ability to utilize those resources effectively to create value (Ramadhani & Sulistyowati, 2023). In the banking industry, profitability is influenced by various factors beyond capital employed, including operational efficiency, technological capabilities, business processes, knowledge management, and innovation (Panjaitan et al., 2025). Therefore, without efficient intermediation activities and effective asset management, physical and financial capital alone may be insufficient to enhance financial performance. The results of this study are in line with previous findings indicating that VACA does not have a significant effect on ROA (Siswanti et al., 2022).

### **The Effect of Value Added Human Capital (VAHU) on Financial Performance**

The results indicate that VAHU positively and significantly affects ROA, suggesting that human capital plays a crucial role in improving the financial performance of banking companies. This finding implies that employees represent valuable organizational assets whose knowledge, expertise, competencies, and experience contribute to the creation of value within the company. Effective utilization of human capital can enhance operational efficiency, encourage innovation, and support better managerial decisions, ultimately leading to higher profitability. Furthermore, VAHU exhibits a stronger explanatory power



than other intellectual capital components, indicating that the success of banking firms is highly dependent on their ability to manage and develop human resources effectively.

This result is particularly relevant to the banking industry during the 2022-2024 period, which experienced rapid digital transformation in the post-pandemic era. The increasing adoption of digital banking services required companies not only to invest in technology but also to develop employees capable of utilizing and managing technological innovations effectively. Competent human resources can improve service quality, increase operational efficiency, and strengthen organizational adaptability in a dynamic business environment. As a result, investments in human capital become an important factor in generating value added and enhancing profitability (Hidayah et al., 2024)

The findings also support Resource Based Theory, which emphasizes that sustainable competitive advantage originates from resources that are valuable, rare, difficult to imitate, and non-substitutable (Agustia et al., 2021). In this regard, human capital represents a strategic organizational asset that contributes to long-term performance through employees' expertise, experience, and innovative capabilities. The results of this study are consistent with previous research conducted by Olarewaju and Msomi (2021), Zhang et al. (2021), Ali et al. (2022), Siswanti et al. (2022), and Sutjipto and Hadi (2024), all of which reported a positive relationship between VAHU and Return on Assets (ROA).

### **The Effect of Structural Capital Value Added (STVA) on Financial Performance**

The results indicate that STVA has a positive and significant effect on ROA, suggesting that structural capital contributes substantially to the financial performance of banking companies. This finding implies that well-developed organizational systems, procedures, technology, and infrastructure can support value creation and improve profitability. By enhancing operational efficiency and facilitating the effective use of organizational resources, structural capital helps companies achieve better financial outcomes.

The positive effect of STVA suggests that organizational success is determined not only by employees' capabilities but also by the supporting systems and infrastructure available within the company. In the banking industry, information technology, internal control mechanisms, standardized procedures, and organizational culture are essential for improving service quality, accelerating operational processes, and minimizing operational risks (Olarewaju & Msomi, 2021). The increasing adoption of digital banking services, including mobile banking and internet banking, has further emphasized the importance of structural capital in maintaining efficiency and competitiveness within the industry (Sulistyowati et al., 2026).

From the perspective of Resource Based Theory, sustainable competitive advantage can be achieved through the effective utilization of strategic resources that support

organizational performance (Agustia et al., 2021). Structural capital serves as a critical organizational resource by facilitating knowledge management, integrating business processes, and supporting consistent operational activities. Therefore, companies with well-developed structural capital are more likely to achieve superior financial outcomes. This finding is in line with previous studies conducted by Olarewaju and Msomi (2021), Ali et al. (2022), and Siswanti et al. (2022), which also reported a positive effect of STVA on Return on Assets (ROA).

#### 4. CONCLUSION

The findings of this study indicate that VACA does not have a significant effect on ROA, suggesting that the efficiency of capital employed was not a major determinant of financial performance among banking companies during the observation period. In contrast, VAHU and STVA have positive and significant effects on ROA, indicating that effective management of human capital and structural capital contributes to value creation and profitability improvement.

Overall, the results highlight the importance of intellectual capital in supporting the financial performance of banking companies. Among the components of intellectual capital, VAHU and STVA contribute more substantially to ROA than VACA. These findings imply that bank management should place greater emphasis on developing employee competencies, strengthening organizational systems, and enhancing technological infrastructure to improve profitability and sustain competitive advantage. For investors, the results suggest that intellectual capital, particularly human capital and structural capital, may serve as important considerations when evaluating the long-term performance potential of banking companies. For regulators, the findings underscore the importance of policies that support human resource development, innovation, and digital transformation within the banking sector to enhance industry competitiveness and resilience. Furthermore, the findings suggest that the success of digital transformation in the banking sector depends not only on capital availability but also on the effective management of human capital and structural capital.

This study is limited to banking companies listed on the Indonesia Stock Exchange during the relatively short observation period of 2022–2024 and uses Return on Assets (ROA) as the sole proxy for financial performance. In addition, the analysis focuses only on VACA, VAHU, and STVA without considering other factors that may influence financial performance, such as firm size, leverage, and other firm-specific characteristics. Therefore, future studies are encouraged to extend the observation period, employ alternative measures of financial performance such as ROE, NIM, or Tobin's Q, and incorporate additional explanatory variables to provide more comprehensive evidence regarding the relationship between intellectual capital and corporate performance.

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