Article Type: Research Paper

Do investing in information technology and intellectual capital improve firm value in the financial technology era?

Ariny Maghfiroh*, Erwin Saraswati and Endang Mardiati

Abstract

Research aims: This research aims to prove the impact of information technology investments and intellectual capital on firm value (Tobin's Q) in the financial technology era.

Design/Methodology/Approach: This study's population was banks listed on the Indonesian Stock Exchange (ISE) during 2017–2022. Purposive sampling was utilized to choose a sample of 46 banks, resulting in a total of 112 observations during six years. This research employed GMM regression for empirical analysis, considering endogeneity.

Research findings: The study revealed that while investments in information technology exerted a favorable influence on firm value, intellectual capital had a beneficial impact on firm value. Human Capital Efficiency (HCE) and Capital Employed Efficiency (CEE) positively impacted firm value. However, the variables Structural Capital Efficiency (SCE) and Relational Capital Efficiency (RCE) did not have any effect on firm value. The variables being controlled for in this study comprised corporate level, industry level, and banking type. The financial success of a corporation could be influenced by the corporate level, determined by the organization's size. The influence of industrial level and bank type on company firm value was limited due to the dynamic nature of market conditions and the intensifying competition within the banking system.

Theoretical contribution/ Originality: This research contributes theoretically to the field of signaling theory by presenting an advantageous analytical framework to examine the effects of IT investments in the dynamic financial sector.

Practitioner/Policy implication: This research contributes to investors in determining investment decisions and the council of commissioners to enhance supervision of IT investments, encourage banking to innovate in leveraging information technology, and introduce new products that can meet customer needs.

Research limitation/Implication: The research focuses exclusively on banks listed on ISE and exclusively employs the MVAIC methodology for research purposes. Since this research was limited to the financial statements presented by the company, so some necessary data were not available, requiring an interview or spreading the questionnaire to the sample used. This research was also limited to banking in Indonesia, so the samples used were also limited, and there needs to be a comparison.

Keywords: TI investment; Intellectual Capital; Firm Value; Financial Technology; conventional Bank; Sharia Bank

AFFILIATION:
Department of Accounting, Faculty of Economics and Business, Universitas Brawijaya, East Java, Indonesia

***CORRESPONDENCE:**
arinym92@gmail.com

DOI: 10.18196/jai.v25i2.21707

CITATION:
Maghfiroh, A., Saraswati, E., & Mardianti, E. (2024). Do investing in information technology and intellectual capital improve firm value in the financial technology era? *Journal of Accounting and Investment, 25*(2), 780-803.

ARTICLE HISTORY
Received:
22 Feb 2024
Revised:
19 Apr 2024
07 May 2024
Accepted:
31 May 2024

JAI Website:

Introduction

The banking sector is crucial for the advancement of a nation. This sector will serve as a crucial pillar of the economy in the future (Fu et al., 2014; Kwabi et al., 2020; Montgomery et al., 2014; Safiullah & Shamsuddin, 2019; Wang et al., 2018). One measure of the sustainability of an industry in the banking sector is firm value. Firm value reflects how well a company manages its resources for investors (Oktabrina & Inggarwati, 2022). It can be assessed by monitoring the stock market price, which tends to increase when the company achieves its long-term objectives (Yohana & Suhendah, 2023). The higher the share value, the greater the shareholder welfare (Revinka, 2021).

In this case, the Indonesia Composite Index (ICI) recorded its lowest level in 18 years. In the first semester of 2020, it declined by 1.35%, reaching IDR 4,716.40 in the first trading session. The banking sector experienced a decline of 5.74%, as several banks hit their lowest points. Only one banking issuer managed to withstand this ICI decline: PT. Bank Central Asia Tbk (BBCA), which has the largest market capitalization on the Indonesia Stock Exchange (IDX).

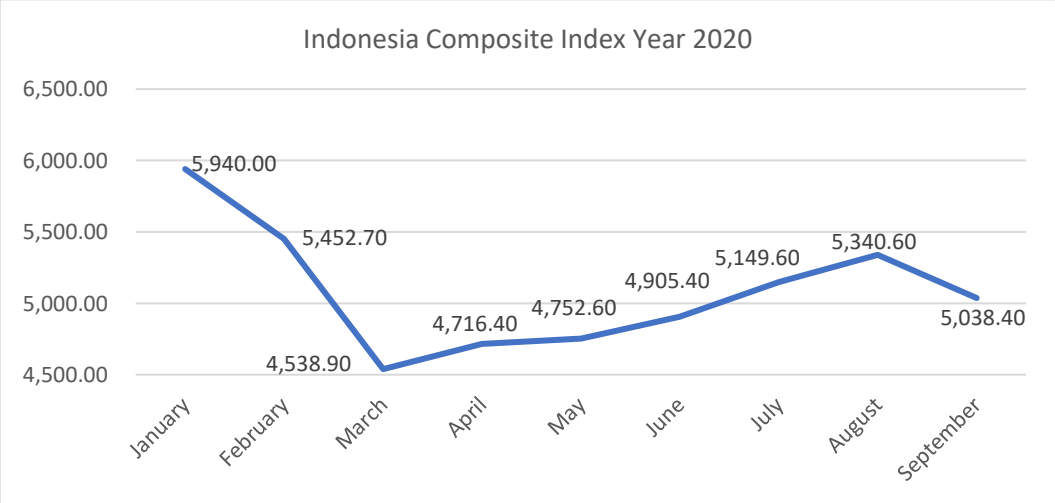

Figure 1 Indonesia Composite Index Year 2020

Another phenomenon that occurred as a result of declining stock prices in recent years is the bankruptcy of Silicon Valley Bank (SVB) in California, U.S., which experienced a capital difficulty and declared bankruptcy in March 2023 (FDIC, 2023). This was due to a massive withdrawal of funds from the bank, where many customers withdrew large sums of money at once because of doubts about the bank's ability to pay the funds in full and immediately. Various factors contributing to the bankruptcy of banks tailored for the technology industry included SVB's acquisition of low-cost investment assets like U.S. government bonds, inflated deposits, the US Federal Reserve's increase in interest rates, the devaluation of bond portfolios, the decreased availability of start-up funding leading to the withdrawal of funds by SVB, SVB's sale of securities at a loss, panic among venture capital firms, and a decline in share prices (Nurmutia, 2023).

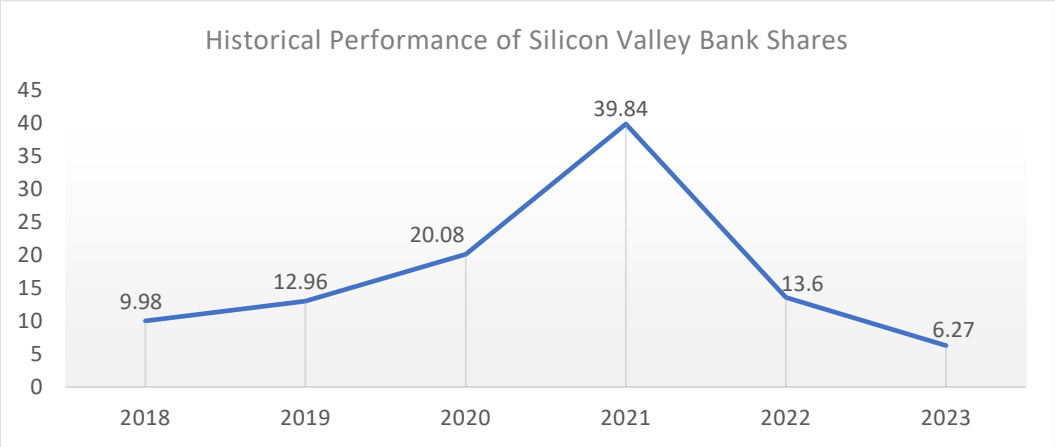

Figure 2 Historical Performance of Silicon Valley Bank Shares

In 2018, there was a skimming incident in Indonesia. Bank Mandiri exemplifies technology-based criminality, highlighting the dichotomy between information technology (IT) productivity and firm value. Bank Mandiri effectively reimbursed the skimming victims' client monies, totaling IDR 260 million (Setiawan & Ika, 2018). In 2019, several Bank Mandiri services, including independent online banking, internet banking, SMS banking, EDC, and ATMs, had difficulties (CNBC, 2019). In May 2023, there was a cyberattack on Bank Syariah Indonesia (BSI) in Indonesia. BSI experienced an interruption that caused consumers to be unable to access BSI Mobile services, ATMs, and teller machines at bank branches, which led to customer data leaking. As a result, the stock price decreased, leading to a decline in customer confidence. Consequently, some clients withdrew their cash and transferred it to a different bank (Caesaria, 2023; KOMPAS, 2023).

Thus, in an effort to increase the firm value, asset management needs to be considered carefully. The company`s main assets are not limited to physical objects but also include valuable, unique, difficult-to-replace, and inimitable assets. These assets are known as intellectual capital, which must be managed efficiently to achieve a competitive advantage. The greater the value of intellectual capital, the greater the potential to create added value for the company through superior innovation compared to competitors (Sayyidah & Saifi, 2017).

Intellectual Capital (IC) can be divided into several components: Human Capital (HC), Structural Capital (SC), Relational Capital (RC), and Capital Employed (CE) (Ulum et al., 2014). IC is an important corporate resource for gaining and maintaining a competitive advantage (Pulic & Kolakovic, 2003). Companies with high IC are believed to manage their resources efficiently (Soriya & Narwal, 2015). Studies indicate that IC affects firm value (Putri et al., 2019; Tangngisalu, 2021). However, other research suggests that IC has a negative effect on firm value (Ginting & Sagala, 2020; Nabila et al., 2021).

As a service company in the financial industry, firms need to adapt to the development of information technology. Some experts argue that service companies have an

advantage in crisis conditions due to their ability to enhance productivity and customer service through IT innovations. By improving the efficiency and quality of services, companies are expected to increase their overall value. IT investment in the banking sector has the highest level of information technology investment per user, indicating that intellectual capacity should ideally be enhanced through corporate efficiency (Namaki et al., 2019; Pérez-Martín et al., 2018). Dehning et al. (2005) assert that IT investment is highly beneficial for improving bank performance. Other studies support these findings, indicating that IT investment also influences firm value (Dehning et al., 2005; Kohli et al., 2012; Sriram & Krishnan, 2003). Enhanced financial performance, evidenced by rising stock prices, contributes positively to the company's value and sends a favorable signal to investors.

While numerous studies have explored firm value, this study uniquely incorporates information technology investments as an independent variable to assess its impact. In the context of Society 5.0, where information technology continues to advance under human control, there is a need to examine intellectual capital comprehensively. This study also introduces control variables such as corporate level, industry level, and banking type. Moreover, the Generalized Method of Moments (GMM) was employed to address endogeneity.

Based on the structured background provided, this study examines the correlation between information technology investment and intellectual capital with the value of banking firms. It utilized data from companies listed on the Indonesian Stock Exchange period 2017–2022. Firm value was measured using Tobin`s Q. Information technology investment was assessed through intangible assets, while intellectual capital was evaluated using Modified Value-Added Intellectual capital (MVAIC).

Literature Review and Hypotheses Development

Signaling Theory

According to Widiastari and Yasa (2018), reporting financial information related to company performance can enhance firm value. A high level of profit indicates strong financial performance and promising future prospects. Additionally, growth in return on assets can convince investors that the company can deliver a high return on investment. In response to these positive signals, investors are likely to increase their stock transactions, which, in turn, positively impacts firm value. Signaling theory suggests that organizations aim to convey positive information to potential investors through disclosures in financial statements. Positive signals from the organization are expected to be well received by the market, provide a competitive advantage, and significantly boost the company's value (Nanik & Candra, 2016).

In economics and finance, signaling theory concerns how organizations or companies convey information to the market or potential investors through specific actions or disclosures. The primary aim of signaling theory is to shape market perceptions of a

company's performance or prospects, thereby enhancing investor confidence and contributing to an increase in the firm's value.

Resource-based View Theory

Resource-based View (RBV) theory is a management theory that posits that a business can gain a competitive edge by effectively leveraging resources that are distinct, scarce, and challenging for competitors to replicate. The notion emphasizes the significance of an organization's internal resources, including human expertise, technology, brand, and managerial abilities, in generating competitive advantages and achieving superior performance. According to this hypothesis, an organization possessing valuable, limited, difficult-to-imitate, and irreplaceable resources can establish a durable competitive advantage. Hence, managers must effectively utilize and oversee the resources of the firm to accomplish long-term objectives (Wernerfelt, 1984). RBV also asserts that the company has the necessary resources to gain a competitive edge and effectively guide the company toward achieving strong long-term performance. Allocating valuable and limited resources strategically can establish a competitive edge, ensuring the longevity and non-replicability, transferability, or substitutability of these resources. Resources encompass both actual and intangible assets that firms can utilize to develop and execute their strategy (Arikan, 2006).

Generalized Method of Moment (GMM)

The Generalized Method of Moment (GMM) is a technique that can be used to handle violations of assumptions in data, such as autocorrelation and heteroskedasticity. Hansen presented this method in 1982, defining it as a technique for estimating parameters that rely solely on the momentum conditions employed. GMM is a technique used to estimate the expansion parameters of the moment method. The moment technique is inapplicable when the count of instrument variables exceeds the count of parameters to be evaluated. GMM equates the state moment of a population with the state moment of a sample. According to W (2012), in a simultaneous equation with L moment conditions and K parameter equations, there exist three potential solutions. First, insufficiently identified (L < K). If the number of moment conditions is insufficient compared to the estimated number of parameters, it is impossible to find a solution in the equation system. Second, precisely determined (L = K). This phenomenon arises when the count of condition moments matches the estimated count of regressors, resulting in an estimate that is identical to the instrumental variable estimation approach. Third overidentified if the value of L is greater than the value of K. This happens when the number of condition moments is greater than the number of parameters being estimated, resulting in an equation system without a unique solution. The θ-parameter is measured using GMM.

Parameter estimation procedures with GMM are performed in successive steps to determine the state moment, determine the sample moment analog, define the function of the criteria, and complete the criterion function. For example, the g(θ) sample moment analog is defined. A is further defined as a GMM weighting matrix that

is non-random in nature and has a full rank. GMM estimates of θ can be obtained by minimizing the function of the criterion, i.e., the analog weighting distance of the sample moment g(θ) to zero. The function of the criterion in estimates with GMM is defined by q(θ) = g (θ)'Ag(θ). The criterion function in estimation with GMM shown in Model 1 and Model 2.

$$\theta = \operatorname{argmin} \theta \, (q \, (\theta)) \quad (1)$$

$$\theta = \operatorname{argmin} \theta \, (g \, (\theta' \, Ag \, (\theta)) \quad (2)$$

As an illustration, given the equation εi = yi - θi with the instrument variable zi. Then, the analog moment sample is defined. With analog g (θ) = n-1 Σn (zi (yi – x'i θ)) and a moment of sample written g (θ) = n-1 (Z' (y - Xθ)), in the form of a function matrix, the criteria can be defined in Model 3, Model 4, and Model 5.

$$q = g \, (\theta)' Ag \, (\theta) \quad (3)$$

$$= \{n - 1Z \, '(y - X\theta)\} \, ' \, A\{n - 1Z' \, (y - X\theta)\} \quad (4)$$

$$= n - 2 \, (y' \, ZAZ'y - 2\theta \, 'X' \, ZAZ'y + \theta'X'ZAZ'X\theta) \quad (5)$$

The parameter θ can be obtained by completing the function of the criterion q(θ) to the condition of the first order that shown in Model 6, Model 7, and Model 8.

$$\partial q(\theta) / \partial \theta = (-2n - 2X'ZAZ'y) + (2n - 2X'ZAZ'X\theta) = 0 \quad (6)$$

$$(2n - 2X'ZAZ'X)\theta = (2n - 2X'ZAZ'y) \quad (7)$$

$$\theta = [X'ZAZ'X] - 1 \, X'ZAZ'y \quad (8)$$

Hypothesis Development

Signaling theory is a concept used in economics and finance to explain how asymmetric information can influence market decisions and behavior (Spence, 1973). Investment in information technology can serve as a positive signal to the market and investors about a company's commitment to innovation and efficiency improvement. When companies invest resources in IT, it can demonstrate to investors that the company is dedicated to maintaining a competitive advantage and optimizing performance. This can enhance investor confidence and increase the value of the company's shares. Investment in information technology can enhance operational efficiency, improve business processes, and foster innovation. These improvements can lead to better financial performance (Agu, Aguegboh, & Ekene, 2020; Farouk & DanDago, 2015; Gunawan & Serlyna, 2018), which, in turn, can increase firm value. Research supports this, showing that investment in information technology has a positive effect on firm value (Dehning et al., 2005; Kohli et al., 2012; Sriram & Krishnan, 2003). Based on this explanation, the following research hypothesis was formulated:

***H₁**: Investments in information technology have an advantageous impact on the firm value.*

Resource-based View Theory (RBV) is a theory that states that a company has resources that can make a company have long-term performance. Valuable and scarce resources can create a competitive advantage so that resources owned can last a long time and are not easily replicated, transferred, or replaced. Resources are both tangible and intangible assets that companies can use to formulate and implement their strategies (Arikan, 2006). Susanti et al. (2021) examined the effect of intellectual capital on firm value. Their study used manufacturing companies listed on the Indonesia Stock Exchange (IDX) from 2013 to 2017. The results demonstrated that intellectual capital exerted a positive effect on firm value. Xu and Liu (2020) investigated the effect of intellectual capital on firm value. The study focused on manufacturing companies in Korea for the period 2013 to 2018. The results indicated that intellectual capital yielded a positive effect on firm value. Based on this explanation, the following research hypotheses were formulated:

***H₂**: Intellectual capital creates a beneficial influence on firm value.*

***H₂ₐ**: Human Capital Efficiency (HCE) has a positive impact on firm value.*

***H₂ᵦ**: Structural Capital Efficiency (SCE) has a positive impact on firm value.*

***H₂c**: Relational Capital Efficiency (RCE) has a positive impact on firm value.*

***H₂d**: Capital Employee Efficiency (CEE) has a positive impact on firm value.*

Based on the hypotheses development, the research framework shown in Figure 3.

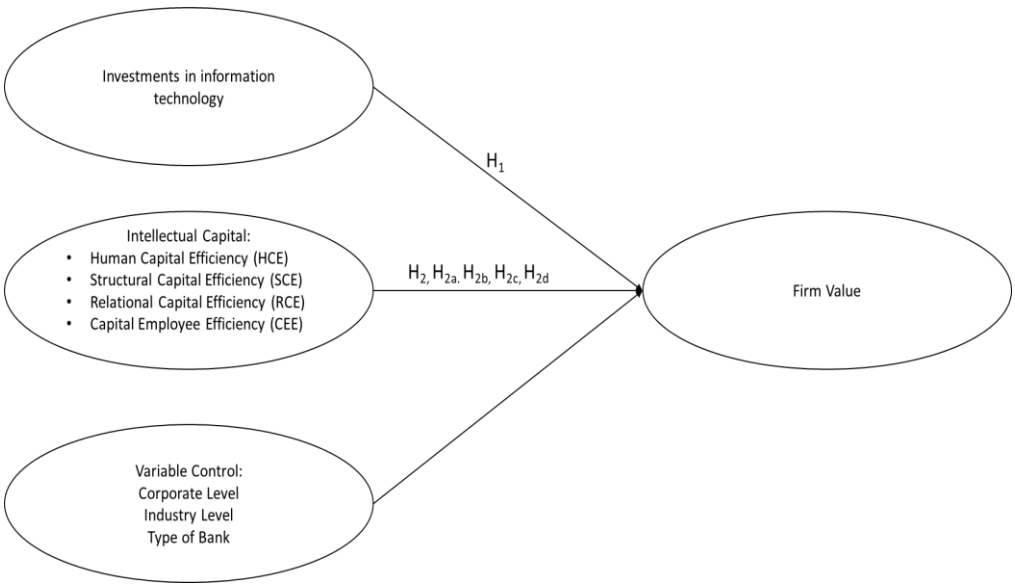

Figure 3 Research Model

Research Method

The study examined the influence of investments in information technology and intellectual capital on the firm value through financial technology. This study employed quantitative research methodology under the framework of positivism. This research is an explanatory study with a causal goal, specifically designed to examine the influence between two variables. The analysis utilized the population of conventional and Sharia banking organizations that were publicly listed on the Indonesian Stock Exchange (ISE) from 2017 to 2022. The period chosen, 2017-2022, was intended to observe the data in its normal state. This is because, in 2020, there was an anomalous condition due to the COVID-19 pandemic. The sampling process employed purposive sampling techniques and judgment sampling. The selection criteria used in determining the sample for this study are as follows: 1) Conventional and Sharia banking institutions that had been consecutively listed on the Indonesian Securities Exchange (ISE) between 2017 and 2022. 2) Conventional and Sharia banking institutions with publicly available financial statements between 2017 and 2022. 3) Conventional and Sharia banking institutions that furnished data pertaining to the variables under investigation and remained operational from 2017 to 2022 without undergoing liquidation. 4) Conventional banking and Sharia enterprises that utilized the rupiah in their financial statements as a means to circumvent discrepancies in exchange rates. Based on these criteria, 46 banks were obtained as research samples with 112 observations for six years (2017-2022).

In this research, firm value served as the dependent variable. The research focused on economic conditions because the current Industry 4.0 environment is constantly evolving. This dynamic environment compels banks to maintain their financial stability to ensure future sustainability. Tobin's Q was employed as the metric for evaluating the firm value. Tobin's Q provides a more precise assessment of a company's value, evaluates its investment prospects and development potential, considers the expenses associated with asset replacement, and assists in decision-making. Pruitt (1994) proposed formulation in Model 9 for Tobin's Q.

$$\text{Tobin`s Q} = (\text{MVE} + \text{PS} + \text{DEBT})/\text{TA} \quad \text{.....} \quad (9)$$

Tobin's Q values are categorized into multiple groups (Bartlett & Partnoy, 2018; Hutabarat & Senjaya, 2016; Thangavelu & Jyotishi, 2017). Tobin's Q ratio of less than 1 signifies that stocks are undervalued, indicating that either management has not effectively utilized the company's assets or there has been insufficient investment growth, resulting in the market undervaluing the company's worth. Tobin's Q value of 1 indicates that the stock is in an average state, suggesting that the management is not actively improving the asset or experiencing any growth in investment.

In this research, information technology was invested as an independent variable. IT investments are part of an intangible asset. The first thing to do is identify the intangible asset. As far as this is concerned, it is based on R&D, training, and innovation spending, while it is further based on intangible assets on the balance sheet (Bontempi & Mairesse, 2008). Model 10 show measurement of IT investment.

$$\text{IT Investment} = \text{Intangible Asset/Total Asset x } 100\% \quad (10)$$

Intangible assets encompass various components such as brands, patents, technology, and other forms of intellectual property that are not readily visible in traditional financial statements. Intellectual Capital Efficiency (ICE) is crucial for evaluating how these intangible assets contribute to a company`s performance, which often goes unnoticed inconventional balance sheets. ICE is essential for determining Model Value Added Intellectual Capital (MVAIC). MVAIC was employed to measure IC in the context of conventional banking. The MVAIC, introduced by Pulic in 2000, measures the added value of intellectual capital and physical capital components. MVAIC considers the overall resource pool of the organization and does not rely exclusively on the company's physical capital. The MVAIC is structured in Model 11 until Model 16.

$$\text{MVAIC} = \text{ICE} + \text{CEE} \quad (11)$$

$$\text{ICE} = \text{HCE} + \text{SCE} + \text{RCE} \quad (12)$$

$$\text{HCE} = \text{VA} / \text{HC} \quad (13)$$

$$\text{SCE} = \text{SC} / \text{VA} \quad (14)$$

$$\text{RCE} = \text{RC} / \text{VA} \quad (15)$$

$$\text{CEE} = \text{VA} / \text{CE} \quad (16)$$

Ulum (2013) developed the iB-VAIC model to measure the performance of Sharia banking by utilizing the financial reports of Indonesian Sharia banks. The model was constructed by including the Islamic Banking Value Added Intellectual Capital (iB-VAIC) framework. The iB-VAIC is structured in Model 17 until Model 21.

$$\text{iBVA} = \text{OUT} - \text{IN} \quad (17)$$

$$\text{iB} - \text{VACA} = \text{VA} / \text{CE} \quad (18)$$

$$\text{iB} - \text{VAHU} = \text{VA} / \text{HC} \quad (19)$$

$$\text{iB} - \text{STVA} = \text{SC} / \text{VA} \quad (20)$$

$$\text{iB} - \text{VAICTM} = \text{iB} - \text{VACA} + \text{iB} - \text{VAHU} + \text{iB} - \text{STVA} \quad (21)$$

To rank a group of banks, the scores obtained from the iB-VAIC calculations might be used. Ulum (2008) provides a classification for the outcomes of the VAIC computations. These categories are as follows: a. top performers—VAICTM scores exceeding 3.00; b. good performers—VAICTM scores ranging from 2.0 to 2.99; c. common performers—VAICTM scores ranging from 1.5 to 1.99; d. bad performers—VAICTM scores below 1.5.

The corporate-level control variable encompassed the dimensions of corporate size and leverage. Large organizations typically serve as significant stakeholders due to their size, which reflects their magnitude or insignificance. This will significantly influence policymaking, with major corporations exerting a greater influence on the public interest compared to small organizations due to their heightened attentiveness to the public. Consequently, companies will exercise greater caution in their financial reporting. In addition, the company's size can be categorized into distinct classes, including large, medium, and tiny. The magnitude of the company is a crucial determinant of information technology investment. The company's size in this study was estimated by considering the aggregate value of all assets possessed by the company, as described by Munawir (2010) as follows in Model 22.

$$\text{Corporate level} = \text{Ln x Total asset} \quad \ldots\ldots (22)$$

Leverage refers to a company's capacity to fulfill its financial responsibilities. An alternate means of obtaining company cash, other than issuing shares in the capital market, is via securing external funds, such as loans. The corporation will endeavor to meet the debt arrangement in order to secure a favorable evaluation from creditors (Astari et al., 2017). Moreover, the utilization of leverage has a substantial influence on the company's performance (Ftiti et al., 2013; Trad et al., 2017). The study calculated leverage by dividing the entire liabilities by the total assets possessed by the company, as described by Kieso et al. (2019) that shown in Model 23.

$$Lev = \frac{Total\ Debt}{Total\ Asset} \text{ x } 100\% \quad \ldots\ldots (23)$$

The industry level was one of the variables being controlled in this investigation. This variable represents the prevailing conditions or distinctive features that are shared across a specific industry or sector, such as the banking sector. The Herfindahl Hirschman Index (HHI) is a metric used to quantify the level of market or industry concentration (DePamphilis, 2019). It represents the proportion of market share controlled by a group of companies or within a certain industry. The concentration ratio was employed for the analysis of industry and company competition, particularly in the context of competition among major enterprises or oligopolies. The concentration ratio can be determined by employing a concentration index, which quantifies the extent to which a specific number of enterprises in an industry control the market share (Rhoades, 1993). First, all the companies currently active in the industry for which the researchers needed to assess concentration were determined. Secondly, the market share of each company was determined by dividing the company's sales by the total sales in the industry. Thirdly, their market share was squared to calculate a second-rank value for each company. Fourth, the total market capitalization of all companies in the industry was calculated. Fifth, the ultimate outcome achieved is the Herfindahl-Hirschman Index (HHI) value. Sixth, the significance of the obtained HHI value was analyzed based on the specified category: 1) Markets with less than 1,500 competitors are considered to be extremely competitive; 2) Markets with a level of competition ranging from 1,500 to 2,500 are considered moderately competitive; 3) More than 2,500: an uncompetitive market or an oligopoly or monopoly.

The categorization of banks was assessed through the use of binary variables; conventional banks will be assigned a value of 0, while Sharia banks will be assigned a value of 1.

The researchers initially conducted step-by-step data analysis to differentiate between different types of banks, such as conventional banks and Sharia banks. The second step was computing firm value utilizing Tobin's Q. The third step involved the calculation of Model Value Added Intellectual Capital (MVAIC) and Islamic Banking Value Added Intellectual Capital (IB-VAIC) to determine the company's performance. The fourth step was the computation of IT investment. The fifth step involved computing each control variable, such as corporation level, industry level, and banking type. Subsequently, the influence of IT investment and intellectual capital on firm value would be assessed while incorporating control variables at the corporate level, industry level, and bank type. Moreover, the data analysis in this study involved conducting a double regression analysis, which is a commonly used method, along with performing a traditional assumption test. The Generalized Method of Moment (GMM) was used with the regression model estimation technique in cases when the assumptions of normality and heteroskedasticity were not met prior to conducting the hypothesis test for the model.

Multiple linear regression analysis was employed as a statistical method to examine the impact of independent variables on dependent variables. The study used information technology investment as the independent variable, quantified by the ratio of intangible assets to total assets, as well as ICs using MVAIC and the iB-VAIC proxy. The research focused on measuring firm value using Tobin's Q proxy as the dependent variable. Additionally, control factors like corporate level, industry level, and banking type are considered. The statistical analysis model employed is formulated in Model 24.

$$\text{Firm value}_{it} = \alpha_0 + \beta_1 \text{IT Inv}_{it} + \beta_2 \text{IC}_{it} + \beta_3 \text{HCE}_{it} + \beta_4 \text{SCE}_{it} + \beta_5 \text{RCE}_{it} + \beta_6 \text{CEE}_{it} + \beta_8 \text{Lev}_{it} + \beta_9 \text{HHI}_{it} + \beta_{10} \text{Type Bank}_{it} + \varepsilon_{it} \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (24)$$

Where α is for Constant; β for Regression coefficient; IT Inv for Information Technology Investment; IC for Intellectual Capital; HCE for Human Capital Efficiency; SCE for Structural Capital Efficiency; RCE for Relational Capital Efficiency; CEE for Capital Employee Efficiency; Lev for leverage; HHI for Herfindahl Hirschman Index; Type Bank for Type Bank is dummy (1 for Sharia Bank and 0 for Conventional Bank).

Result and Discussion

Descriptive statistical analysis includes averages, minimum values, maximum values, and deviation standards of information technology investments, Intellectual Capital (IC), Human Capital Efficiency (HCE), Structural Capital Efficiency (SCE), Relational Capital Efficiency (RCE), Capital Employed Efficiency (CEE), corporate level, industry level, banking type, and Tobin's Q. The statistical descriptive results revealed the minimum value, maximum value, average (mean), and standard deviation. The minimum value is used to determine the smallest value of the data concerned, which varies from the

average, whereas the maximum value is applied to identify the largest value of that data. The mean or average is used in terms of identifying the average of the relevant data, and the deviation standard is used to identify how much the data in question varied from the mean. Descriptive statistical results can be seen in Table 1.

Table 1 Results of Descriptive Statistics

Variable	Mean	Min	Max	Std. Dev
TI Inv	0.003	9.242	0.068	0.007
IC	3.024	-12.525	159.120	10.920
HCE	9.470	-12.885	1619.571	111.390
SCE	0.373	-38.990	9.292	3.004
RCE	0.100	-0.694	15.516	1.071
CEE	0.022	-0.179	0.129	0.027
Corporate Level	0.719	0.040	1.042	0.237
Industry Level	0.003	5.938	0.067	0.011
Type Bank	0.071	0.000	1.000	0.257
Tobins`Q	2.205	0.059	65.934	7.031

The IT investment variable revealed a minimum value of 9.242 and a maximum value of 0,068. The average value was 0.003, and the default deviation was 0.007. The results of the analysis demonstrated that the average value of the sample was lower than the standard deviation value. The higher standard deviation value compared to the average indicates that the data deviation and value diversity of the sample company are relatively high.

The intellectual capital variable indicated a minimum value of -12,525 and a maximum value of 159,120. The results of the analysis showed that the average value of the sample was lower than the standard deviation value. The higher standard deviation figure compared to the average value indicates that the data deviation and diversity of the value of the sample company are relatively high.

The firm value variable, as measured by Tobin's Q, exhibited a minimum value of 0.059 and a maximum value of 65.934. The average value was 2.205, with a standard deviation of 7.031. The analysis revealed that the average value of the sample was lower than the standard deviation. The higher standard deviation compared to the average value indicates a relatively high degree of data variability and diversity among the sample companies.

The variables Human Capital Efficiency (HCE), Structural Capital Efficiency (SCE), Relational Capital Efficiency (RCE), and Capital Employed Efficiencies (CEE) showed that the minimum and maximum values varied. The average value of the sample was lower than the standard deviation value. The higher standard deviation figure compared to the average value indicates that the data deviation and diversity of the value of the sample company are relatively high.

The company-level variable displayed a minimum value of 0.040 and a maximum value of 1.042. The average value was 0.719, and the standard deviation was 0.237. The lower

standard deviation figure compared to the average value indicates that the data deviation and diversity of the value of the sample company are relatively low. Industry grade and bank type also indicated that minimum and maximum values varied. The average value of the sample was lower than the standard deviation value. The higher standard deviations compared to the average value indicate that the data deviation and diversity of the value from the sampling company are relatively high.

The normality assumption test was then conducted to determine whether the residual variable in a regression model followed a normal distribution. The Jarque Bera test can be used to determine if the distribution of residues is normal. A residual is considered to be normally distributed when the p-value of the Jarque Bera test is higher than the predetermined significance level (α = 0.05). Figure 4 are the outcomes of the normalcy assumption test conducted using the Jarque Bera method.

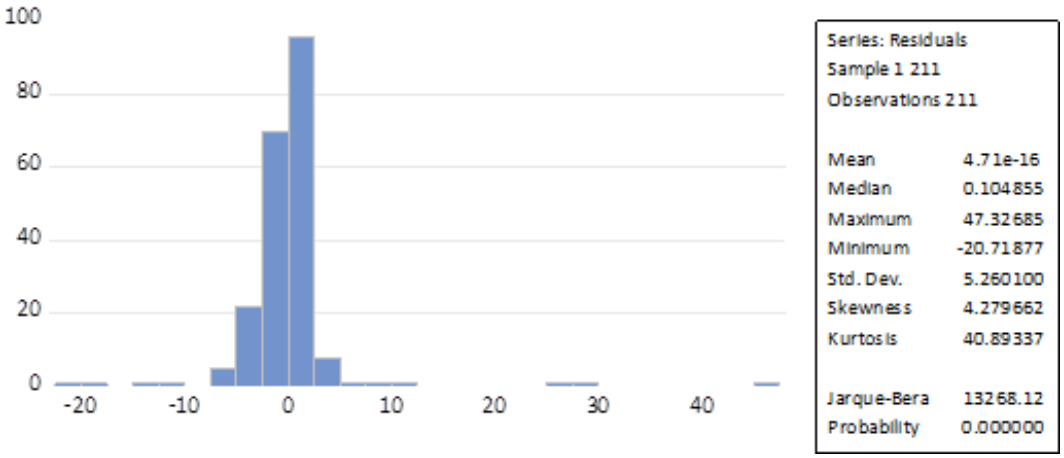

Figure 4 Jarque Bera Test

The normality assumption test conducted on the data presented in the figure above yielded a Jarque Bera statistic of 13268.12, accompanied by a p-value of 0.000. This outcome indicates that the p-value was less than the predetermined level of significance (α = 0.05). Consequently, the indicated residue did not follow a normal distribution. Therefore, the condition of normality was not realized.

The heteroskedasticity assumption was employed to ascertain if the residual generated by the regression model exhibited a uniform (constant) range. Testing the premise of heteroscedasticity involves examining if the residuals exhibit a consistent range. The glacier test would be conducted using the timeline data. According to the test criteria, if the p-value is greater than the level of significance (α = 5%), it is concluded that the residual is homogeneous. Table 2 are the findings from the heteroskedasticity assumption test.

Table 2 Results of Heteroskedasticity Assumption Test

Criteria	Value
Chi-Square	44.02072
p-value	0.000

From the data shown in Table 2, it is evident that the Chi-Square statistical value was 44.02072, accompanied by a p-value of 0.000. Given that the p-value was less than the alpha level of 5%, it can be inferred that the assumption of heteroskedasticity was not realized.

The purpose of the multicollinearity test is to determine whether there is a lack of correlation between the independent variables in the model. In a regression model, it is anticipated that independent variables exhibit no correlation with one another. In order to identify the absence of multicollinearity, it is possible to examine the variance inflation factor (VIF) value of each independent variable in relation to the dependent variable. If the VIF score is below 10, the model indicates the absence of multi-linearity symptoms. The results of the multicollinearity assumption test are displayed in the Table 3.

Table 3 Results of the Multicollinearity Test

Variable	VIF
MVAIC and iB-VAIC (IC)	1.085155
IT Investment	1.146615
HCE	1.005593
SCE	7.235475
RCE	7.221192
CEE	1.059478
Corporate Level	1.195882
Industry Level	1.048131
Type Bank	1.102506

Based on the data presented in Table 3, it is evident that all independent variables and controls had Variance Inflation Factor (VIF) values below 10. Therefore, the researchers could confidently infer that the assumption of multicollinearity was confirmed.

Moreover, the purpose of the autocorrelation assumption test is to ascertain the presence of correlation among the residuals produced by the regression model. The Breusch-Godfrey Serial Correlation LM Test was employed to assess the autocorrelation assumption. According to the test requirements, if the p-value is greater than the level of significance (α = 5%), it indicates the absence of an autocorrelation problem. Table 4 show the outcomes of the autocorrelation assumption test.

Table 4 The autocorrelation assumption test

Criteria	Value
F-statistics	0.226941
p-value	0.7972

From the provided table, it is evident that the statistical F-value was 0.226941, accompanied by a p-value of 0.7972. Given that the p-value was greater than the alpha level of 5%, the researchers might conclude that the assumption of non-autocorrelation was achieved.

Table 5 The Generalized Method of Moment (GMM) regression model with the Newey-West correction

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4.725439	2.889049	1.635638	0.1035
IC	0.049211	0.018430	2.670205	0.0082
IT Inv	527.3657	228.3245	2.309720	0.0219
HCE	0.000665	0.000249	2.677517	0.0080
SCE	0.189229	0.168163	1.125270	0.2618
RCE	0.386880	0.414439	0.933503	0.3517
CEE	34.55319	12.49973	2.764315	0.0062
Corporate Level	-7.656227	3.393392	-2.256217	0.0251
Industry Level	13.94826	8.072704	1.727831	0.0856
Type Bank	-0.810694	1.801122	-0.450105	0.6531

The GMM regression equation of the above estimates in Model 25.

According to the diagnostic test results, the above models did not satisfy the assumptions of normality and heteroscedasticity. Often, when conducting research with economic data, there is a common occurrence of violating the premise of heterogeneity. The reason for this is that time-series data exhibits a significant degree of volatility, resulting in a wide range of data values. To address the issue, the researchers employed the Generalized Method of Moment (GMM) regression model with the Newey-West correction to estimate the standard error model. This was done to acquire a resilient error standard in the face of data variability, ensuring the attainment of dependable model test outcomes. The software reviews provide an overview of the estimations, which are displayed in Table 5.

$$\text{Firm value} = 4.725439 + 527.3657\text{Inv TI}_{it} + 0.049211\text{MI}_{it} + 0.000665\text{HCEi}_{t} + 0.189229\text{SCE}_{it} + 0.386880\text{RCE}_{it} + 34.55319\text{CEE}_{it} + 13.94826\text{LEV}_{it} + 13.94826\text{HHI}_{it} - 0.810694\text{Tipe Bank}_{it} + \varepsilon_{it} \quad (25)$$

In order to determine the validity of the conditions of moment in the model, one can conduct tests such as the Hansen/J test or the Sargan test. Software EViews exclusively employs the J-test. Therefore, in this study, the researchers utilized the same test. The test requirements specify that if the p-value is greater than the level of significance (which is set at 0.05), the model is considered to have a valid condition of the moment. According to the data in Table 5, the statistical value of the J-test was 0.244720, and the

p-value was 0.620817. The test findings indicated that the p-value (0.620817) was higher than the predetermined level of significance (0.05), signifying that the model contained valid moment conditions.

The outcome of the Hypothesis 1 test is displayed in Table 5. The experiment that assessed the potential impact of the investment in information technology produced a numerical value of 2.309720 and a p-value of 0.0219. The test findings indicated a p-value of 0.0219, which is below the level of significance of 0.05. This suggests that the alpha 5% criterion was met, demonstrating a significant impact of technology investment on financial information performance. When examining the positive coefficient of 527.3657, it signifies that each incremental unit of investment in information technology can enhance firm value by 527,3657 units. Therefore, this outcome substantiates hypothesis 1, which posits that investments in information technology have a favorable effect on the firm value of banks.

Table 5 displays the test results for hypothesis 2. The test examining the influence of intellectual capital produced a t-count value of 2.670205 and a p-value of 0.0082. The test findings indicated a p-value of 0.0082, which is below the predetermined level of significance (0.05). This implies that, at a 5% alpha level, there was a statistically significant impact of intellectual capital on firm value. When the positive coefficient of 0.049211 is seen, it signifies that for every 1-unit gain in intellectual capital, there is a corresponding improvement of 0.049211 units in firm value. Therefore, this outcome corroborates hypothesis 2, which posits that intellectual capital exerts a favorable impact on the firm value.

The results of the test of hypothesis 2a of human capital efficiency (HCE) can be seen in Table 5. The test of influence hypotheses for HCE yielded a t-count value of 2.677517 with a p-value of 0.0080. The test results showed a p-value (0.0082) < level of significance (=0.05), which means that at the 5% alpha stated, there was a significant influence of the HCE on firm value. When viewed from the positive coefficient of 0.000665, it indicates that each increase of 1 HCE can improve firm value by 0.000665 units. Thus, this result supports hypothesis 2a, stating that human capital efficiency has a positive effect on firm value.

The result of the 2b test, Structural Capital Efficacy (SCE), can be seen in Table 5. The test of the SCE influence hypothesis yielded a t-count value of 1.125270 with a p-value of 0.2618. The test results showed a p-value (0.2618) > the level of significance (=0.05), which means that at alpha 5%, there was no significant influence of SCE on firm value; thus, the result of hypotheses 2b was not supported, which means that structural capital efficiency did not influence the firm value of the bank. Thus, the result of hypothesis 2b was not supported, which means relational capital efficiency does not influence firm value.

The test results of the H2c hypothesis showed a t-count of 0.933503 with a p-value of 0.3517, so it can be concluded that the H2c hypothesis was rejected, which means relational capital efficiency (RCE) did not influence firm value. It is assumed that the company is not in a position to manage business relationships or cooperation that can

provide benefits for both parties, so it cannot improve the firm value and value of the company.

Table 5 displays the findings of the H2d test for the Capital Employee Efficiency (CEE) hypothesis. The CEE influence test produced a t-statistic of 2.764315 and a p-value of 0.0062. The test results indicate that the p-value of 0.0062 was less than the level of significance of 0.05, demonstrating a substantial impact of CEE on firm value at the 5% alpha level. When the coefficient is positive at 34.55319, it means that for every 1 unit rise in CEE, the firm value improves by 34.55319 units. The results confirm the 2D hypothesis that the efficiency of capital employees positively affects the firm's value.

Furthermore, testing control variables at the corporate level, industry level, and banking type yielded distinct results for each proxy. The corporate-level control variables test resulted in a t-value of -2.256217 and a p-value of 0.0251. The test findings indicated a p-value of 0.0251, which is below the level of significance ($\alpha = 0.05$), suggesting a substantial impact on the firm value of the company at the 5% alpha level. The negative coefficient of -7.656227 suggests that for every 1 unit increase in the company's level, the firm value can decrease by 7.656227 units. In addition, the industry-level influence control variable test resulted in a t-score of 1.727831 with a p-value of 0.0856. The test results indicate that the p-value (0.0856) is greater than the level of significance (0.05), suggesting that at the 5% alpha level, there is no significant impact of the industry level on firm value. The test on the variable controlling the influence of the bank type returned a t-count value of -0.450105 with a p-value of 0.6531. The test findings indicate that the p-value (0.6531) is greater than the significance level (0.05), suggesting that at the specified 5% alpha level, there is no significant impact of the bank type on firm value.

The initial alternative hypothesis (H_1) in this study examined the influence of IT investment on firm value. As a result, it can be inferred that H_1 was supported, indicating that information technology investment impacted firm value. The findings of this study support the studies conducted (Dehning et al., 2005; Kohli et al., 2012; Sriram & Krishnan, 2003). Investments in information technology will transform the banking business model and drive banks to operate more efficiently (Thuy & Nguyen, 2021). Investments in information technology can decrease agency costs by enhancing operational efficiency, speeding up customer response times, boosting productivity, enhancing transparency and accountability, and enabling company owners to more precisely oversee managers' performance and reduce the risk of managerial abuse of power (Laudon, 2018).

This study's second alternative hypothesis (H_2) investigated the impact of intellectual capital on firm value. As such, it can be concluded that the accepted H_2 hypotheses impacted firm value. The findings corroborate the studies conducted (Susanti et al., 2021; Xu & Liu, 2020). Greater intellectual capital leads to increased financial performance (Inriana & Zulfikar, 2022; Syariati et al., 2018; Zehri et al., 2012). An organization proficient in managing its intellectual capital will prolong the company's longevity (Wernerfelt, 1984). It aligns with the resource-based paradigm, asserting that

organizations possessing valuable resources can gain a competitive edge and accomplish long-term objectives.

The test results indicated that human capital efficiency (HCE) had an impact on firm value, supporting the H_{2a} hypothesis. The test results confirmed Mehri et al. (2013) study, as corroborated by Nassar (2018) and Ozkan et al. (2017), indicating that HCE positively impacted business financial performance. High customer engagement is achieved through a strong customer-company relationship, which is facilitated by trained and competent personnel who excel in manufacturing and delivering goods and services (Rini & Boedi, 2016).

The test results for the H_{2b} hypothesis indicated that structural capital efficiency (SCE) did not impact firm value. This test's results contradict the findings of Kurfi et al. (2017), Nassar (2018), and Soriya and Narwal (2015), which suggested that SCE has a beneficial effect on firm value. This is evidenced by the fact that the adoption of technology and digital transformation has not been fully maximized. As a result, bank skimming remains a phenomenon, which means that customer security in transactions is still not entirely safe.

The test results for the H_{2c} hypothesis revealed that relational capital efficiency (RCE) also did not impact firm value. This test's results contradict the findings of Ulum et al. (2014). The results confirmed (Chen et al., 2005; Hejase et al., 2016; Hsu & Sabherwal, 2012). The corporation is seen to be unable to effectively handle business partnerships or collaborations that could be mutually beneficial, thereby hindering the enhancement of its financial performance, firm value, and worth.

Lastly, the test results for the H_{2d} hypothesis indicated that capital employee efficiency (CEE) had a positive effect on firm value, which was supported. The test results corroborated previous studies by Anggara, I, and Wiksuana (2018), Girma (2017), and Isanzu (2016), indicating that CEE positively influenced firm value. CEE is a metric designed for every unit of physical capital. Pulic posits that if one unit of employed capital generates a higher return than another company, the company is more proficient in utilizing its physical assets (A Pulic, 1998). One investment in CEE that can be made is by budgeting funds for education and training for employees so that they can develop the knowledge and skills they possess (Nurhayati, 2017).

Conclusion

Based on the analysis and discussion presented, it has been found that the strategic use of information technology investment can transform a bank's business system, leading to increased efficiency. This includes faster response times to customer requests, enhanced productivity, greater transparency, and improved accountability. Additionally, it enables company owners to better monitor managers and reduce potential misuse of power (Laudon, 2018; Thuy & Nguyen, 2021). Lower operating costs resulting from these improvements will enhance financial performance. This improved performance

provides positive signals to investors through attractive stock prices. The findings of this study support signaling theory in addressing conflicts of interest among owners, management, and stakeholders.

In practice, the implications of this research can provide information to investors as one of their considerations in determining investment decisions, avoiding the possibility of adverse investments. The Board of Commissioners can be involved in enhancing the supervision of IT investments, encourage banks to consider the right type of banking based on market conditions and company characteristics, encourage banking to innovate in the use of information technology, and introduce new products that can meet the needs of customers. For regulators, the results of this study could be considered in regulating information technology investments. This is to detect the risks that may jeopardize performance and establish appropriate measures to address those risks.

This research has certain limitations that create opportunities for further research. First, this research was limited to the financial statements presented by the company, so some necessary data were not available. Second, this research was limited to banking in Indonesia, so the samples used were also limited, and there was no comparison. Hence, further research is expected to extend the research to other countries. In addition, the variable of good corporate governance can be added so that it can determine the impact of corporate management mechanisms on different aspects of intellectual capital. Finally, macroeconomic factors linked to fiscal policy will directly affect banking credit distribution patterns and result in different performance patterns.

References

Anggara, W., & Wiksuana, I. G. B. (2018). Pengaruh intellectual capital terhadap kinerja keuangan pada subsektor hotel, restoran, dan pariwisata. *E-Jurnal Manajemen Universitas Udayana, 7*(2), 864–891. https://doi.org/10.24843/EJMUNUD.2018.v7.i02.p06

Arikan, A. M., & Barney, J. B. (2006). Competitive advantages and the resource-based view of the firm. *Journal of Management, 32*(1), 124–149. https://doi.org/10.1177/0149206305279595

Astari, N. K., Suryanawa, I. K., & Ketut, I. (2017). Faktor-faktor yang mempengaruhi manajemen laba. *E-Jurnal Akuntansi Universitas Udayana, 20*(1), 290–319.

Bartlett, R., & Partnoy, F. (2018). The misuse of Tobin's Q. *UC Berkeley Public Law Research Paper.* https://doi.org/10.2139/ssrn.3118020

Bontempi, M. E., & Mairesse, J. (2008). Intangible capital and productivity: An exploration on a panel of Italian manufacturing firms. *National Bureau of Economic Research Working Paper Series, No. 14108*. https://doi.org/10.3386/w14108

Caesaria, S. D. (2023, May 18). Kasus peretasan BSI, dosen Unair jelaskan ciri-ciri ransomware. *Kompas.com.* Retrieved from https://www.kompas.com/edu/read/2023/05/18/141700471/kasus-peretasan-bsi-dosen-unair-jelaskan-ciri-ciri-ransomware?page=all

Chen, M. C., Cheng, S. J., & Hwang, Y. (2005). An empirical investigation of the relationship between intellectual capital and firms' market value and financial performance. *Journal of Intellectual Capital, 6*(2), 159–176. https://doi.org/10.1108/14691930510592771

CNBC Indonesia. (2019, July 30). Sistem eror, uang Rp 10 miliar Bank Mandiri "raib". Retrieved from https://www.cnbcindonesia.com/market/20190730121356-19-88531/sistem-eror-uang-rp-10-miliar-bank-mandiri-raib

Dehning, B., Richardson, V. J., & Stratopoulos, T. (2005). Information technology investments and firm value. *Information & Management, 42*(7), 989–1008. https://doi.org/10.1016/j.im.2004.11.003

DePamphilis, D. M. (2019). The regulatory environment. In *Mergers, Acquisitions, and Other Restructuring Activities* (10th ed., pp. 35–63). Academic Press. https://doi.org/10.1016/B978-0-12-815075-7.00002-4

Farouk, B. K. U., & DanDago, K. I. (2015). Impact of investment in information technology on financial performance of Nigerian banks: Is there a productivity paradox? *Journal of Internet Banking and Commerce, 20*(1), 1–22.

Federal Deposit Insurance Corporation (FDIC). (2023). Failed bank information for Silicon Valley, Santa Clara, CA [Press release]. Retrieved from https://www.fdic.gov/resources/resolutions/bank-failures/failed-bank-list/silicon-valley.html

Ftiti, Z., Nafti, O., & Sreiri, S. (2013). Efficiency of Islamic banks during subprime crisis: Evidence of GCC countries. *Journal of Applied Business Research, 29*(1), 285–304. https://doi.org/10.19030/jabr.v29i1.7615

Fu, X. M., Lin, Y. R., & Molyneux, P. (2014). Bank competition and financial stability in Asia Pacific. *Journal of Banking & Finance, 38*, 64–77. https://doi.org/10.1016/j.jbankfin.2013.09.012

Ginting, M. C., & Sagala, L. (2020). Pengaruh modal intelektual terhadap nilai perusahaan (Studi kasus pada perusahaan manufaktur yang terdaftar di Bursa Efek Indonesia periode tahun 2017-2019). *Jurnal Manajemen, 6*(1), 45–56.

Girma, B. (2017). Intellectual capital efficiency and its impact on financial performances of Ethiopian commercial banks. *Research Journal of Finance and Accounting, 8*(8), 1–10.

Gunawan, H., & Serlyna, S. (2018). Impact of information technology investment to financial performance on banking sector. *Journal of Applied Managerial Accounting, 2*(1), 41–46. https://doi.org/10.30871/jama.v2i1.700

Hansen, L. P. (1982). Large sample properties of generalized method of moment estimators. *Econometrica, 50*(4), 1029–1054. https://doi.org/10.2307/1912775

Hejase, H. J., Hejase, A. J., Tabsh, H., & Chalak, H. C. (2016). Intellectual capital: An exploratory study from Lebanon. *Open Journal of Business and Management, 4*(4), 571–605. https://doi.org/10.4236/ojbm.2016.44061

Hsu, I.-C., & Sabherwal, R. (2012). Relationship between intellectual capital and knowledge management: An empirical investigation. *Decision Sciences, 43*(3), 489–524. https://doi.org/10.1111/j.1540-5915.2012.00357.x

Hutabarat, F. M., & Senjaya, V. F. (2016). Tobin's Q analysis as an indicator used in measuring and analyzing banking industry of companies listed in Kompas100 period 2010-2014. In *Prosiding Seminar Nasional INDOCOMPAC* (pp. 1–10).

Inriana, I., & Zulfikar, Z. (2022). Intellectual capital efficiency and performance of conventional banks in Indonesia. *The International Journal of Business & Management, 10*(2), 209–217. https://doi.org/10.24940/theijbm/2022/v10/i2/BM2202-026

Isanzu, J. N. (2016). The relationship between intellectual capital and financial performance of banks in Tanzania. *Research Journal of Finance and Accounting, 7*(1), 28–38.

Kieso, D. E., Weygandt, J. J., Warfield, T. D., Wiecek, I. M., & McConomy, B. J. (2019). *Intermediate accounting* (10th ed., Vol. 1). John Wiley & Sons.

Kohli, R., Devaraj, S., & Ow, T. T. (2012). Does information technology investment influence a firm's market value? A case of non-publicly traded healthcare firms. *MIS Quarterly, 36*(4), 1145–1163. https://doi.org/10.2307/41703502

KOMPAS. (2023). Kasus BSI bukti keamanan siber di Indonesia lemah, dari skala satu sampai 10 skornya 3. Retrieved from https://www.kompas.tv/nasional/409259/kasus-bsi-bukti-kemanan-siber-di-indonesia-lemah-dari-skala-satu-sampai-10-skornya-3?page=all

Kurfi, S. U. A., Udin, N. M., & Bahamman, S. M. (2017). The impact of intellectual capital on the financial performance of listed Nigerian food products companies. *Journal of Accounting and Taxation, 9*(11), 147–160. https://doi.org/10.5897/JAT2017.0246

Kwabi, F. O., Boateng, A., & Du, A. (2020). Impact of central bank independence, transparency and institutional quality on foreign equity portfolio allocation: A cross-country analysis. *International Review of Financial Analysis, 72*, 101464. https://doi.org/10.1016/j.irfa.2020.101464

Laudon, K. C., & Laudon, J. P. (2018). *Management information systems: Managing the digital firm* (15th ed.). Pearson Education.

Mehri, M. G., Umar, M. S., Saeidi, P., Hekmat, R. K., & Naslmosavi, S. (2013). Intellectual capital and firm performance of high intangible intensive industries: Malaysia evidence. *Asian Social Science, 9*(9), 146–159. https://doi.org/10.5539/ass.v9n9p146

Montgomery, H., Harimaya, K., & Takahashi, Y. (2014). Too big to succeed? Banking sector consolidation and efficiency. *Journal of International Financial Markets, Institutions and Money, 32*, 86–106. https://doi.org/10.1016/j.intfin.2014.05.005

Munawir, S. (2010). *Analisa laporan keuangan* (4th ed.). Liberty.

Nabila, F., Surasni, N. K., & Husnan, L. H. (2021). Pengaruh intellectual capital dan struktur modal terhadap nilai perusahaan dengan profitabilitas sebagai variabel pemediasi. *Jurnal EMBA, 9*(2), 162–172.

Namaki, A., Raei, R., Asadi, N., & Hajihasani, A. (2019). Analysis of Iran banking sector by multi-layer approach. *Iranian Journal of Finance, 3*(1), 73–89.

Nassar, S. (2018). The impact of intellectual capital on firm performance of the Turkish real estate companies before and after the crisis. *European Scientific Journal, 14*(1), 29–45. https://doi.org/10.19044/esj.2018.v14n1p29

Nurhayati, S. (2017). Analisa pengaruh intellectual capital terhadap kinerja pasar dan kinerja keuangan pada perusahaan LQ45 yang terdaftar di Bursa Efek Indonesia periode tahun 2010-2013. *Jurnal ASET (Akuntansi Riset), 9*(1), 97–112. https://doi.org/10.17509/jaset.v9i1.5260

Nurmutia, E. (2023). 10 asal muasal Silicon Valley bank bangkrut. Retrieved from https://www.liputan6.com/saham/read/5235489/10-asal-muasal-silicon-valley-bank-bangkrut-begini-kronologinya?page=2

Oktabrina, S. S., & Inggarwati, K. (2022). The effect of investment opportunity set and managerial ownership on company value with debt policy as intervening variables. *Journal of Economics, Business and Accounting, 5*(2), 1–15. https://doi.org/10.31539/costing.v5i2.23811

Ozkan, N., Cakan, S., & Kayacan, M. (2017). Intellectual capital and financial performance: A study of the Turkish banking sector. *Borsa Istanbul Review, 17*(3), 190–198. https://doi.org/10.1016/j.bir.2016.03.001

Pérez-Martín, A., Pérez-Torregrosa, A., & Vaca, M. (2018). Big data techniques to measure credit banking risk in home equity loans. *Journal of Business Research, 89*, 448–454. https://doi.org/10.1016/j.jbusres.2018.02.008

Pruitt, S. W., & Gitman, L. J. (1991). The interactions between investment, financing, and dividend decisions of major US firms. *Financial Review, 26*(3), 409–430. https://doi.org/10.1111/j.1540-6288.1991.tb00388.x

Pulic, A. (1998). Measuring the performance of intellectual potential in knowledge economy. *2nd McMaster World Congress on Measuring and Managing Intellectual Capital by the Austrian Team for Intellectual Potential*, 1–20.

Pulic, A. (2000). MVA and VAIC™ analysis of randomly selected companies from FTSE 250. *Austrian Intellectual Capital Research Center*.

Pulic, A., & Kolakovic, M. (2003). Value creation efficiency in the new economy. *Global Business and Economics Review, 5*(1), 111–128. https://doi.org/10.1504/GBER.2003.006201

Putri, A. J., Agustin, H., & Helmayunita, N. (2019). Pengaruh intellectual capital terhadap nilai perusahaan dengan profitabilitas sebagai variabel intervening. *Jurnal Eksplorasi Akuntansi, 1*(3), 1350–1365. https://doi.org/10.24036/jea.v1i3.161

Revinka, S. (2021). Pengaruh pandemi Covid-19 terhadap nilai perusahaan pada sebelas sektor di Bursa Efek Indonesia (BEI). *Jurnal Acitya Ardana, 1*, 145–163.

Rhoades, S. A. (1993). The Herfindahl-Hirschman Index. *Federal Reserve Bulletin, 79*, 188–189.

Rini, S., & Boedi, S. (2016). Pengaruh intellectual capital terhadap kinerja keuangan perbankan. *Jurnal Manajemen dan Akuntansi, 17*(1), 77–86.

Safiullah, M., & Shamsuddin, A. (2019). Risk-adjusted efficiency and corporate governance: Evidence from Islamic and conventional banks. *Journal of Corporate Finance, 55*, 105–140. https://doi.org/10.1016/j.jcorpfin.2018.08.009

Sayyidah, U., & Saifi, M. (2017). Pengaruh intellectual capital terhadap nilai perusahaan dengan profitabilitas sebagai variabel moderasi. *Jurnal Administrasi Bisnis, 46*(1), 163–171.

Setiawan, S. R. D., & Ika, A. (2018, March 22). OJK: Bank harus ganti rugi dana nasabah korban "skimming". *Kompas.com*. Retrieved from https://ekonomi.kompas.com/read/2018/03/22/101500926/ojk--bank-harus-ganti-rugi-dana-nasabah-korban-skimming-

Soriya, S., & Narwal, K. P. (2015). Intellectual capital performance in Indian banks: A panel data analysis. *International Journal of Learning and Intellectual Capital, 12*(2), 103–121. https://doi.org/10.1504/IJLIC.2015.068983

Spence, M. (1973). Job market signaling. *The Quarterly Journal of Economics, 87*(3), 355–374. https://doi.org/10.2307/1882010

Sriram, R. S., & Krishnan, G. V. (2003). The value relevance of IT investments on firm value in the financial services sector. *Information Resources Management Journal, 16*(1), 46–61. https://doi.org/10.4018/irmj.2003010104

Susanti, N., Widajatun, V., Sumantri, M., & Nugraha, N. (2021). Implications of intellectual capital financial performance and corporate values (Studies on goods and consumption sector 2013–2017 period). *International Journal of Research in Business and Social Science, 10*(3), 62–69. https://doi.org/10.20525/ijrbs.v10i3.1106

Syariati, A., Abdullah, W., & Almin, A. (2018). Apakah intellectual capital meningkatkan kinerja keuangan dan nilai perusahaan? *Unej E-Proceeding, 1*(1), 1–10.

Tangngisalu, J. (2021). The impact of intellectual capital on company value. *Jurnal Manajemen Bisnis, 8*(2), 189–200. https://doi.org/10.33096/jmb.v8i2.771

Thangavelu, S., & Jyotishi, A. (2017). Influence of R&D and IPR regulations on the performance of IT firms in India: An empirical analysis using Tobin's Q approach. In *Proceedings of the 2017 ACM SIGMIS Conference on Computers and People Research* (pp. 73–79). https://doi.org/10.1145/3084381.3084400

Thuy, V. T. N., & Nguyen, T. T. (2021). ICT and bank performance: Empirical evidence from Vietnam. *Journal of Contemporary Issues in Business and Government, 27*(2), 4150–4165. https://doi.org/10.47750/cibg.2021.27.02.433

Trad, N., Trabelsi, M. A., & Goux, J. F. (2017). Risk and profitability of Islamic banks: A religious deception or an alternative solution? *European Research on Management and Business Economics, 23*(1), 40–45. https://doi.org/10.1016/j.iedeen.2016.09.001

Ulum, I. (2008). Intellectual capital and financial return of listed Indonesian banking sector. In *Proceeding International Research Seminar and Exhibition* (pp. 1–17). Lemlit UMM.

Ulum, I. (2013). iB-VAIC: Model pengukuran kinerja intellectual capital perbankan syariah di Indonesia. *Jurnal Inferensi, 7*(1), 185–206. https://doi.org/10.18326/infsl3.v7i1.185-206

Ulum, I., Ghozali, I., & Purwanto, A. (2014). Intellectual capital performance of Indonesian banking sector: A modified VAIC (M-VAIC) perspective. *Asian Journal of Finance & Accounting, 6*(2), 103–123. https://doi.org/10.5296/ajfa.v6i2.5246

W, G. (2012). *Econometrics analysis* (7th ed.). Pearson Prentice Hall.

Wang, G.-J., Xie, C., Zhao, L., & Jiang, Z.-Q. (2018). Volatility connectedness in the Chinese banking system: Do state-owned commercial banks contribute more? *Journal of International Financial Markets, Institutions and Money, 57*, 205–230. https://doi.org/10.1016/j.intfin.2018.07.008

Wernerfelt, B. (1984). A resource-based view of the firm. *Strategic Management Journal, 5*(2), 171–180. https://doi.org/10.1002/smj.4250050207

Xu, J., & Liu, F. (2020). The impact of intellectual capital on firm performance: A modified and extended VAIC model. *Journal of Competitiveness, 12*(1), 161–176. https://doi.org/10.7441/joc.2020.01.10

Yohana, S., & Suhendah, R. (2023). The effect of profitability, leverage, and firm size on sustainability report disclosure. *Jurnal Akuntansi, 27*(3), 525–545. https://doi.org/10.24912/ja.v27i3.1481

Zehri, C., Abdelbaki, A., & Bouabdellah, N. (2012). How intellectual capital affects a firm's performance? *Australian Journal of Business and Management Research, 2*(8), 24–31. https://doi.org/10.52283/NSWRCA.AJBMR.20120208A04

About the Authors

Ariny Maghfiroh (A.M.) – is a graduate student at Department of Accounting, Faculty of Economics and Business, Universitas Brawijaya, East Java, Indonesia. Email address: arinym92@gmail.com

Erwin Saraswati (E.S.) – is a lecturer at Department of Accounting, Faculty of Economics and Business, Universitas Brawijaya, East Java, Indonesia. Email address: erwin@ub.ac.id

Endang Mardiati (E.M.) – is a lecturer at Department of Accounting, Faculty of Economics and Business, Universitas Brawijaya, East Java, Indonesia. Email address: endang@ub.ac.id

Author Contributions

Conceptualisation, A.M.; Methodology, A.M.; Investigation, A.M.; Analysis, A.M.; Original draft preparation, A.M.; Review and editing, A.M. and E.S. and E.M.; Visualization, A.M.; Supervision, E.S. and E.M.

Conflicts of Interest

The authors declare no conflict of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript, or in the decision to publish the results.