The Role of Financial Technology and Intellectual Capital in Improving Bank Performance in the Digital Era

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ABSTRACT

The rapid evolution of financial technology (fintech) and the strategic role of Intellectual Capital (IC) have transformed the banking sector, State-owned Enterprises banks in Indonesia. This study aims to examine the individual and combined effects of fintech and IC on the financial performance of State-owned Enterprises banks from 2021 to 2023. Employing panel data regression analysis with 30 observations from five State-owned Enterprises banks, the research measures fintech via mobile banking transaction volume and IC through Value Added Human Capital (VAHU), Structural Capital Value Added (SCVA), and Value-Added Capital Employed (VACA), with Return on Assets (ROA) as the performance indicator. Results indicate that fintech has no significant impact on ROA, while VAHU significantly enhances financial performance. SCVA and VACA show no notable effects. Collectively, fintech and IC significantly influence performance. These findings underscore the importance of optimizing human capital and strategically integrating fintech to boost efficiency and competitiveness, offering valuable insights for state-owned enterprises banks' strategic planning and policy development in a digital era.

Keywords: *Financial Technology; Intellectual Capital; Financial Performance; State-Owned Banks*

ABSTRAK

Perkembangan pesat teknologi finansial (fintech) dan peran strategis modal intelektual (IC) telah mengubah sektor perbankan, khususnya bank-bank milik negara (BUMN) di Indonesia. Penelitian ini bertujuan untuk menguji pengaruh fintech dan IC secara individual dan gabungan terhadap kinerja keuangan bank-bank BUMN tahun 2021 hingga 2023. Dengan menggunakan analisis regresi data panel dengan 30 observasi dari lima bank BUMN, penelitian ini mengukur fintech melalui volume transaksi mobile banking dan IC melalui Value Added Human Capital (VAHU), Structural Capital Value Added (SCVA), dan Value Added Capital Employed (VACA), dengan Return on Assets (ROA) sebagai indikator kinerja. Hasil penelitian menunjukkan bahwa fintech tidak memiliki dampak signifikan terhadap ROA, sedangkan VAHU secara signifikan meningkatkan kinerja keuangan. SCVA dan VACA tidak menunjukkan pengaruh yang nyata. Secara kolektif, fintech dan IC secara signifikan mempengaruhi kinerja. Temuan ini menggarisbawahi pentingnya mengoptimalkan sumber daya manusia dan mengintegrasikan fintech secara strategis untuk meningkatkan efisiensi dan daya saing, menawarkan wawasan berharga bagi perencanaan strategis dan pengembangan kebijakan bank BUMN di era digital.

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INTRODUCTION

A country's economic stability is primarily supported by the financial industry, which serves as a strategic component. Its role extends beyond the facilitation of daily financial transactions and the provision of payment services to encompass capital mobilisation and investment financing. Banks play a substantial role in the regulation of inflation and the establishment of sustainable economic growth (Ledhem & Mekidiche, 2020). State-owned banks are the primary contributors to the national economy in Indonesia. State-owned banks possessed 45.69% of the banking industry's assets, with a total value of IDR 4,728.43 trillion, as of December 2022 (OJK, 2024). This figure significantly exceeds that of national private banks and regional development banks. These assets' dominance serves as confirmation of the primary role of state-owned institutions in Indonesia's economic development and stability.

State-owned banks are confronted with significant financial performance challenges that are influenced by a variety of internal and external factors, despite their significant contributions (Supriyadi et al., 2023). Financial performance of a bank is evaluated by its operational efficacy and profitability, which can be analysed using ratios such as Return on Assets (ROA) and Return on Equity (ROE). The profitability of state-owned banks has increased, as evidenced by the OJK report for 2021-2022 (OJK, 2024). Specifically, ROA and ROE have increased by 3.19% and 24.11%, respectively. On the other hand, labour costs also increased by 2.92%, suggesting that operational efficiency is under pressure. In this scenario, state-owned banks must adopt a strategic approach to ensure that they maintain a balance between operational efficiency and profitability.

Financial technology has emerged as a new competitor in the financial sector, as the challenges have become increasingly complex due to the development of information technology (Kumalasari & Farida, 2024; Lestari & Rahmanto, 2021; Sari & Hadyarti, 2024). Fintech, which provides technology-based services, has successfully captured market share that has previously been within the banking sector (Broby, 2021). According to the OJK (2024) report, Indonesia is home to over 101 licensed fintech ventures that provide swift, effortless, and effective financial solutions. These services significantly disrupt traditional banking business models, compelling banks to innovate through the digitalisation of banking services, including e-banking, internet banking, and mobile banking. The value of digital banking transactions in April 2023 reached IDR 4.3 quadrillion, a 158% increase from 2018. Nevertheless, state-owned banks are still obligated to optimise human resources, increase productivity, and maintain efficiency as the primary capital in the digitalisation era, despite the adoption of this technology.

Intellectual capital (IC) plays a pivotal role in boosting the financial performance of state-owned banks, as highlighted by Soewarno and Tjahjadi (2020). IC encompasses human capital (HC), structural capital (SC), and employed capital (CA), which collectively foster competitive advantage and create substantial value for organizations (Pigola et al., 2022). Effective management of IC drives organizational innovation, enhances operational efficiency, and boosts productivity, enabling banks to thrive in dynamic markets (Zahedi & Naghdi Khanachah, 2021). Ozgun et al. (2022) emphasize that robust IC positively influences financial outcomes, suggesting that banks with strong IC are better equipped to compete and excel. However, conflicting findings by Alia et al. (2022) reveal a significant negative correlation between IC and financial performance, particularly when measured by return on assets (ROA). This discrepancy raises critical questions about the true impact of IC on state-owned banks in Indonesia, especially amidst intensifying competition driven by financial technology advancements. The inconsistent findings underscore the need for deeper investigation into how IC can be optimized to strengthen financial performance in this rapidly evolving digital landscape,

offering valuable insights for strategic planning and policy development in the banking sector.

These inconsistent findings highlight a critical research gap that this study aims to address. Unlike Soewarno and Tjahjadi (2020), who employed a cross-sectional approach to examine IC's impact on Indonesian banking firms without distinguishing between state-owned and private banks, this study focuses exclusively on state-owned banks, which dominate Indonesia's financial sector with unique regulatory and economic roles. Additionally, while Alia et al. (2022) investigated IC's effect on Islamic banks using a single composite IC measure, this research disaggregates IC into its components—Value Added Human Capital (VAHU), Structural Capital Value Added (SCVA), and Value-Added Capital Employed (VACA)—and integrates fintech, measured by mobile banking transaction volume, as a distinct variable. This simultaneous analysis of fintech and IC components is rare in prior studies, which often examined these factors in isolation (e.g., Phan et al., 2020). Furthermore, the study's panel data regression approach, covering 2021–2023, captures the post-pandemic digital banking surge, a context underexplored in earlier research. By combining these elements, this study provides a nuanced understanding of how fintech and IC drive financial performance in state-owned enterprises banks during a transformative period.

This study endeavours to investigate the impact of intellectual capital on the financial performance of state-owned institutions in Indonesia, taking into account the aforementioned context. The objective of this investigation is to investigate the extent to which the optimisation of IC can enhance the operational efficiency and profitability of banks in the context of rising labour costs and technological disruption. This research is anticipated to offer theoretical contributions by enhancing comprehension of the correlation between intellectual capital (IC) and financial performance. Additionally, it will offer practical advice to state-owned banks on how to develop intellectual capital-based strategies to ensure the sustainability and competitiveness of their businesses in the digital era. This research is of great significance in that it can serve as a reference for state-owned bank management in the optimisation of intangible resources to enhance financial performance. Furthermore, the findings of this investigation are also beneficial to regulators, including OJK and Bank Indonesia, as they develop policies that foster the expansion of the role of state-owned banks in the context of evolving financial industry dynamics. Consequently, this research provides practical solutions for state-owned banks to maintain their stability and contribute to national economic development, in addition to contributing to the development of economic and management theory.

LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

Banking Financial Performance in the Lens of Digital Transformation

The financial performance of banks involves a systematic evaluation of their efficiency and effectiveness in generating profits, as well as their liquidity status over a specified timeframe. This performance indicates the bank's financial condition, encompassing the collection and distribution of funds through various operational activities that underpin the bank's sustainability and development (Syahwildan & Damayanti, 2022). Bank financial performance is traditionally assessed through key indicators including capital adequacy, liquidity, and profitability, which reflect the institution's capacity to manage its resources concerning assets and liabilities (Nurjanah & Prasetyo, 2024; Phan et al., 2020). The rapid digital transformation in the banking industry has altered the management of financial performance through the use of technology. Digitalisation through the implementation of information technology, big data, artificial intelligence (AI), and digital payment systems enables banks to lower operational costs, enhance transaction efficiency, and expedite precise data-driven decision-making, thereby influencing the assessment of bank financial performance.

The primary metrics for assessing bank profitability are Return on Assets (ROA), Return on Equity (ROE), Operating Profit Margin (OPM), and Net Interest Margin (NIM) (Sapitri, 2023). In the context of digitalisation, each indicator can be significantly

influenced. Return on Assets (ROA) assesses the effectiveness and efficiency of banks in utilising assets to generate profits, and it may improve with the implementation of technology that enhances asset utilisation. Digital banking systems enhance transaction speed and minimise reliance on physical infrastructure, thereby enabling banks to optimise asset productivity. ROE, an indicator of a bank's capacity to generate profits from its capital, may rise with the adoption of technology that lowers operating costs, enhances digital marketing, and offers improved insights into customer behaviour via data analysis and AI. Operating Profit Margin (OPM), a metric that evaluates operating profit relative to net sales, can be affected by digitalisation.

The implementation of digital platforms, including mobile banking and cloud-based customer management systems, has the potential to lower operating costs and enhance profit margins. NIM, which assesses a bank's capacity to generate profits from interest income, can be enhanced through the implementation of technology for more efficient management of loan and savings portfolios, utilising data-driven analysis for informed decision-making. The role of digital technology significantly impacts banking financial performance (Nguyen-Thi-Huong et al., 2023). Digitalisation enables banks to enhance operational efficiency, decrease transaction costs, and expedite customer service. This results in enhanced profitability, improved liquidity, and superior risk management. The application of big data and artificial intelligence in assessing customer risk and market trends enables banks to decrease non-performing loans (NPLs) and enhance financial stability (Nasrin Eni et al., 2023). Digital technology enhances banks' financial performance and generates opportunities for sustainable growth, necessitating appropriate adaptation to emerging technologies.

Financial Technology and Financial Performance

Financial Technology encompasses technological advancements aimed at enhancing the efficiency, speed, and affordability of financial services. Technologies including blockchain, digital payment systems, peer-to-peer (P2P) lending, robo-advisors, and the application of big data and artificial intelligence (AI) in financial analysis have transformed interactions between companies and consumers in the financial sector (Sanyaolu et al., 2024). Fintech enhances banking operations by streamlining transaction processes, improving risk management, and creating products that better align with customer requirements. Digital payment technology diminishes reliance on physical infrastructure and enables cross-border transactions with reduced costs (Kumari & Devi, 2022). P2P-based lending services enhance access to funding for individuals and small businesses (Abbasi et al., 2021). Fintech has the potential to enhance banks' financial performance by improving accessibility, lowering operational costs, and developing business models that are more attuned to market demands. Financial performance enhancement via fintech can be assessed using multiple performance indicators, including profitability, liquidity, operational efficiency, and risk management. Fintech enhances profitability by lowering operational costs and implementing innovative, efficient business models. Moreover, the implementation of robo-advisors for client investment management enables banks to decrease personnel expenses and enhance service efficiency (Zhang et al., 2021). Big data enables banks to provide products that are tailored to client needs, which may enhance revenue and foster customer loyalty.

Operational efficiency can be enhanced through the automation of processes that once necessitated manual intervention, exemplified by digital payment systems that lower transaction costs relative to conventional methods. Similarly, the implementation of cloud-based technology enables banks to optimise data and application management, leading to decreased infrastructure costs and enhanced response times (Li et al., 2021). Fintech enhances liquidity by accelerating transaction speeds and facilitating fund management. The implementation of blockchain technology improves transparency and mitigates fraud risk, thereby reinforcing the liquidity position of banks. Furthermore, fintech facilitates risk management through the application of big data and artificial intelligence to assess customer risk profiles, enabling banks to offer more tailored loans

and decrease the incidence of non-performing loans. Fintech has significant potential to enhance the financial performance of institutions through the introduction of operational efficiencies, increased profitability, improved risk management, and strengthened liquidity. Fintech significantly influences banks and generates new opportunities for sustainable growth within the financial industry. Therefore, this study proposed following hypotheses:

H1: Financial Technology has a positive and significant impact on banking financial performance.

Intellectual Capital and Financial Performance

Intellectual Capital (IC) denotes intangible assets that significantly contribute to the provision of knowledge-based resources, thereby enhancing a company's, including banks, performance and competitiveness (Ionita & Dinu, 2021). Intellectual capital encompasses more than just goodwill, patents, or other assets reflected on the balance sheet; it also incorporates broader components such as human skills, customer relationships, innovation, organisational systems, and technological proficiency. This concept indicates that a company's value is reflected not only in its physical assets but also in the knowledge held by individuals, organisations, and external networks associated with it.

Ur Rehman et al. (2022) identifies three primary components of intellectual capital: human capital (HC), structural capital (SC), and capital employed (CA). The three elements function synergistically to generate added value, thereby enhancing organisational performance, particularly within the banking sector. HC denotes the knowledge, skills, experience, and potential that employees within an organisation possess. In the banking context, human capital encompasses the collective capability of employees to devise optimal solutions that enhance efficiency and service quality. Competent and informed employees contribute to the formulation of effective strategies aimed at enhancing financial performance, including the management of credit risk, the development of new products, and the application of technology to enhance customer service (Abd-Elrahman & Ahmed Kamal, 2022).

Human capital encompasses a corporate culture that promotes innovation and ongoing competency development, essential for addressing the challenges of an increasingly competitive market (Liu et al., 2020). SC encompasses the systems, procedures, and organisational structures that underpin the intellectual and operational performance of the company. The banking sector's supply chain encompasses technology infrastructure, information systems, efficient business processes, and managerial policies that enhance decision-making and optimise daily operations. SC encompasses systems that facilitate innovation, knowledge management, and data and information management, which are essential for making data-driven decisions (Xu & Li, 2022). A robust system enables banks to enhance operational efficiency, lower costs, and elevate customer service, thereby positively influencing profitability and liquidity. Capital employed (CA) denotes the total assets utilised by the bank in its operations to generate revenue and profit. CA encompasses fixed assets, working capital, and additional investments that facilitate the bank's operational functions. Efficient management of current assets in the banking industry enhances profitability by optimising the use of available resources (Xu & Li, 2022). Effective utilisation of current assets can maximise income from existing assets, minimise waste, and improve return ratios, including Return on Assets (ROA) and Return on Equity (ROE). Effective management of current assets enables banks to enhance their growth and financial stability, despite challenges posed by technological disruption and rising cost pressures.

Empirical evidence indicates that the role of intellectual capital in banking financial performance is significant (Xu & Li, 2022). Robust human capital enables banks to develop innovative products that address market demands and enhance risk management, thereby improving profitability and financial stability. SC endorses digital transformation

and data utilisation to analyse customer behaviour, thereby enhancing operational efficiency and risk management. Efficient technology minimises transaction costs and expedites operational processes, thereby enhancing profitability and liquidity. Furthermore, effective management of current assets enables banks to utilise their resources efficiently, thereby enhancing financial performance, promoting growth, and bolstering competitive advantage. Effective intellectual capital management enhances operational performance and product development while directly improving financial performance in the banking sector. Thus, this research proposed the following hypotheses:

H2: Human capital has a positive and significant influence on banking financial performance.
H3: Structure capital has a positive and significant influence on banking financial performance.
H4: Employed capital has a positive and significant influence on banking financial performance.

The conceptual framework is depicted in Figure 1 below, illustrating the hypothesized relationships between Fintech, Intellectual Capital components (VAHU, SCVA, VACA), and Financial Performance (ROA). The framework posits that these independent variables collectively and individually influence the financial performance of state-owned banks, with their combined effects amplifying operational efficiency and competitive advantage in a digitalized banking landscape.

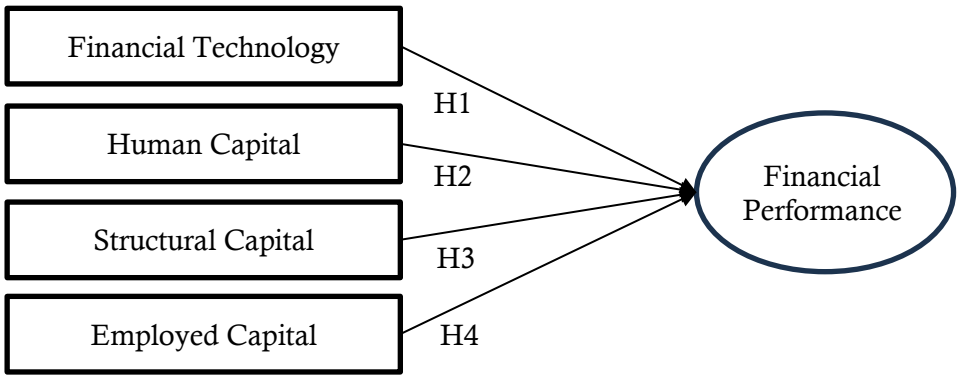

Figure 1. Research Framework

This study is based on the importance of innovation and strengthening intellectual resources in improving the performance of state-owned banks in the digital era. The framework in Figure 1 illustrates the relationship between two independent variables, namely Financial Technology (Fintech) and Intellectual Capital, to one dependent variable, namely state-owned enterprises Bank Performance.

RESEARCH METHODS

This study employs a quantitative research approach to investigate the influence of financial technology (fintech) and intellectual capital (IC) on the financial performance of state-owned banks in Indonesia over the period from 2021 to 2023. The research leverages a panel data regression framework to analyze the relationships between the variables, focusing on a structured and systematic methodology to ensure robust findings. The design is tailored to capture both cross-sectional and time-series variations, allowing for a comprehensive examination of how fintech and IC components drive financial outcomes in a dynamic banking landscape. The study was conducted between December 2023 and March 2024, utilizing secondary data to maintain consistency and reliability in the analysis.

The population for this study comprises all state-owned banks registered with the Financial Services Authority (OJK) in Indonesia. To ensure the relevance and accuracy of the sample, purposive sampling was applied, selecting banks based on two specific criteria: first, the banks must have implemented fintech mobile banking services during the study period (2021–2023); second, they must have published comprehensive financial reports for the same timeframe. Based on these criteria, five state-owned enterprises banks were selected, as they met both requirements. Given that the study spans three years, with each year comprising two semesters, the total number of company observations is calculated as five banks multiplied by two semesters, yielding 10 company samples per year. Over the three-year period, this results in a total of 30 observations (5 banks × 2 semesters × 3 years). This sample size is sufficient to support robust statistical analysis while focusing exclusively on state-owned banks, which play a dominant role in Indonesia's financial sector due to their significant asset base and regulatory importance.

Data collection relied on secondary sources to ensure objectivity and accessibility. The primary data were extracted from the financial reports of the selected state-owned enterprises banks, which are publicly available on the OJK website (www.ojk.go.id) and the respective bank websites. These reports provided detailed information on financial performance metrics, mobile banking transaction volumes, and intellectual capital components. To supplement the financial data, additional sources such as academic journals, books, and official websites were consulted to contextualize the findings and ensure a comprehensive understanding of the variables. The data collection process involved a documentation technique, where financial report data were systematically observed and recorded. To address discrepancies in the units of measurement among variables—particularly the large scale of mobile banking transaction volumes—the volume data were transformed using the Natural Logarithm (LN). This logarithmic conversion was applied to stabilize variance, mitigate excessive fluctuations, and preserve the original data's integrity, as recommended by Diana and Osesoga (2020). This approach ensured that the fintech variable was comparable with financial performance and intellectual capital metrics, facilitating accurate regression analysis.

RESEARCH RESULTS

This study's dependent variable is financial performance, operationalised through the Return on Asset (ROA) ratio. Return on Assets (ROA) indicates a company's capacity to generate net profit through its assets (Mar'atushsholihah & Karyani, 2021). This study selects ROA as a ratio due to its capacity to measure the overall profits generated by the company, thereby serving as an indicator of the bank's effectiveness and internal efficiency in asset utilisation.

Table 1. Descriptive Analysis

Analysis	ROA	FINTECH	VAHU	SCVA	VACA
Mean	2.318	33.593	2.275	0.215	0.531
Median	2.405	33.775	2.240	0.203	0.553
Maximum	4.030	35.963	3.978	0.466	0.749
Minimum	0.680	30.233	1.125	0.091	0.111
Std. deviation	1.005	1.573	0.602	0.085	0.124
Observation	30	30	30	30	30

Table 1 presents an overview of the variables utilised in this study, derived from the results of the descriptive statistical analysis. The financial performance of banks, as indicated by Return on Assets (ROA), ranges from a minimum of 0.680 to a maximum of 4.405. The mean return on assets (ROA) for the 30 companies analysed is 2.318, suggesting that, overall, the companies observed achieved positive profitability during the study period. The standard deviation of 1.005, being less than the maximum ROA value of 4.405, suggests that the variation in ROA data among these companies is relatively low. This indicates a consistent stability in profit performance across the samples. The financial technology variable, indicated by the volume of mobile banking transactions,

has a minimum value of 30.233 and a maximum value of 35.963. The mean volume of mobile banking transactions across 30 companies is 35.593. The standard deviation of 1.573, which is less than the mean value (1.573 < 35.593), suggests a low level of variation in mobile banking transactions among companies, indicating a consistent application of financial technology within the banking sector.

The initial component assessed in relation to Intellectual Capital is Value Added Human Capital (VAHU), which exhibits a minimum value of 1.125 and a maximum value of 3.978. The mean VAHU across 30 companies was measured at 2.275. The standard deviation of 0.602, which is less than the average of 2.275, suggests that the variation in VAHU data among the companies is relatively low, reflecting a degree of consistency in human resource management within the banks analysed. The second component of Intellectual Capital is Value Added Structural Capital (SCVA), with a minimum value of 0.111 and a maximum value of 0.749. The mean SCVA is 0.531, accompanied by a standard deviation of 0.124. A standard deviation value less than the average (0.124 < 0.531) signifies low variation in SCVA data, indicating that the structural and operational support systems across companies are relatively consistent in facilitating financial and operational performance. The final element of Intellectual Capital examined is Value Added Capital Employed (VACA), which ranges from a minimum of 0.091 to a maximum of 0.466. The mean VACA is 0.215, with a standard deviation of 0.084. The standard deviation value of VACA, which is smaller than the average (0.084 < 0.215), indicates a relatively low level of variation in the use of capital optimised to create value among the banks studied. The results of this descriptive statistical analysis offer an overview of the stable trends in financial performance, financial technology implementation, and intellectual capital management within the state-owned banks included in the research samples.

Table 2. Cow Test Result

Effect Test	Statistic	d.f.	Prob.
Cross-section F	9.158182	(4.21)	0.0002
Cross-section Chi-Square	30.287044	4	0.0000

This research began the model selection process by applying the Chow Test to determine the most suitable model between the Common Effect Model and the Fixed Effect Model for the analyzed data. As shown in Table 2, the cross-section chi-square test yielded a p-value of 0.0000, significantly below the 0.05 threshold. This result leads to the rejection of the null hypothesis, which posits that the Common Effect Model is appropriate. Instead, the findings confirm that the Fixed Effect Model, accounting for individual bank variations through varying intercepts, better fits the data, making it the preferred choice for this study's regression analysis.

Table 3. Hausman Test Result

Test Summary	Cross-section random
Chi-Sq. Statistic	36.632726
Chi-Sq. d. f.	4
Prob.	0.0000

This research further utilizes the Hausman Test to determine the most appropriate model between the Fixed Effect Model and the Random Effect Model for panel data analysis. As reported in Table 3, the Hausman Test yields a p-value of 0.0000 for the random cross-section, well below the 0.05 significance threshold. This outcome leads to the rejection of the null hypothesis, confirming the Fixed Effect Model as the more suitable choice. The notably low p-value underscores significant individual differences among the banks, necessitating the use of varying intercepts to capture these variations accurately. Combined with the Chow Test results, which also favored the Fixed Effect Model over the Common Effect Model, the Hausman Test reinforces that the Fixed Effect

Model provides a more precise framework for analyzing inter-bank variations, enhancing the reliability and accuracy of the study's findings on financial performance.

The linear regression analysis of panel data utilising the Fixed Effect Model yields the following regression equation:

ROA = 1,318185 – 0,046713 * FINTECH + 0,839010 * VAHU + 0,629550 * SCVA + 1,515278 * VACA

The regression analysis provides insights into the impact of independent variables on the financial performance of state-owned banks, measured by Return on Assets (ROA). The constant term of 1.318185 indicates that when all independent variables such as fintech, Value Added Human Capital (VAHU), Structural Capital Value Added (SCVA), and Value Added Capital Employed (VACA) are zero, the baseline ROA is 1.318185. The fintech coefficient of -0.046713 reveals a negative relationship, where a 1% increase in fintech activity, measured by mobile banking transaction volume, reduces ROA by 0.046713%, suggesting potential challenges in fintech integration. Conversely, the VAHU coefficient of 0.839010 indicates a positive effect, with a 1% increase in human capital efficiency boosting ROA by 0.839010%. Similarly, the SCVA coefficient of 0.629550 shows that a 1% rise in structural capital efficiency enhances ROA by 0.629550%. The VACA coefficient of 1.515278 reflects a strong positive correlation, where a 1% increase in capital employed efficiency significantly elevates ROA by 1.515278%. These findings highlight that VAHU, SCVA, and VACA substantially enhance financial performance, underscoring the importance of intellectual capital, while fintech's negative impact suggests the need for strategic adjustments to optimize its contribution to ROA.

The partial test results, utilizing the t-test at a 5% significance level, provide a nuanced understanding of the individual impacts of financial technology (fintech) and intellectual capital components on the financial performance of state-owned banks, measured by Return on Assets (ROA) from 2021 to 2023. For fintech, proxied by the natural logarithm of mobile banking transaction volume, the t-count is -0.301861, significantly below the t-table value of 1.70814, with a p-value of 0.7657, exceeding the 0.05 threshold. This indicates that fintech does not significantly influence ROA. The negative coefficient (-0.046713) suggests that increased mobile banking transactions may impose costs (e.g., infrastructure investments or customer acquisition) that outweigh immediate financial benefits. This finding aligns with Ayuningtyas and Sufina (2023), who noted that mobile banking's impact on financial performance is often limited by uneven customer adoption and high implementation costs. The lack of significance may reflect the transitional phase of fintech integration in state-owned enterprises banks, where benefits such as reduced operational costs or enhanced customer reach have not yet fully materialized, necessitating strategic alignment to maximize fintech's potential.

In contrast, Value Added Human Capital (VAHU) demonstrates a significant positive impact on ROA. The t-count of 2.404658 exceeds the t-table value, with a p-value of 0.0255, below 0.05, confirming statistical significance. The coefficient (0.839010) indicates that a 1% increase in human capital efficiency boosts ROA by 0.839%, underscoring the critical role of skilled and innovative employees in driving profitability. This result supports the theory that human capital, as a core component of intellectual capital, fosters innovation and operational efficiency (Abd-Elrahman & Ahmed Kamal, 2022). It is consistent with Alia et al. (2022), who found a positive link between human capital and financial performance in Islamic banks, highlighting the importance of knowledge and creativity in enhancing service quality and risk management. For state-owned enterprises banks, this suggests that investments in employee training and development are pivotal for sustaining competitive advantage in a digitalized banking landscape.

However, Structural Capital Value Added (SCVA) and Value-Added Capital Employed (VACA) do not significantly affect ROA. For SCVA, the t-count of 0.294163 is below the t-table value, with a p-value of 0.7715, indicating no significant impact.

Similarly, VACA yields a t-count of 1.136168 and a p-value of 0.2686, both non-significant. Despite positive coefficients (0.629550 for SCVA and 1.515278 for VACA), these results suggest that organizational systems and capital utilization have limited direct effects on profitability during the study period. This aligns with Heryustitriasputri and Suzan (2019), who found that structural capital's impact on financial performance is often indirect, mediated by operational efficiencies that require longer timeframes to materialize. The non-significant effect of VACA may stem from the capital-intensive nature of state-owned enterprises banks, where large asset bases do not immediately translate into proportional profit gains. These findings imply that state-owned enterprises banks should prioritize refining organizational processes and optimizing asset utilization strategies to enhance their financial impact, while continuing to leverage human capital as a primary driver of performance.

The simultaneous test, conducted via the F-test at a 95% confidence level, reveals a significant collective impact of fintech, Value Added Human Capital (VAHU), Structural Capital Value Added (SCVA), and Value-Added Capital Employed (VACA) on the financial performance of state-owned banks from 2021 to 2023. The F-count of 30.61647 far exceeds the F-table value of 2.76, with a p-value of 0.00000, well below the 0.05 threshold, strongly supporting the alternative hypothesis. This indicates that, together, these variables explain a substantial portion of the variation in ROA, reflecting their synergistic effect on operational efficiency and profitability. The high F-count suggests a robust model fit, capturing the complex interplay between technological adoption and intellectual capital in driving financial outcomes. This finding is consistent with Irfani (2021), who demonstrated that the combined influence of fintech and intellectual capital significantly enhances banking performance by fostering innovation and reducing costs. For state-owned enterprises banks, this underscores the importance of integrating fintech with strong human and structural capital frameworks to achieve sustainable growth in a competitive digital landscape. The result highlights the need for a holistic strategy that aligns technological investments with human capital development and efficient asset management to maximize financial performance.

The determination test produced an Adjusted R-squared value of 0.890949, or 89.09%, indicating that fintech, Value Added Human Capital (VAHU), Structural Capital Value Added (SCVA), and Value-Added Capital Employed (VACA) explain 89.09% of the variance in the financial performance of state-owned banks from 2021 to 2023. The remaining 10.91% is attributed to other factors not included in this model, highlighting the significant explanatory power of these variables.

DISCUSSION

This section evaluates the research findings from regression and simultaneous tests to test the study's hypotheses, focusing on the influence of financial technology (fintech) and intellectual capital (IC) on the financial performance of state-owned banks from 2021 to 2023. Utilizing panel data, the study analyzes three key intellectual capital components Value Added Human Capital (VAHU), Structural Capital Value Added (SCVA), and Value-Added Capital Employed (VACA) alongside fintech, measured by mobile banking transaction volume. The regression and simultaneous test results are scrutinized to determine each variable's effect on financial performance, with Return on Assets (ROA) as the primary metric. This analysis clarifies how fintech and IC components individually and collectively drive bank profitability, offering insights into their strategic importance for enhancing operational efficiency and competitiveness in a rapidly evolving financial landscape.

This analysis seeks to deepen insights into how financial technology (fintech) and intellectual capital influence the financial performance of state-owned banks, the primary focus of this study. By evaluating each hypothesis against the study's findings and relevant prior research, this discussion clarifies their implications. Specifically, the study examines the relationship between fintech, measured by mobile banking transaction volume, and financial performance, assessed via Return on Assets (ROA). Panel data regression

analysis reveals a t_count of -0.301861 for fintech's effect, compared to a t_table value of 1.70814 at a 0.05 significance level. Since t_count (-0.301861) is less than t_table and the p-value (0.7657) exceed 0.05, fintech does not significantly impact the financial performance of state-owned enterprises banks from 2021 to 2023. This result aligns with Ayuningtyas and Sufina (2023), who found that mobile banking similarly lacks a significant effect on financial outcomes. The limited impact may stem from uneven adoption of mobile banking among state-owned bank customers, leading to insufficient revenue generation to substantially boost profits. These findings suggest that strategic enhancements in fintech implementation are needed to maximize its potential contribution to financial performance.

This study investigates the relationship between intellectual capital and the financial performance of state-owned banks from 2021 to 2023, focusing on Value Added Human Capital (VAHU), Structural Capital Value Added (SCVA), and Value-Added Capital Employed (VACA). Regression analysis reveals that VAHU significantly impacts financial performance, with a t_count of 2.404658 exceeding the t_table value of 1.70814 at a 0.05 significance level, and a p-value of 0.0255 below 0.05. This indicates that effective human capital management, by optimizing labor costs, enhances employees' knowledge, skills, and creativity, thereby improving workforce quality and boosting Return on Assets (ROA). This finding aligns with Alia et al. (2022), who also reported a significant positive effect of VAHU on ROA, underscoring the critical role of human resources in driving bank profitability.

Conversely, the analysis for SCVA shows no significant impact on financial performance. The t_count for SCVA is 0.294163, below the t_table value of 1.70814, with a p-value of 0.7715 exceeding 0.05. This suggests that SCVA, which reflects organizational processes and systems, does not meaningfully contribute to ROA. The lack of impact may be attributed to the organizational structures of B state-owned enterprises UMN banks during this period, which failed to adequately support employee productivity, thus limiting financial gains. This result is consistent with Heryustitriasputri and Suzan (2019), who similarly found that SCVA had no significant effect on ROA. These findings highlight the need for state-owned banks to strengthen structural capital frameworks to better support operational efficiency and financial performance, while continuing to prioritize human capital development.

The simultaneous testing, conducted via an F-test, reveals a significant collective impact of financial technology (fintech), Value Added Human Capital (VAHU), Structural Capital Value Added (SCVA), and Value-Added Capital Employed (VACA) on the financial performance of state-owned banks from 2021 to 2023. The F_count value of 30.61647 surpasses the F_table value of 2.76, with an F-statistic p-value of 0.00000, well below the 0.05 threshold, confirming a statistically significant joint effect. This suggests that banks leveraging robust intellectual capital alongside advanced fintech achieve enhanced operational efficiency and improved financial outcomes, as measured by Return on Assets (ROA). These results are consistent with Irfani (2021), who found that fintech and intellectual capital components—VAHU, SCVA, and VACA—collectively exert a positive and significant influence on banking performance. While fintech alone lacks a significant direct impact, the intellectual capital component, particularly VAHU, drives financial performance. The synergy between fintech and intellectual capital fosters operational efficiencies, enabling state-owned enterprises banks to strengthen competitiveness and financial sustainability in a dynamic market, highlighting the importance of integrating technological and human capital strategies

CONCLUSION

The conclusion shows that VAHU significantly improves financial performance, confirming the important role of human capital in driving operational efficiency and profitability. Skilled, innovative, and motivated employees—as reflected in VAHU—contribute significantly to value creation. This suggests that investment in employee training, knowledge development, and creativity is essential for state-owned banks to

remain competitive in the evolving financial landscape. In contrast, fintech as measured by mobile banking transaction volume does not have a significant effect on ROA. This absence of influence could be due to uneven adoption among customers or lack of strategic integration, suggesting that while fintech has transformative potential, its benefits have not been fully realized in state-owned banks. Similarly, SCVA and VACA do not show a significant effect on financial performance, indicating that organizational systems and capital used, while important, do not directly drive profitability in this context. However, simultaneous testing through the F-test confirms that fintech and IC components collectively have a significant impact on ROA. Theoretically, this study enriches the understanding of how human capital drives banking performance, while highlighting the limited direct impact of fintech, opening up opportunities to explore barriers to its adoption. In practice, state-owned banks are advised to prioritize human capital development through targeted training and innovation programs to improve VAHU, and strategically enhance fintech integration to expand customer reach and operational efficiency. The insignificant effects of SCVA and VACA suggest the need to optimize organizational processes and capital management to support financial goals more effectively. Despite making important contributions, this study has limitations, including focusing only on state-owned banks, which may limit the generalizability of the results to the private or international banking sector. In addition, fintech is only measured through mobile banking transaction volume, without including other technologies such as artificial intelligence or blockchain. Future research could include private banks, explore a wider range of fintech applications, and examine additional factors such as digital transformation or big data analytics. Examining the relationship between structural capital and capital employed across industries could also shed light on its role in organizational success. These findings provide a basis for state-owned banks to refine their strategies, optimize intangible resources, and navigate the digital era effectively, as well as contribute to academic discourse and policy development in the Indonesian banking sector.

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