Does financial technology moderate the relationship between intellectual capital and company performance? Empirical study in Indonesian banking

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Abstract
This study aims to examine whether financial technology moderates the relationship between intellectual capital and firm performance. Using secondary data obtained from the Indonesian stock exchange with a sample of banking companies listed on the Indonesian stock exchange. The dataset comprises a total of 230 observations. A panel datarandom effect regression model is applied to analyze the data. This study shows that intellectual capital moderated by financial technology has a significant and insignificant effect on company performance. However, overall, the average based on a prob>chi2 value of <0.05 indicates a significant positive result on the performance of banking companies in Indonesia during the 2018-2022 observation year. This research examines the importance of human resources and other intangible assets in achieving competitive advantages and enhancing company performance. Specifically, it explores the role of financial technology in addressing the challenges posed by complex competition within the financial sector, with a particular focus on the banking industry. Many studies confirm the importance of intellectual capital to improve company performance, as well as the importance of utilizing increasingly sophisticated financial technology that can affect company performance. However, to the researcher's knowledge, there has been no research linking intellectual capital with company performance moderated by financial technology. In addition, there is no research that measures company performance using various aspects such as accounting-based performance and market-based performance.
Keywords: Intellectual capital, Financial technology, Company performance, Indonesian banking.

1. Introduction

Era Society 5.0 has created a transformation in the financial industry, especially the banking sector. According to a survey conducted by the Bank Indonesia, there is a consistent upward trend in credit growth over successive years. In 2020, the estimated rate of growth stands at 2.5%, in 2021 it will increase to 6.0%. By the year 2022, the growth rate is expected to reach 9.2%, indicating a notable increase of 5.2% in comparison to the preceding year. This makes the banking sector one of the sectors that supports economic growth in Indonesia. Regardless of its contribution, it is expected that banking sector will experience many challenges in 2023, including the issue of a lack of quality human resources, human resources, or intellectual capital that is inherent in banking companies. Therefore, the bank does not only focus on physical assets but also data that supports the analysis of intangible assets including expertise, technology, and intellectual capital knowledge in improving company performance (Aljuboori et al., 2022; Chowdhury et al., 2019; Hermawan et al., 2021; Nishanthini, 2021; Poh et al., 2018; Scafarto et al., 2016; Smriti & Das, 2017; Vishnu & Gupta, 2014). Intellectual capital is also recognized as a strategic intangible asset in improving company performance (Bayraktaroglu et al., 2019; M. H. Do et al., 2022; L. Liu et al., 2022; Mehri et al., 2013; Öner et al., 2021; Smriti & Das, 2017; Tran et al., 2022; Weqar et al., 2020).

Intellectual capital has become a major concern for academic researchers and practitioners because it is considered an essential part of the company. Companies that apply intellectual capital have their equity attractiveness for shareholders and enable companies to have competitive advantages and superior performance (Bontis et al., 2015; Gómez-Valenzuela, 2022; Naidenova & Parshakov, 2013; Sanyaolu et al., 2022; Sardo & Serrasqueiro, 2018). Several corporate strategies have considered and emphasized the importance of using intellectual capital (Inkinen, 2015; Molodchik et al., 2014; Pangestuti et al., 2022; Radic, 2018; Suharman et al., 2022; Tarighi et al., 2022).

According to Kianto et al. (2013), systematic intellectual capital management affects company performance based on data collected from companies in Finland, Russia, and China. Ahmed et al. (2022); Dadashinasab & Sofian (2014); Hapsah & Bujang, (2019) show that the effects of intellectual capital efficiency, human capital, structural capital, and relational capital efficiency are positively related to company performance. Alfonso & Giovani, (2021) Smriti & Das (2018) also show that structural capital efficiency and capital efficiency are equally important to market growth and company performance.

Akhunjonov (2019); Al-musali et al. (2014); Angi et al. (2023); Ghofur (2020); Iazzolino et al. (2019); Nguyen et al. (2023); Nishanthini (2021); Pietrantonio (2014); Poh et al. (2018); Tasawar (2019); Tong & Saladrigues (2023); Ubaidillah (2023); Weqar et al. (2020); Xu & Li (2019) confirm that intellectual capital affects company performance. However, it is important to note that there are also studies, such as those conducted by (Andriana (2014); Kusuma et al. (2021); Lestari et al. (2013), which argue that the intellectual capital model does not have a discernible effect on company performance. Thus, it is crucial to expand the existing literature by examining other variables related to intellectual capital and company performance, including financial technology.

Several studies have examined the effect of financial technology on company performance (Almashhadani & Almashhadani, 2023; Baker et al., 2023; Chen et al., 2021; Gyamera et al., 2023; M. S. Hassan et al., 2023; Le et al., 2021; Y. Liu et al., 2021; Mugane & Ondigo, 2016; Muthaura et al., 2021; Ogbuji et al., 2020; Oluwasegun et al., 2021; Siska, 2022; Ubaidillah, 2023; Wijaya, 2022). Nevertheless, some investigations have indicated that there is no discernible effect, as evidenced by the research conducted by Almulla & Aljughaiman (2021); Sharif Abu Karsh (2020); Zaviera & Kurniawati, (2022). To the best of the author's knowledge,

there has been a lack of prior investigations examining the correlation between intellectual capital and financial technology. Hence, researchers intend to use financial technology as a moderating variable in this study. This study aims to investigate the potential of financial technology as a moderating variable in enhancing the application of intellectual capital within the banking sector.

The Technology Acceptance Model (TAM) theory developed by Davis in 1989 is considered a model that can provide an understanding of complex human behavior and the factors that shape this behavior into a system (Shaikh et al., 2020). This model believes its use can improve individual and company performance (Priantama, 2018). The theory of determinism technology, which was first pioneered by Marshall (1962) also views that the purpose of developing technology is to facilitate human activities and significantly influence society. Thus, it is appropriate to speculate that the company's performance is determined by financial technology. Advanced customer-oriented financial technologies can broaden their acceptance, creating a competitive advantage for firms (Chen et al., 2021; Jerene & Sharma, 2020). Abu Daqar et al. (2020); Dawood et al. (2022); Zinakova (2020) emphasize that financial technology is an innovation for advancing banking services and products such as mobile banking for online payments to create superior services. Le et al. (2021) have shown that Vietnam uses mobile banking as a financial technology strategy in service development to improve company performance.

This study uses the theory of Resource Based View (RBV) which was first pioneered by Weenerflt in 1984. This theory views that the resources owned by the company determine the progress of a company. The intangible resources of intellectual capital play a critical role in enhancing company competitiveness. The RBV theory posits assumptions on how firms might effectively compete with one another, using the utilization of advanced financial technologies to achieve a competitive advantage and affect overall company performance (Simatupang, 2013). A significant contribution from this research is determining how the use of financial technology can strengthen the relationship between the value of intellectual capital and company performance.

This study tries to overcome the gaps in previous studies that have been described in the intellectual capital and company performance literature. This research employs performance measurement techniques that encompass various aspects such as 1) accounting-based performance as measured by return on assets (ROA) and return on equity (ROE) and 2) market-based performance as measured by Tobins'Q. To the best researcher's knowledge, the use of various aspects for measuring company performance has not been previously undertaken, motivating researchers to use this measurement. Specifically, the researcher posits that the effects of intellectual capital and company performance depend on the ability to use financial technology.

This research contributes to the literature through various aspects. First, researchers seek to find the impact of intellectual capital on corporate performance in the banking sector. Therefore, researchers include financial technology as a moderating variable. Based on previous literature, no one uses Financial Technology as a moderating variable for intellectual capital on company performance. Therefore, this study contributes to the empirical literature by examining the role of financial technology in analyzing the impact of intellectual capital on firm financial performance. Second, this study tries to measure company performance from various aspects of performance, namely accounting-based performance (ROA, ROE) and market-based performance (T'Q). Third, this research is important for companies and external parties to pay more attention to the impact of using financial technology to support intellectual capital in improving company performance.

The next section of this article describes "literature review and hypothesis development," then "research methodology," followed by "results and discussion". The last section discusses the conclusions drawn from the study, contribution highlights, and suggestions for future research.

2. Literature Review and Hypothesis
2.1. Intellectual capital and company performance

The term intellectual capital was first proposed by Galbraith in 1969, as documented by Hapsari et al. (2021). Intellectual capital is defined as knowledge-based activities and processes that contribute to the company and the company's future benefits by adding value to the company's stakeholders (Sardo & Serrasqueiro, 2018). Intellectual capital, alternatively referred to as intangible assets, has been discussed in previous studies (Chowdhury et al., 2019; Hapsari et al., 2021; Tiwari & Vidyarthi, 2018). The optimal utilization of intellectual capital is crucial for firms in order to enhance value creation, performance, and competitiveness (Bayraktaroglu et al., 2019; Chowdhury et al., 2019). Effective use of intellectual capital or intangible assets can create value in a knowledge-based economy (Chowdhury et al., 2019; Sardo & Serrasqueiro, 2018). Companies that Intellectual Capital that make use Intellectual Capital experience enhanced creativity as they cultivate novel competencies and generate innovative ideas to address market demands (Aljuboori et al., 2022). Therefore, utilizing intellectual capital can enhance organizational performance, as evidenced by studies conducted by Mehri et al. (2013); Naidenova & Parshakov (2013); Shubita (2022); Tran et al. (2022).

Previous studies state that to obtain a sustainable competitive advantage so as to improve company performance, companies must have intangible resources or intellectual capital that is capable of generating additional value for company stakeholders (Inkinen, 2015; Lee & Wang, 2023; Mohamed & Tamanna, 2023; Suharman et al., 2022).

Components of intellectual capital efficiency include value-added capital employed efficiency (VACA), human capital coefficient (VAHU), and structural capital value added (STVA). The combination of these three added values is called the value-added intellectual coefficient (VAICTM) which can indicate the company's intellectual capabilities (R.Lubis et al., 2020). Apart from that, intellectual capital is divided into employee capital (CE) which refers to the tangible value of the company's relationships with external parties, human capital (HC) which refers to the knowledge, experience, and competencies possessed by employees within the company, and structural capital (SC) which refers on company structure and culture (Bayraktaroglu et al., 2019; Liu et al., 2022; Mehri et al., 2013). Existing literature supports a positive relationship between intellectual capital and firm performance (Hapsah & Bujang, 2019; Nimtrakoon, 2015; Odat & Ruba, 2022; Paoloni et al., 2022; Raman & Karam, 2018; Susana et al., 2022). Therefore, the following first hypotheses are proposed:

H1a: VAICTM is positively related to ROA firm performance
H1b: VAICTM is positively related to ROE firm performance
H1c: VAICTM is positively related to Tobins'Q firm performance
H1d: CE (capital employee) is positively related to company performance ROA
H1e: CE (capital employee) is positively related to company performance ROE
H1f: CE (capital employee) is positively related to Tobins'Q company performance
H1g: HC (human capital) has a positive relationship with ROA company performance
H1h: HC (human capital) has a positive relationship with ROE company performance
H1i: HC (human capital) is positively related to Tobins'Q company performance
H1j: SC (structural capital) is positively related to company performance ROA
H1k: SC (structural capital) is positively related to company performance ROE
H1l: SC (structural capital) is positively related to Tobins'Q firm performance

2.2. The moderating role of financial technology between intellectual capital and company performance

According to Wang et al. (2022), financial technology is technology-driven financial innovation to create new business models, technology applications, and product services that significantly impact financial markets, financial institutions, and how financial services are delivered. In the theory of perceived ease of use, ease of use has a highly positive relationship with the intention to use technology within companies (Al-Rahmi et al., 2018; Shaliza et al., 2019). Companies that adopt financial technology tend to have sales and profit growth that can enhance company performance (Cho et al., 2022; Q. D. Do et al., 2023; R. Hassan, 2023). The use of technology in companies gives companies a competitive advantage and enables the development of innovation in services (Nour, 2022). Technological innovations can improve production processes, efficiency, and product innovation and reduce production costs. With the innovation produced, companies can expand market share, increase market competitiveness, and improve company performance Sena, (2012); Zhu & Zhao, (2022). This shows that financial technology is an essential aspect of determining company returns (Y. Liu et al., 2021). This places financial technology as a link in supporting intellectual capital to provide services with qualified financial technology in companies (Oluwasegun et al., 2021). In order to understand how the application of certain financial technologies can affect intellectual capital so that it has an impact on company performance, researchers focus on financial technology employed within banking institutions. Several studies have discussed how financial technology affects company results in general (Almashhadani & Almashhadani, 2023; Chen et al., 2021; Ogbuji et al., 2020; Zaviera & Kurniawati, 2022), however, company understanding of the role of financial technology in increasing company resources is still limited (Y. Liu et al., 2021; Of & In, 2020; Siska, 2022).

The measurement of financial technology uses the number of automated teller machines at each bank, symbolized by ATM, which is then moderated by the ic variable so that it is symbolized by VAICTM_ATM. Apart from that, another measurement used is the number of mobile banking users where mobile banking is symbolized by MB which is then moderated by the ic variable becoming VAICTM_MB (Elmi & Abdi, 2018; Muthaura et al., 2021)

In line with previous research findings, this study proposes financial technology as a potential moderating factor between the benefits of intellectual capital and firm performance for the following reasons. First, The Resource-Based View (RBV) framework establishes a basic mechanism by linking financial technology to intellectual capital and firm performance. Dopting change-oriented behavior can support company activities in relation to intellectual capital, in fact it can produce greater organizational performance (Simatupang, 2013). Second, company performance is influenced by financial technology, which creates innovation for companies. This presents an opportunity for the advancement of financial technology as a means to enhance company performance (Putri Dwi Wahyuni et al., 2022). Therefore, the following second and third hypotheses are proposed:

H2a: VAICTM_ATM moderates the positive relationship between intellectual capital and ROA firm performance

H2b: VAICTM_ATM moderates the positive relationship between intellectual capital and ROE firm performance

H2c: VAICTM_ATM moderates the positive relationship between intellectual capital and Tobins'Q firm performance

H2d: VAICTM_MB moderates the positive relationship between intellectual capital and ROA firm performance

H2e: VAICTM_MB moderates the positive relationship between intellectual capital and ROE firm performance

H2f: VAICTM_MB moderates the positive relationship between intellectual capital and Tobins'Q firm performance

The third hypothesis indicates that all variables included in the regression table have a significant influence on company performance ROA, ROE and Tobins'q so the third hypothesis can be proposed as follows:

H3a: All variables are positively related to ROA financial performance

H3b: All variables are positively related to ROE financial performance

H3c: All variables are positively related to TOBINS'Q financial performance

Based on the literature review and hypotheses, the framework in this study is presented in Figure 1. The moderation model will strengthen the direct relationship between the strategic value of intellectual capital and company performance which is presented in Figure 1 below:
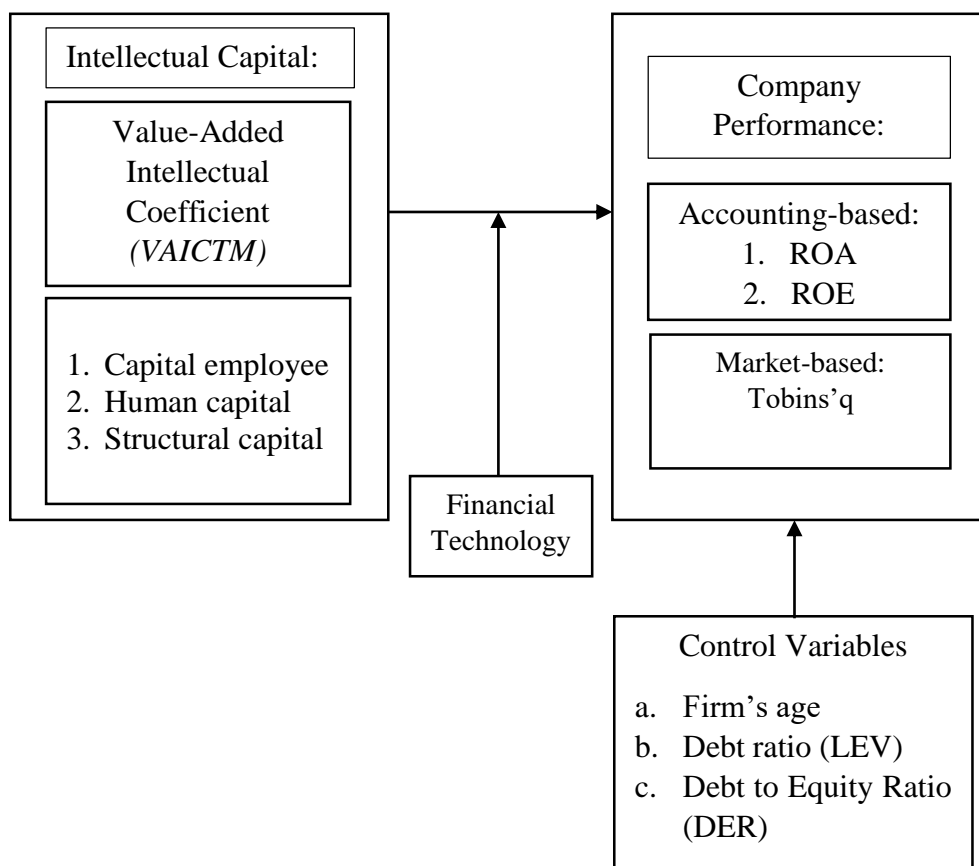
Figure 1. Research Framework

3. Research methodology
3.1. Data Source and Sample Selection

The present study employs empirical analysis by utilizing data on intellectual capital, firm performance, and financial technology extracted from the annual reports of each respective company. The collected data source from available database for the banking sectors in Indonesia has been listed on the Indonesia Stock Exchange for the last 5 years, spanning from

2018 to 2022. There are 46 banking institutions that have been listed on the Indonesian stock exchange, comprising a total of 230 data observations.

3.2. Variable Measurement
3.2.1. Company performance
Most previous research used accounting-based performance indicators, Return on Assets (ROA) and Return on Equity (ROE), as a measure of company performance (Akhunjonov, 2019; Bayraktaroglu et al., 2019; Cahyaningrum et al., 2020; L. Liu et al., 2022; Poh et al., 2018; Tasawar, 2019; Tiwari & Vidyarthi, 2018; Ubaidillah, 2023; Vishnu & Gupta, 2014; Weqar et al., 2020). However, in this study, in addition to accounting-based performance, calculated using the following proxies (Al-musali et al., 2014):

Return On Assets (ROA)	net profit before tax/total assets
Return On Equity (ROE)	net profit before tax/shareholders' equity

This study also use other aspects such as market-based performance which is measured using Tobins'Q (Brune *et al.*,(2021); Achmad, 2017; Dura, 2022; Evans & Kartikaningdyah, 2019).

Tobins' Q	Stock Market Price/ *Book Value*
Book Value (BV)	*Equity* / Number of outstanding shares

3.2.2. Intellectual Capital
The measurement of intellectual capital includes three indicators, namely 1) Capital Efficiency (CE) 2) structural capital (HC) 3) relational capital (SC). Apart from that, researchers also use VAICTM which was introduced by Pulic in 1998 as a metric for measuring the efficiency of intellectual capital (IC) (Bayraktaroglu et al., 2019; Mehri et al., 2013) (Akhunjonov, 2019; L. Liu et al., 2022; Smriti & Das, 2017; Tiwari & Vidyarthi, 2018; Vishnu & Gupta, 2014). Mathematically, VAICM is calculated using the following proxies (Achmad, 2017; Al-musali et al., 2014; L. Liu et al., 2022)

VAICTM	VACA + VAHU + STVA	Information:
VA	*OUT – IN*	*Out* (total revenue)
		In (expenses, other than employee expenses)
VACA	VA/CE	Available funds (total equity)
VAHU	VA/HC	Employee expense
STVA		*structural capital* (va-hc)

3.2.3. Financial Technology
Companies require the implementation of technology to enhance their profitability and performance. Companies that fail to embrace technological advancements, particularly in the banking sector, will struggle to compete with high volumes of competition, ultimately leading to their forced exit from the industry (Beloke & Elle, 2021; Mugane & Ondigo, 2016; Oluwasegun et al., 2021). This study employs financial technology disclosures as a metric for assessing firm performance, specifically focusing on the number of mobile banking customers and the number of ATMs at each bank. (Almashhadani & Almashhadani, 2023; Beloke & Elle, 2021; Elmi & Abdi, 2018; Muthaura et al., 2021; Zaviera & Kurniawati, 2022).

3.2.4. Control variable
This study uses control variables, including 1) firm age (AGE), 2) debt ratio (LEV) and 3) debt-to-equity ratio (DER). Company age is measured using the year the company was established until the year of the survey was conducted. The debt ratio (LEV) is calculated by dividing the

total liabilities by the total assets. The debt-to-equity ratio (DER) is calculated by dividing the total liabilities by the total equity. (L. Liu et al., 2022; Smriti & Das, 2017; Tran et al., 2022).

4. Results and Discussion
4.1. Descriptive statistics

Table 1 presents descriptive statistics for all variables. The average performance of banking companies from 2018 to 2022 shows positive results as indicated by the greater mean than the standard deviation. This suggest that the distribution of data is homogeneous and banking companies have optimized their company performance. The average number of confirmed company intellectual capital shows that the mean is greater than the standard deviation. This suggest that the value of intellectual capital in banking companies has a role in improving the performance of a company. These findings align with previous research (Tiwari & Vidyarthi, 2018; Tran et al., 2022; Xu & Li, 2019). Meanwhile, the average value of automated teller machines and the use of mobile banking during the study period shows that banking companies have implemented the financial technology component of ATMs and the use of mobile banking within their companies (Elmi & Abdi, 2018).

Table 1. Descriptive Statistics

Variable	Obs	Mean	Std. dev.	Min	Max
ROA	230	.0146496	.0069642	.0069	.023
ROE	230	.0807078	.0409676	.0341	.1301
TOBINS_Q	230	1.678266	1.743756	.0001312	8.954636
VAICTM	230	3.046553	.9530159	1.990796	4.213845
CE	230	.2904806	.7687764	.0072206	10.74525
HC	230	2.643364	2.008787	.10379	10.62476
SC	230	.8871145	1.162861	.0062819	8.634836
VAICTM_ATM	230	13.1817	5.190034	7.436746	19.61282
VAICTM_MB	230	39.18651	12.70807	25.27249	55.0363
AGE	230	41.48261	12.36798	29	57
LEV	230	.804782	.047597	.7446	.8533
DER	230	4.474345	1.277834	2.9234	5.8699

4.2. Correlation Analysis

The correlation results are shown in Table 2. ROA has a positive correlation and shares a positive directional association with VAICTM, CE, HC, SC, VAICTM, VAICTM_ATM, VAICTM_MB, and AGE. However, it demonstrates an inverse relationship with the LEV and DER. Meanwhile ROE has a positive correlation and a unidirectional association with VAICTM, CE, HC, SC, VAICTM_ATM, VAICTM_MB, AGE, LEV and DER. Tobins'Q exhibits a positive correlation and a unidirectional relationship with VAICTM, HC, SC, VAICTM_MB. Conversely, it demonstrates an inverse association with variables including CE, VAICTM_ATM, AGE, LEV, and DER. The value of each variable in general has a value below 0.8 indicating a lack of multicollinearity. However, there are a few variables that above

the threshold of 0.8, suggesting the presence of multicollinearity. Nevertheless, it is important to note that multicollinearity is not the primary concern in this study.

Table 2. Correlation Matrix

	ROA	ROE	TOBINS_Q	VAICTM	CE	HC	SC	VAICTM~M	VAICTM~B	AGE	LEV	DER
ROA	1											
ROE	0.8	1										
TOBINS_Q	0.1	0.08	1									
VAICTM	0.3	0.34	0.06	1								
CE	0.01	0.04	-0.01	0.10	1							
HC	0.26	0.24	0.09	0.68	0.36	1						
SC	0.20	0.22	0.09	0.27	-0.04	-0.18	1					
VAICTM_ATM	0.35	0.40	-0.14	0.72	0.09	0.55	0.07	1				
VAICTM_MB	0.41	0.39	0.07	0.96	0.10	0.68	0.26	0.7	1			
AGE	0.14	0.14	-0.28	0.09	0.06	0.13	-0.03	0.34	0.12	1		
LEV	-0.04	0.16	-0.13	0.03	0.10	0.05	-0.16	0.25	0.03	0.16	1	
DER	-0.11	0.09	-0.11	0.02	0.10	0.04	-0.18	0.24	0.04	0.09	0.92	1

4.3. The Effect of Intellectual Capital on the Performance of Indonesian Banking Institutions

The regression model employed in this study is determined by the outcomes of the Hausman test t, which indicates that the probability (prob>chi2) of 0.0622 is more than the significance level of 0.05. Consequently, the null hypothesis (H0) is accepted, suggesting that a random effect (RE) is appropriate for this analysis. The random effect model effectively addresses the issue of heteroscedasticity by employing the generalized least squares (GLS) technique (Runggu et al., 2021; Suwardi, 2011).

Tables 3, 4, and 5 are the results of testing using random effect panel data regression. According to the findings presented in Table 3, there is a substantial positive correlation between intellectual capital and corporate performance, specifically return on assets (ROA). As a result, hypothesis H1a is supported. This implies that the existence of intellectual capital within banking companies provides positive results on company performance. The factors that have an impact on the relationship between intellectual capital and return on assets include the contribution of human resources in generating product and service innovations, as well as the acquiring of new knowledge. In addition, knowledge management, quality of management and educational level of employees can effectively affect the company's ROA performance. This aligns with prior research that posits a knowledge-driven society, wherein the investment in human capital can serve as a valuable asset for organizations. Companies have the potential to enhance their overall performance by making investments in human capital (Aljuboori et al., 2022; Mehri et al., 2013; Rahman & Liu, 2022; Shubita, 2022; Tran et al., 2022).

The regression results presented in Table 4 indicate that there is no statistically significant relationship between IC and the ROE performance of banking institutions. Consequently, the hypothesis H1b, which posits a significant effect of IC on ROE, is rejected. The reason for this is that the banking sector is subject to stringent regulations, which prioritize financial considerations above Intellectual Capital. In addition to these constraints, the conservative nature, traditional assessment and other factors contribute to the limited influence of intellectual capital (IC) on return on equity (ROE). Similarly, the findings presented in Table 5 indicate that there is no substantial impact of IC on Tobins'Q performance causing H1c to be rejected.

This is due to the fact that banking sector companies tend to prioritize traditional financial metrics like return on assets (ROA), hence rendering intangible capital (IC) insignificant in influencing Tobin's q, a measure of market value. In addition, other indicators such as stability, liquidity and traditional role in financial intermediation cause IC to have a limited impact on the Tobins'Q performance of companies.

While certain tests show insignificant results, the overall findings indicate that the prob>chi2 values for each measurement are consistently below 0.05. means that all variables influence company performance Consequently, the hypotheses H3a, H3b, and H3c are accepted. It can be inferred that the comprehensive intellectual capital model, as indicated by the VAICTM variable, has a positive correlation with the performance of banking companies in Indonesia. The selected from the regression results table it is also found that CE and HC do not significantly influence H1d and H1g is accepted, but SC significantly influences ROA H1j. Company performance ROE CE and HC have no effect on H1e and H1h are rejected while SC has a significant influence on H1k and is accepted. Of the two company performance variables, only the SC component has an influence, this is because companies that have structural capital and efficient procedures will increase their competitive advantage which influences company performance. Tobins'q CE, HC, and SC company performance measurements do not have a significant influence on company performance, so H1f, H1j, and H1l are rejected.

While certain tests show insignificant results, the overall findings indicate that the prob>chi2 values for each measurement are consistently below 0.05. means that all variables influence company performance Consequently, the hypotheses H3a, H3b, and H3c are accepted. It can be inferred that the comprehensive intellectual capital model, as indicated by the VAICTM variable, has a positive correlation with the performance of banking companies in Indonesia. The selected performance measure exhibits more robustness in the case of Return on Assets (ROA) as compared to Return on Equity (ROE) and Tobin's Q (Öner et al., 2021).

4.4. The Effect of Financial Technology in Moderating the Relationship Between Intellectual Capital and The Performance of Banking Institutions in Indonesia

Tables 3, 4, and 5 demonstrate the random effect panel data regression results. Table 3 shows that the role of the mobile banking moderation variable has significant effects as a moderator on intellectual capital and ROA, hence H2d is accepted. This is consistent with the adoption of mobile banking, that operational efficiency can reduce physical operational costs and positively impact ROA (Elmi & Abdi, 2018; Le et al., 2021). In addition, the use of mobile banking can increase transaction volume, customer growth, and develop product innovations to help increase revenue and ROA. However, as the number of ATMs has no significant effect on the company's ROA performance, H2a is rejected. This is because the ATM operational costs will increase as the number of ATMs increases. Therefore, ATM does not have a significant effect on ROA. Furthermore, the impact of other technologies and investment expenditures is the reason ATM has no impact on the company's ROA performance.

The regression results in Table 4 shows that variable Mobile Banking or VAICTM_MB significantly affects ROE, means that H2e is accepted. This is because the presence of Mobile Banking can increase the customer base, affecting revenue and profits that affect ROE (Le et al., 2021). In addition, by adopting Mobile Banking, higher product sales, cost efficiency, and optimal use of capital can positively impact ROE. However, the ATM or VAICTM_ATM moderation variable shows no significant effect, so H2b is rejected. This due to the number of ATMs that do not provide a significant competitive advantage in competition in the banking market, causing differential limitations and reducing the impact of ROE.

The regression results in Table 5 suggests that the moderating variable ATM or VAICTM_ATM has a significant effect on the Tobins'Q performance, implying that H2c is accepted. This is consistent with the ease of access to adequate ATM services to influence the market value perception and increase the company's value in the perspective of influential investors with Tobins'Q. However, different results are shown for the mobile banking moderation variable or VAICTM_MB, which does not have a significant relationship to the performance of Tobins'Q companies, hence H2f is rejected. This is because the company allocates limited resources to the development of MB with investment returns that affect increasing market value, so the influence of Tobins'Q is limited.

The results of the three regressions show all variables including financial technology have a positive correlation with the performance of banking companies in Indonesia. Empirical results show that financial technology VAICTM_MB plays an important moderating role in the relationship between intellectual capital and company performance, for the performance measures selected are stronger, namely ROA and ROE performance (Almashhadani & Almashhadani, 2023; Elmi & Abdi, 2018; Muthaura et al., 2021) compared to Tobins'q.

Table 3. ROA Regression Results

ROA	Coefficient	Std. err.	z	P>|z|
VAICTM	-.0035411	.001697	-2.09	0.037
CE	-.0000755	.0004695	-0.16	0.872
HC	.000365	.0003161	1.15	0.248
SC	.0009896	.0003657	2.71	0.007
VAICTM_ATM	-.0001241	.0001427	-0.87	0.384
VAICTM_MB	.0003867	.0001397	2.77	0.006
AGE	.0000568	.0000608	0.93	0.350
LEV	.0793427	.0256488	3.09	0.002
DER	-.0029693	.0009022	-3.29	0.001
_cons	-.0428254	.0169852	-2.52	0.012
sigma_u	.00456353			
sigma_e	.0041309			
rho	.54963632	(fraction of variance due to u_i)		

Table 4. ROE Regression Results

ROE	Coefficient	Std. err.	z	P>|z|
VAICTM	-.0204771	.0106833	-1.92	0.055
CE	-.0005913	.0030156	-0.20	0.845
HC	.0014309	.0020102	0.71	0.477
SC	.0064734	.0023439	2.76	0.006
VAICTM_ATM	-.0000419	.0008914	-0.05	0.963
VAICTM_MB	.0020677	.0008759	2.36	0.018
AGE	.0001914	.0003343	0.57	0.567
LEV	.5630318	.1580153	3.56	0.000
DER	-.0151996	.005619	-2.71	0.007
_cons	-.3397875	.1040468	-3.27	0.001
sigma_u	.02344334			
sigma_e	.0266556			
rho	.43614405	(fraction of variance due to u_i)		

Table 5. TOBINS_Q Regression Results

TOBINS_Q	Coefficient	Std. err.	z	P>|z|
VAICTM	-.548174	.512019	-1.07	0.284
CE	-.0894278	.1491841	-0.60	0.549
HC	.1812879	.0979827	1.85	0.064
SC	.1669979	.1154214	1.45	0.148
VAICTM_ATM	-.1057632	.0422345	-2.50	0.012
VAICTM_MB	.0652861	.0417536	1.56	0.118
AGE	-.0292421	.0138787	-2.11	0.035
LEV	-4.120412	7.358872	-0.56	0.576
DER	.1430541	.2651005	0.54	0.589
_cons	5.471731	4.818635	1.14	0.256
sigma_u	.90138964			
sigma_e	1.3801945	(fraction of variance due to u_i)		
rho	.29899582			

5. Conclusion

This study aims to investigate the relationship between intellectual capital and its components which are moderated by financial technology and the performance of banking institutions in Indonesia. This study uses a sample of 46 banking companies listed on the Indonesia Stock Exchange with 230 data observations from 2018 to 2022. In addition, the authors also include control variables in this study as an explanation of the regression model.

Using the panel data regression random effect model, the main conclusion is first that VAICTM as a whole affects the performance of banking companies in Indonesia. The two use of mobile banking or VAICTM_MB moderating variables are the main drivers to improve company performance compared to the smaller automated teller machines VAICTM_ATM variables. Finally, the different results for each control variable indicate that the control variable has an effect on overcoming problems that arise unexpectedly which can affect research results.

The theoretical contribution of this study is, firstly, while much of the previous research has concentrated on companies across different sectors, this study extends the present understanding of IC research specifically within the context of banking institutions in Indonesia. This study included the role of financial technology in moderating intellectual capital to determine whether IC moderated by the efficient utilization of financial technology can enhance company performance. Finally, the research provides companies with valuable insights into the components of intellectual capital and financial technology that should be taken into account to improve company performance.

This study highlights several practical implications. First, considering the increasing significance of intangible assets for companies, it is essential for banks in Indonesia to prioritize the development of human resources and foster strong relationships with customers, clients, and investors. While some studies indicate that the influence of intangible asset components may be indirect, it remains crucial for banks to allocate attention towards these components. The banking institutions in Indonesia should continue to increase the use of other financial technologies apart from the financial technology listed by the authors in this study. The authors propose that it is imperative for all personnel inside the organization to possess comprehensive technological proficiency. This would enable the company to provide training programs to enhance employees' competence in the domain of financial technology. Ultimately, it is imperative for policymakers to implement preferential policies that facilitate the effective collaboration of human resources and financial technology in order to enhance firm performance.

This study has several limitations. First, the scope of sample used by researchers is limited to the banking sector, thus further research must consider other sectors. Second, the subsequent studies can consider the effect of moderating financial technology with IC in improving company performance in various sectors. Alternatively, they can compare the moderating effect of implementing financial technology on intellectual capital and its influence on company performance between developed and developing countries. At last, future studies can add variables other than IC which are moderated by financial technology in their research.

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