



# “Exploring the digital transformation impacts on bank profitability in Indonesia: A textual and sentiment analysis approach”

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# EXPLORING THE DIGITAL TRANSFORMATION IMPACTS ON BANK PROFITABILITY IN INDONESIA: A TEXTUAL AND SENTIMENT ANALYSIS APPROACH

## Abstract

The rapid advancement of digital transformation has brought significant changes to the banking industry, raising questions about its impact on financial performance. This study aims to analyze the effects of digital transformation on the profitability of Indonesian commercial banks listed on the Indonesia Stock Exchange (IDX) during the 2018–2023 period. Utilizing a sample of 216 observations derived from 47 banks listed on the Indonesia Stock Exchange, the study employed quantitative panel data regression techniques to assess the relationship between digital transformation and key financial metrics, with the data structure as an unbalanced panel. The findings indicate that digital transformation measured through textual analysis negatively and significantly impacts both ROA and ROE, with coefficients of  $-0.202$  ( $p$ -value = 0.001) and  $-1.022$  ( $p$ -value = 0.022), respectively. Digital transformation measured through sentiment analysis negatively and significantly affects ROA with a coefficient of  $-0.746$  ( $p$ -value = 0.044), though it does not significantly impact ROE (coefficient =  $-1.740$ ,  $p$ -value = 0.423). The resource-based view emphasizes that strategic resource planning and intelligent resource allocation are required to convert digital transformation initiatives into a sustainable competitive advantage that generates profitability. These results highlight that while digital transformation initiatives may enhance operational efficiency, they come with short-term costs to profitability. The study also underscores the importance of aligning digital transformation strategies with long-term financial objectives to ensure sustainable growth and profitability in the banking sector.

## Keywords

financial performance, banking sector, textual analysis, sentiment analysis, innovation, operational efficiency, Indonesian banks

## JEL Classification

G21, M15, O32, L25, O36

## INTRODUCTION

In today's rapidly evolving world, businesses are constantly adapting to changes driven by external forces, like technological advancements, which profoundly impact their performance on a global scale. Most businesses adopt new technologies to enhance their value creation, helping them stay competitive in a dynamic market (Jeza & Lekhanya, 2022). As a result, digital transformation has become a significant trend (Nguyen-Thi-Huong et al., 2023), particularly in the banking industry, where it fosters growth and strengthens competitiveness. Embracing digital transformation has become essential for both nations and businesses alike. However, this process requires structural changes and addressing numerous challenges along the path to successful implementation (Gomes et al., 2019). Successfully navigating digital transformation requires strategic planning and a willingness to adapt core processes (Eyieyien et al., 2024).



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Data from the Central Bank of Indonesia revealed that digital banking transactions in Indonesia's banking industry transformed by 158% from January 2018 to April 2023. The transaction value rose from IDR 1,500 trillion at the beginning of 2018 to IDR 4,200 trillion by the end of April 2023 (Ahdiat, 2023), meaning that digital banks' presence is inevitable. The rapid advancement of technology has led to the opening of markets and intensified competition among economic and commercial enterprises, each striving for excellence to secure its survival and longevity in the market (Afaishat et al., 2024). Not only does this transition facilitate convenience, but it also caters to changing consumer expectations of readily available and efficient services. Customer engagement and satisfaction have improved due to more immediate access to banks, quality of service information, and services available through innovations in digital banking (e.g. mobile applications) (Trani & Tran, 2024). Automation and digital tools have simplified banking procedures, allowing financial institutions to accommodate more customers productively while reducing operational costs (Mohamud & Farah, 2023). In the midst of this digitization trend, digital banking improvement has become a road that Indonesian banks can no longer avoid. This shift demands that banks adopt digital solutions and integrate them into their core strategies to remain relevant and sustain profitability in a dynamic economic environment.

## 1. LITERATURE REVIEW AND HYPOTHESES

Resource-based view (RBV) is a theory that can explain how to create competitive advantages for a firm (Kuncoro & Kristiaji, 2006). The RBV theory conceptualizes an organization as the collection of assets that are 'semi-permanently' associated with a firm (Wernerfelt, 1984). This theory explains the internal factors that turn into a sustainable competitive advantage for a company (Kraaijenbrink et al., 2010). It can be anything, for instance, brand, technological expertise, qualified employees, equipment, etc. (Wernerfelt, 1984). The primary idea of the resource-based view (RBV) theory assumes that for a company to have attained and sustained competitive advantage, the firm must possess resources and capabilities that can be valued, rare, inimitable, and non-substitutable (cannot be replaced) (Barney, 1991). The company's resources and capabilities are limited compared to their competition, therefore achieving strategic success by exploiting what they have (Salsabila et al., 2022). According to Maatman et al. (2010), as long as company leaders set their background and experience, it generates advantages that are difficult for other companies to imitate or find the oppositional capabilities; therefore, value the forefront and a sustainable competitive advantage can be built.

Digital transformation is defined as using new digital technologies to enhance business operations, improve operational processes, and enrich customer experiences. It has been extensively

studied as a key driver of organizational change and innovation. It also focuses on innovating business models to create greater organizational value and is reflected and expressed in annual reports (Nguyen-Thi-Huong et al., 2023). According to Hinings et al. (2018), digital transformation can be an aggregation effect of several innovations. It involves participants, structures, practices, values, and beliefs at organizational, industry, and field levels that disrupt or transform existing norms with innovative ideas (Huang & Cheng, 2024; Mergel et al., 2019; Nadkarni & Prügl, 2021). While digital transformation aims to deliver strategic advantages, studies reveal a mixed picture of its success. Zhai et al. (2022) highlighted that the benefits are not uniformly realized across organizations, with many failing to meet performance expectations. Based on a survey of 800 companies in eight Asia Pacific countries, including Indonesia (Baker McKenzie, 2022), while only one-third of respondents said they had successfully monetized new technology, 58% reported budget as a significant challenge for implementing digital transformation. This financial hurdle, along with the cost-benefit problems such as switch-over costs, employee reskilling, and time investment factors, has slowed down the wheels of transformation. However, for companies that manage to overcome those challenges, a vital contribution is possible in terms of cost reduction and increasing productivity (Schallmo et al., 2017; Zhai et al., 2022).

Several studies have examined digital transformation within both companies and banks. Multiple

studies indicate that digital transformation positively affects organizational performance (Huang & Cheng, 2024; Surahman et al., 2023; Zhai et al., 2022). Xie and Wang (2023) propose that digital transformation enhances business performance and operational efficiency in banks by positively influencing the profitability of deposit and loan services. When implemented successfully, digital transformation can lead to many positive business outcomes. Similarly, Akter et al. (2022) noted that successful implementation of digital strategies leads to benefits such as improved decision-making processes, cost reduction, higher productivity, and enhanced operational efficiency.

Studies on digital transformation in SMEs offer insights into business growth, customer retention, and market accessibility if digital technologies are introduced to their full extent (Jeza & Lekhanya, 2022; Surahman et al., 2023). In the banking sector, Afaishat et al. (2024) emphasized that adopting digital strategies can enhance competitive advantage and indirectly boost profitability by improving operational efficiency and customer satisfaction. However, other studies indicate that digital transformation takes a considerable duration of time to show its influence on firm-level performance (Beccalli, 2007; Kriebel & Debener, 2019; Nguyen-Thi-Huong et al., 2023). Nguyen-Thi-Huong et al. (2023) stated that while digital transformation is anticipated to increase operational efficiency and improve customer service, significant upfront expenses and difficulties implementing technology frequently result in a short-term drop in profitability. This is called the “profitability paradox”, whereby banks use technology to increase efficiency. Still, the expected profit advantages are only sometimes realized due to competitive pressures and the significant investments needed for digitization.

This study focused on the frequency of relevant keywords in their annual financial reports. The words and their frequency and presence in the banks’ reports allow the extent of a bank’s progress in digital transformation to be quantified. The more frequently these terms appear in the reports, the greater the implication that the bank is actively engaging in digital transformation as defined. This approach facilitates a structured assessment of a bank’s willingness to adopt and embed digital technologies across

its business and service offerings based on the language recorded in its official statements (Nguyen-Thi-Huong et al., 2023). Measuring digital transformation through textual analysis by counting the frequencies of digital transformation keywords in the annual reports offers a direct measure of digital transformation attention across the industry, allows for consistent tracking over time, and relies on data readily available in the public domain, reflecting how banks think about and prioritize their digital transformation initiatives alongside other business objectives. Python is used to perform text analysis with a predefined set of keywords, which counts the frequencies of these keywords across the reports. Digital transformation is described by keywords related to digital transformation, like information systems, big data, the internet of things, digitalization, artificial intelligence, cyber security, etc. Keywords about digital transformation will reflect the level of digital transformation in IDX commercial banks. The natural logarithm of the final word count +1 was then used to measure digital transformation (DTK) (Zhai et al., 2022).

Further advancements in measuring digital transformation include the use of sentiment analysis. For instance, a study by Makowska-Tlomak et al. (2021) utilized sentiment analysis to examine help desk ticket data, identifying negative emotions and tracking their frequency relative to the number of tickets submitted. Moreover, this study utilizes sentiment analysis to derive the degree of digital transformation. Sentiment analysis is a method that aims to take out the emotional details through different texts and categorize the polarity of the sentiment. This can offer insights into how stakeholders communicate effectively and adapt digitally. It provides clues about the emotional side of digital transformation efforts. Each sentence is broken down to find sentiment scores per word using the Valence Aware Dictionary and Sentiment Reasoner (VADER) in Python. The reason for using VADER is that it employs a human-friendly approach by assessing the effect each word will have on the overall sentiment and capturing the meanings conveyed by punctuation marks within that text (Camodeca et al., 2018).

Building on these insights, this study aims to examine the impact of digital transformation on bank profitability in Indonesia, focusing on re-

turn on assets (ROA) and return on equity (ROE) as key indicators. Employing textual and sentiment analysis to measure digital transformation, this research seeks to uncover the nuanced relationship between digital strategies and financial performance in the Indonesian banking sector. Therefore, the research hypotheses are put forward as follows:

- H1: *Digital transformation measured with textual analysis (DTK) has a negative impact on return on assets (ROA).*
- H2: *Digital transformation measured with textual analysis (DTK) has a negative impact on return on equity (ROE).*
- H3: *Digital transformation measured with sentiment analysis (DTS) has a negative impact on return on assets (ROA).*
- H4: *Digital transformation measured with sentiment analysis (DTS) has a negative impact on return on equity (ROE).*

## 2. METHODOLOGY

This study adopts an empirical approach to investigate the effect of digital transformation on bank profitability in Indonesia using secondary data. The research seeks to explain the relationship between digital transformation and financial performance. Data were sourced from the annual

reports of 47 banks listed on the Indonesia Stock Exchange (IDX) between 2018 and 2023, capturing variables such as digital transformation keywords (DTK), digital transformation sentiment (DTS), ROA, ROE, and control variables like employee productivity (EPD), firm age (FAG), loan-to-asset ratio (LAR), and capital adequacy ratio (CAR). The study's population consists of 47 banks, with a final dataset of 216 observations after accounting for missing or incomplete data.

Table 1 explains the variables used in this study to capture the impact of digital transformation on bank profitability. In this study, digital transformation is measured through two indicators: textual analysis (DTK), which utilizes the natural logarithm of the total number of related keywords associated with digital transformation (Chen & Hao, 2022; Nguyen-Thi-Huong et al., 2023; Xie & Wang, 2023), and sentiment analysis (DTS), which assigns values of +1 for positive, 0 for neutral, and -1 for negative sentiments (Huang & Kuo, 2024). Bank performance in terms of profitability is defined by return on assets (ROA) and return on equity (ROE). Pre-tax income over number of employees describes Employee productivity (EPD); Firm age (FAG) is the sum of years in operation for a company. The loan-to-asset ratio (LAR) is the proportion of loans to total assets, and the capital adequacy ratio (CAR) is collected from equity capital divided by risk-weighted assets (expressed in percentage). It offers a framework for assessing the effects of digital transformation on the economy.

**Table 1.** Measurement items

Variables	Indicator
Digital Transformation – Textual Analysis (DTK) (Chen & Hao, 2022; Nguyen-Thi-Huong et al., 2023; Xie & Wang, 2023)	Natural logarithm (N + 1); N represents the total number of related words identified through keywords associated with digital transformation
Digital Transformation – Sentiment Analysis (DTS) (Huang & Kuo, 2024)	+1 = positive; 0 = neutral; -1 = negative
Bank Profitability (ROA & ROE) (Hery, 2023)	ROA = total income / total assets ROE = total income / total equity
Employee Productivity (EPD) (Oppong & Pattanayak, 2019)	Pre-tax income / number of employees.
Firm Age (FAG) (Rahman & Yilun, 2021)	Total years a company has been in operation since its establishment.
Loan to Asset Ratio (LAR) (Nugraha et al., 2019)	Loans / total assets
Capital Adequacy Ratio (CAR) (Sang, 2021)	(Equity capital / risk-weighted assets) · 100%

Based on the purpose of the model and the description of variables, data were collected from the annual reports and financial statements of commercial banks listed on the Indonesia Stock Exchange (IDX) using observation years from 2018 until 2023. Data about digital transformation will be gathered by analyzing the textual content in banks' annual reports. Collected data will be encrypted and put into STATA software version 17 for calculation and analysis.

### 3. RESULTS

Table 2 explains the steps in selecting data. The total number of companies listed in IDX during the 2018–2023 period is 901. The analysis focused explicitly on banking enterprises, as 854 companies were involved and needed to be focused on banking organizations alone, finally leaving 47 banking enterprises to analyze. Observing these banks over six years (2018 to 2023) resulted in a potential total of 282 observations. However, 66 observations were excluded due to incomplete data related to the study's variables, leaving a final dataset of 216 complete and valid observations used for the analysis.

Data collected were analyzed using STATA, a powerful and robust software for data panels. The descriptive analysis indicates that banks' mean Return on Assets (ROA) is 1.51 (maximum: 7.16

and minimum: 0.02). The average return on equity (ROE) lies at 7.61, ranging from 29.05 to a min of –6.84. Moreover, banks, on average, have a digital transformation score (DTK) of 4.374, and each bank used an average of 79 words to discuss digital transformation in their annual report. Its score ranges to 5.72 (480 words) and down fringe lip to 1.61 (four words). Table 3 shows that the digital transformation measured by sentiment analysis has a mean score of 0.235 with minimum and maximum values between –0.17 and 0.51, respectively. These scores suggest that perceptions around digital transformation, overall, are positive as the mean score (0) is above neutral. In particular, a negative score (from –1 to 0) implies a negative sentiment, zero represents neutrality, and scores ranging from 0 to 1 mean positive sentiment. Therefore, the terminal mean associated with a positive score represents the overall good perception of digital transformation among the analyzed banks.

This study investigates the hypothesis that digital transformation measured through textual analysis (DTK) negatively impacts return on assets (ROA). As presented in Table 4, the regression analysis reveals a coefficient of –0.202 for DTK, indicating a negative relationship with ROA. The associated p-value of 0.001 suggests that this result is statistically significant, supporting the hypothesis that an increase in digital transformation correlates with a decrease in ROA. Accordingly, the results

**Table 2.** Demographics

Description	Total
All the companies listed on the Indonesia Stock Exchange (IDX) during 2018–2023	901
Companies that are not in the banking sector	(854)
Banking sector enterprises listed on the IDX from 2018–2023	47
Companies in the banking industry listed on the IDX for the period 2018–2023 · 6 years	282
Companies without complete data related to the variables under investigation	(66)
Total observations	<b>216</b>

**Table 3.** Descriptive statistics

Variable	Mean	Std. dev.	Min.	Max.
ROA	1.513	1.337	0.02	7.16
ROE	7.615	6.735	–6.84	29.05
DTK	4.374	0.676	1.61	5.72
DTS	0.235	0.115	–0.17	0.51
EPD	335.539	392.520	–373.26	2206.57
FAG	49.671	25.155	4	125
LAR	0.949	0.526	0.05	5.29
CAR	34.939	36.158	10.78	329.09

**Table 4.** Hypotheses testing results for the dependent variable ROA

ROA (Dependent)	Coef.	P-Value
_cons	–	0.027
DTK (Independent)	–0.202	0.001***
DTS (Independent)	–0.746	0.044*
EPD (Controlling #1)	0.002	0.000***
FAG (Controlling #2)	0.001	0.829
LAR (Controlling #3)	0.570	0.165
CAR (Controlling #4)	0.003	0.423
Adjusted R Square	52.58%	–

Note: \*\*\* means significance at <1%. \* means significance at <10%.

**Table 5.** Hypotheses testing results for the dependent variable ROE

ROE (Dependent)	Coef.	P-Value
_cons	–	0.001
DTK (Independent)	–1.022	0.022*
DTS (Independent)	–1.740	0.423
EPD (Controlling #1)	0.115	0.000***
FAG (Controlling #2)	0.065	0.001***
LAR (Controlling #3)	–1.208	0.160
CAR (Controlling #4)	–0.030	0.000***
Adjusted R Square	58.06%	–

Note: \*\*\* means significance at <1%. \* means significance at <10%.

indicate that digital transformation can negatively affect banks' financial performance based on asset returns. This highlights that while digital transformation is essential for long-term competitiveness, its financial benefits may not materialize immediately, potentially straining short-term profitability. This underscores the need for careful strategic planning to balance innovation with sustainable financial outcomes.

Hypothesis 2 (*H2*) investigates the effect of digital transformation textual analysis (DTK) on return on equity (ROE). As shown in Table 5, the regression coefficient is –1.022, with a p-value of 0.022. Moreover, this p-value reflects the significant, hence negative, relationship between DTK and ROE. As a result, the results confirm the hypothesis that more robust digital transformation instead reduces banks' return on equity. According to this, although banks, as previously observed, are investing in digital initiatives, a considerable commitment and expenditure, these projects may not – or at least as yet – yield the expected positive financial results, suggesting a disconnect between investment and profit.

The third hypothesis (*H3*) investigates the impact of digital transformation, as measured by sentiment analysis (DTS), on return on assets (ROA).

As provided in Table 4, the coefficient for DTS is –0.746, with a p-value of 0.044. Such a low p-value demonstrates the statistically significant negative impact of sentiment analysis of digital transformation and ROA. This study indicates an increase in positive sentiment about digital transformation efforts corresponds directly to a decrease in bank's returns on assets. This could be representative of the high costs and resource requirements associated with early-stage digital transformation projects, which can drive down profitability ahead of generating any real benefit. It underscores the importance of banks adopting digital initiatives in a targeted way that ensures they drive positive sentiment and are complementary to financial performance targets to create sustainable profitability. This highlights the crucial need for banks to implement digital transformation effectively and manage it to foster positive sentiment, as reflected in annual reports, which can, in turn, positively impact ROA.

The fourth hypothesis (*H4*) examines the relationship between digital transformation measured through sentiment analysis (DTS) and return on equity (ROE). Table 5 demonstrates that DTS has a coefficient of –1.740 and a p-value of 0.423 within regression results. The p-value (0.086) indicates

that the relationship between sentiment analysis of digital transformation and ROE, although negative, does not have statistical significance. This finding suggests that digital transformation can affect equity returns differently, depending on implementation strategies or the cost structure, stakeholder expectations, etc. The results suggest that sentiment analysis on ROE could be fragile, and a more vital exploration of how stakeholders react to digitalization differently may help explain financial performance in banking.

## 4. DISCUSSION

The result of this study, indicating a significant and negative impact of digital transformation (measured through textual analysis) on return on assets, aligns with previous research (Nguyen-Thi-Huong et al., 2023). Specifically, the more digital transformation banks have undergone, the greater the negative return on assets they experienced. This result supports the idea that digital transformation decreases return on assets (ROA) (Beccalli, 2007). Previous studies also explained that digital transformation success often demands significant technological investments, new transaction standards, and numerous issues that may stumble the execution (Nguyen-Thi-Huong et al., 2023).

The findings of hypothesis *H2* indicate that DTK has a negative and significant impact on ROE. This negative aspect of this relationship could be explained by the enormous costs of technological investment and organizational restructuring for digitalization (Nguyen-Thi-Huong et al., 2023). While digital transformation aims to create efficiencies within an operation, these costs can erode profits based on shareholder equity. This phenomenon suggests that competition, where all market players operate with pre-existing technologies, may lead to higher efficiency without profit increases (Beccalli, 2007; Kriebel & Debener, 2019). Similarly, lower-than-expected outcomes from digitalization or implementation issues can drag down profitability further and drive return-on-equity (ROE) south. Prior studies show that in the early stages of transformation, there tends to be pressure on ROE as banks invest in digitalization for the long term, which will take time to reap the rewards (Nguyen-Thi-Huong et al., 2023).

The research findings indicate that digital transformation significantly negatively influences the return on assets (ROA) when assessed through keyword frequency. Likewise, evaluating digital transformation using sentiment analysis reveals a detrimental impact on ROA. This result is consistent with Jardak and Ben Hamad (2022), who state that digital transformation has a harmful influence on return on equity (ROE) since information technologies (IT) investments may take time to produce outcomes. Although a more significant proportion of IT assets means that long-run performance should increase, it also means that ROE in the short run must decline because only the market value of equity responds to the increasing cost efficiency. Despite the potential for success with digital transformation, banks incur high financial, human, and temporal costs in developing and maintaining the errors produced during its process. Hence, business results may seem better in the early phases of digital transformation. Still, the huge cost-side trade-offs with benefits make it impossible to ascertain whether these digital projects are era profitable or not. Bad digital transformation management is another contributing factor that can stem from a lack of a well-defined digital strategy (Westerman et al., 2012). In addition, the absence of an adequate degree of digital intelligence can amplify this adverse impact (Bughin & Zeebroeck, 2017). Those information technology investments are essential as they help eliminate delays in responding competitively and also aid in countering the challenges posed by new entrants into the market. However, companies need to immediately achieve the returns from these investments, thus explaining the negative relationship between digital transformation and ROA.

Additionally, the findings of this study indicate that digital transformation, as measured by sentiment analysis (DTS), does not have a statistically significant impact on Return on Equity (ROE). Therefore, *H4* in this study cannot be accepted. This phenomenon may arise because sentiment analysis primarily reflects perceptions or opinions regarding digital transformation as expressed in annual reports, which may not necessarily translate into tangible effects on a company's financial performance, particularly regarding equity returns. While positive or negative sentiments related to digitalization might represent manage-

ment or market perspectives, their influence on ROE can be more intricate and may take longer to manifest. The findings are not in line with the research by Xie and Wang (2023), which indicated a positive and significant relationship between digital transformation and ROE in the banking sector. Therefore, although digital transformation is crucial, its outcomes on ROE may take time to be apparent or quantifiable solely through sentiment analysis within annual reports.

Control variables in this study enable significant conclusions regarding factors affecting the financial performance of Indonesian banks to be drawn. The first control variable, Employee Productivity (EPD), has a statistically significant positive effect on ROA and ROE. The interpretation of this finding is that an increase in pre-tax income per employee, measured as employee productivity, positively affects profitability. Such a result corroborates that an effective workforce can improve a bank's profitability, consistent with Nguyen et al. (2019) and Zhenjing et al. (2022), also indicating the positive impact between employee output and firm performance. This implies that banks with higher productivity tend to be more profitable, as seen by sharp increases in ROA and ROE.

On the other hand, Loan to Asset Ratio (LAR), which is liquidity risk, does not influence both ROA and ROE significantly, suggesting that Indonesian banks manage liquidity risk properly, which is no substantial performance shift between both financial performances. Firm Age (FAG) has a positive and significant impact on ROE, which indicates that the older the bank is, the more profitable it is but does not have a substantial influence on profitability measured by ROA. Lastly, Capital Adequacy Ratio (CAR) does not influence ROA but has a strongly negative effect on ROE; even though a strong capital buffer may ensure the bank's stability, it might limit the return on equity, which ex-

poses the trade-off between security and profit.

While digital technology can be a strategic resource supporting competitive advantage, ineffective implementation or excessive investment can decrease short-term profitability. This paradoxical situation can be explained by the resource-based view (RBV), in which digital transformation involves substantial investments in new technologies and changes in organizations' operations. Still, organizations may need help to extract or fully appreciate its value as they manage the disruptive impacts for better profits. Banking institutions must be prudent in managing their digital resources, ensuring that investments in digital transformation are backed by comprehensive strategic planning and effective change management. If done right, digital transformation can massively improve operational efficiency and help in increasing long-term profits. To implement successfully, organizations must examine their assumptions, learn from successes and failures, and foster an environment that embraces experimentation and flexibility. Also, leaders need to establish alignment between the technological legs and the business goals of their respective organizations while effectively communicating this vision to successfully navigate these complexities (Oludapo et al., 2024). It enables smoother transitions and helps to tackle the diverse challenges that come into play while implementing any digital strategies. However, a haphazard approach to digital technology can load financial performance with the costs associated with new tech, leaving businesses unable to harness competitive advantages brought by digitalization. While many companies invest heavily to digitalize their business models, they must be mindful that technological enablement is only one aspect of a successful initiative. The necessary capabilities must also be in place for the enterprise to fully capitalize on its technology investment.

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## CONCLUSIONS

This study examines the effect of digital transformation on bank profitability in Indonesia, setting a sample using 216 observations from 47 listed banks in the financial services sector registered with the Indonesia Stock Exchange (IDX). The study reveals the critical negative implications of digital transformation as computed via keywords towards ROA and ROE. Furthermore, digital transformation measured by sentiment analysis indicates a negative effect on ROA, while it does not significantly affect ROE.

These results emphasize the complex relationship between digital transformation efforts and financial performance, suggesting that the immediate benefits of digital adoption may not always translate into short-term profitability.

This study underscores the importance of strategic planning and effective management in overcoming the challenges of digital transformation. Investing in advanced technologies and operational changes must be carefully aligned with long-term business goals to minimize short-term financial pressures. Banks must strike a balance by developing a well-thought-out roadmap supporting sustainable growth while addressing immediate investment needs.

The findings reveal that transitioning to digital systems presents significant costs and challenges, which can sometimes outweigh the operational efficiency gains, making it less impactful on short-term profitability. This emphasizes the need for a prudent digital strategy that balances short-term investments with long-term growth objectives. The study also provides valuable insights into how digital transformation initiatives are perceived, using word analysis and sentiment analysis to assess their impact. For investors, a bank's digital transformation progress can be a critical indicator of its future performance. Positive sentiments and a comprehensive roadmap for technological improvements signal potential for profitability. At the same time, insufficient investment in updating digital capabilities suggests that short-term efficiency gains may not lead to substantial benefits.

## AUTHOR CONTRIBUTIONS

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Data curation: Elvira Cantika Daeli.

Formal analysis: Elvira Cantika Daeli.

Funding acquisition: Elvira Cantika Daeli.

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Project administration: Elvira Cantika Daeli.

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Visualization: Elvira Cantika Daeli.

Writing – original draft: Elvira Cantika Daeli.

Writing – reviewing & editing: Elvira Cantika Daeli, Linda Kusumaning Wedari.

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