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Keywords: Digital Transformation, Banking, Financial Performance, ROA, Text Analysis

ABSTRACT

This study investigates how the disclosure of digital transformation activities relates to the financial performance of banks in Indonesia during the post-pandemic period. The analysis draws on a panel of 43 banking institutions listed on the Indonesia Stock Exchange between 2021 and 2024. Digital transformation is assessed by examining the frequency of relevant keywords in annual reports, while financial performance is measured using Return on Assets (ROA). Firm size, calculated as the natural logarithm of total assets, serves as a control variable. After removing outliers, the dataset includes 138 firm-year observations. Panel regression is performed using the Common Effect Model, selected based on the Chow test. The results indicate that greater intensity in digital transformation disclosure is linked to lower ROA, suggesting that short-term costs from technology investments, system integration, cybersecurity, and organizational adjustments may offset immediate financial benefits. This research contributes evidence from an emerging banking market and emphasizes that the financial advantages of digital transformation may not be reflected immediately in accounting-based performance measures.

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The Impact of Digital Transformation on The Financial Performance of Indonesian Banking Firms (2021–2024)

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Abstract

This study investigates how the disclosure of digital transformation activities relates to the financial performance of banks in Indonesia during the post-pandemic period. The analysis draws on a panel of 43 banking institutions listed on the Indonesia Stock Exchange between 2021 and 2024. Digital transformation is assessed by examining the frequency of relevant keywords in annual reports, while financial performance is measured using Return on Assets (ROA). Firm size, calculated as the natural logarithm of total assets, serves as a control variable. After removing outliers, the dataset includes 138 firm-year observations. Panel regression is performed using the Common Effect Model, selected based on the Chow test. The results indicate that greater intensity in digital transformation disclosure is linked to lower ROA, suggesting that short-term costs from technology investments, system integration, cybersecurity, and organizational adjustments may offset immediate financial benefits. This research contributes evidence from an emerging banking market and emphasizes that the financial advantages of digital transformation may not be reflected immediately in accounting-based performance measures.

Keywords: digital transformation, banking, financial performance, ROA, text analysis.

INTRODUCTION

The advancement of digital technology has driven significant transformation in the financial services industry, influencing how customers access and utilize financial services. As society increasingly adopts digital transaction habits, banks can no longer rely solely on conventional service models; they must also adapt their service delivery and operational processes accordingly. Pratiningsih and Wardhani (2024) explain that shifting customer behavior characterized by demand for fast, flexible, and easily accessible services has compelled banks to enhance technology-based financial services. In the post-pandemic context, the need for digital services became even more pressing, as physical interactions were temporarily restricted while the demand for financial transactions continued unabated.

Digital transformation in banking extends beyond adopting tools like mobile banking, internet banking, QRIS, and digital transactions. Vial (2019) views digital transformation as an organizational change process triggered by the adoption of digital technologies, with consequential impacts on how companies create value. Guo and Xu (2021) argue that digital transformation encompasses not only technological adoption but also changes in business processes, capabilities, organizational structures, and corporate culture. Digital transformation in banking must therefore be understood as a process far broader than the mere digitization of customer-facing services.

Although digital transformation holds considerable potential for improving efficiency and expanding service reach, its effect on financial performance has not always yielded consistent results. According to Degely et al. (2026), implementing digitalization allows banks to lower operational expenses while also creating additional revenue channels via digital services. However, digital transformation also demands substantial investment in technology, system integration, cybersecurity, and organizational adjustment. Guo and Xu (2021) emphasize that digital transformation carries both benefits and costs, meaning its impact on financial performance is not always immediately positive particularly when companies are still in the implementation and adjustment phases.

Divergent findings from prior studies further indicate that the connection between digital transformation and banks' financial performance remains a topic that requires further study. Pratiningsih and Wardhani (2024) reported a positive impact of digitalization on bank profitability in Indonesia. Consistent findings were observed by Degely et al. (2026), who noted that digital transformation can improve financial outcomes, particularly in larger banking institutions. Conversely, Nguyen-Thi-Huong et al. (2023) found evidence of a negative effect on bank performance, while Daeli and Wedari (2025) indicated that, when measured through textual analysis, digital transformation negatively influences ROA. These contrasting study results suggest that the influence of digital transformation on financial performance is context-dependent and may be shaped by the research period, variable measurement approaches, firm characteristics, and the stage of digitalization implementation.

This research measures financial performance using Return on Assets (ROA) as the indicator. Brigham and Houston (2019) explain that ROA measures a firm's capacity to generate earnings from the assets it controls. In the banking sector, ROA is particularly relevant given that bank operations are heavily reliant on asset management to generate returns. Digital transformation in this study is measured using a text analysis approach applied to annual reports, specifically by counting the frequency of digital-related keywords. This approach is employed because annual reports can reflect a company's strategy, policies, and orientation toward digital transformation, consistent with the methodology used by Guo and Xu (2021), Nguyen-Thi-Huong et al. (2023), and Daeli and Wedari (2025).

Drawing on the issues discussed above, this research investigates the relationship between digital transformation and ROA among Indonesian banking firms during the 2021–2024 period while controlling for firm size. The study seeks to provide empirical evidence on whether the extent of digital transformation disclosure in annual reports is reflected in the financial performance of banks during the post-pandemic period. By examining this relationship, the research contributes to understanding how digital initiatives affect short-term profitability in the context of emerging banking markets.

The Resource-Based View (RBV) positions a firm's internal resources as a fundamental basis for building competitive advantage. As articulated by Barney (1991), a firm's resources are not limited to physical assets but also encompass capabilities, information, knowledge, organizational processes, and the capacity to manage owned resources effectively. In this study, digital transformation is regarded as a strategic resource, as it involves the utilization of digital technologies, information systems, data, and organizational capabilities. In the banking sector, digital resources are particularly significant because banking operations depend heavily on service speed, system security, and the ability to manage customer information.

Dynamic Capability Theory, developed as an extension of the RBV by Teece, Pisano, and Shuen (1997), refers to a firm's ability to integrate, build, and reconfigure internal and external competencies in response to changes in the business environment. This concept is relevant to explaining digital transformation because mere ownership of technology is

insufficient to improve firm performance. Companies must also be capable of integrating technology into their business processes, services, and strategies. In the post-pandemic banking context, this capability is especially critical as banks are required to adapt their services and operational systems to the increasingly digital expectations of customers.

For the purpose of this study, digital transformation is viewed as the application of digital technologies to support organizational operations and service provision. Guo and Xu (2021) argue that digital transformation represents a broader organizational change that encompasses not only technological implementation but also the reconfiguration of processes, capabilities, structures, and cultural practices. In the banking sector, digital transformation manifests through the development of mobile banking, internet banking, digital transactions, QRIS, open banking, fintech integration, big data analytics, cloud computing, and cybersecurity. Digital transformation is captured by the frequency of digital-related keywords found in the annual reports of each firm.

Financial performance can be viewed as the extent to which a company is able to convert its resources into financial returns. To capture this aspect, the present study uses Return on Assets (ROA) as the performance indicator. Brigham and Houston (2019) suggest that ROA reflects the effectiveness of asset utilization in producing profits. In the banking sector, ROA is a relevant measure because banks are fundamentally dependent on asset management to conduct operational activities and generate returns.

Firm size indicates the scale of a company's operations. Meiryani et al. (2020) explain that firm size can be assessed through total assets or total sales. In this study, firm size serves as a control variable and is represented by the natural logarithm of total assets. Controlling for firm size allows the analysis to account for variations in asset scale among banks, thereby providing a clearer assessment of the relationship between digital transformation and ROA.

Relationship Between Variables

Digital Transformation and Financial Performance

Digital transformation may influence financial performance through two distinct pathways. From a Resource-Based View perspective, digital transformation can be regarded as a strategic resource encompassing technology, information systems, data, and organizational capabilities that supports operational efficiency and value creation (Barney, 1991). In the banking sector, digital transformation can help banks accelerate service delivery, broaden customer access, and enhance the quality of business processes. Pratiningsih and Wardhani (2024) and Degely et al. (2026) demonstrate that digitalization can benefit bank profitability through efficiency gains and the development of digital-based services.

However, digital transformation does not necessarily yield immediate improvements in financial performance. Guo and Xu (2021) note that digital transformation involves both benefits and costs. While it can drive efficiency and innovation, its implementation also requires investment in technology, system integration, cybersecurity, and organizational adjustment. From a Dynamic Capability Theory perspective, the benefits of digital transformation can only materialize when a firm successfully realigns its resources and capabilities to changing business conditions (Teece, Pisano, & Shuen, 1997). When this adjustment process is not yet optimal, the costs of digital transformation may be reflected in financial results before the benefits become apparent.

Prior empirical findings further indicate that the relationship between digital transformation and financial performance remains inconsistent. Nguyen-Thi-Huong et al. (2023) found that digital transformation negatively affects bank performance, while Daeli and Wedari (2025) found that digital transformation measured through textual analysis negatively affects ROA in Indonesian banking firms. These findings suggest that digital transformation,

particularly in its early implementation stages, may suppress profitability as banks continue to bear technology investment costs and navigate operational adjustments. Based on this discussion, the following hypothesis is proposed:

H1: Digital transformation has a negative effect on the financial performance of banking companies.

METHOD

Population and Sampling Technique

The population for this study consists of banking institutions listed on the Indonesia Stock Exchange (IDX) from 2021 to 2024. A purposive sampling approach was applied, selecting firms based on criteria aligned with the research objectives. The selection criteria were: (1) continuous listing on the IDX for the entire 2021–2024 period; (2) availability of complete annual reports and financial statements; (3) exclusion of Regional Development Banks (Bank Pembangunan Daerah); and (4) availability of data required to calculate the study variables. Using these criteria, a total of 43 banks were included in the sample. The initial dataset contained 172 observations, which was reduced to 138 after removing outliers to ensure data quality.

Variable Identification and Measurement

The study's dependent variable is financial performance, represented by Return on Assets (ROA), which is calculated by dividing net income by total assets. The main independent variable, digital transformation, is captured using LN_DTX and measured through a textual analysis of company annual reports, focusing on the frequency of keywords associated with digital strategies, digital banking services, and supporting technologies. Firm size serves as a control variable and is measured using the natural logarithm of total assets to account for differences in organizational scale across banks.

Data Collection

Secondary data obtained from the annual reports and financial statements of banking firms listed on the Indonesia Stock Exchange (IDX) were utilized in this study. Information extracted from annual reports was used to construct the digital transformation variable through a keyword-based textual analysis, whereas financial statement data were employed to calculate ROA and firm size. The dataset was processed using EViews 10. To test the proposed relationship, panel data regression analysis was performed. The analytical procedure included descriptive statistical analysis, panel model selection, diagnostic testing, hypothesis testing, and evaluation of the coefficient of determination.

RESULT AND DISCUSSION

Descriptive Statistics

Descriptive statistics provide a general overview of the characteristics of the research data. The variables examined in this study are financial performance (proxied by ROA), digital transformation (proxied by LN_DTX), and firm size as a control variable.

Based on the results, ROA has a mean value of 0.0097, indicating that the sampled banking companies generated an average profit of 0.97% relative to total assets during the study period. The maximum ROA of 0.0349 and minimum of -0.0079 reflect heterogeneity in profitability across banks, which is expected given that the sample encompasses institutions with varying asset scales, business strategies, and operational conditions.

The LN_DTX variable has a mean of 5.6965, a maximum of 7.9582, and a minimum of 0.0000. These values indicate considerable variation in the intensity of digital transformation

disclosure across the sampled annual reports. While some banks extensively disclosed their digital activities and strategies, others exhibited very low levels of digital disclosure, suggesting that digital transformation has not been uniformly communicated across banking companies.

The firm size variable has a mean of 10.6660, with a maximum of 14.5121 and a minimum of 7.0750. This range reflects the diversity in asset scale across the sampled banks, reinforcing the relevance of including firm size as a control variable to ensure that the effect of digital transformation on ROA is analyzed proportionally.

Chow Test Results

The Chow test was performed to assess whether the Common Effect Model or the Fixed Effect Model was more appropriate. The results showed a Cross-section probability of 0.9091 and a Cross-section Chi-square probability of 0.6706. Since both p-values exceed 0.05, the pooled Common Effect Model was deemed suitable. This indicates that the differences among individual banks are not statistically significant enough to justify using the Fixed Effect Model. Consequently, the panel regression analysis was conducted using the Common Effect Model for subsequent testing.

Panel Data Regression Results

The panel regression analysis indicates that the digital transformation variable (LN_DTX) has an estimated coefficient of -0.0017 with a p-value of 0.0018. Given that the p-value is below the 0.05 significance threshold, digital transformation exhibits a negative and statistically significant effect on ROA, supporting the study hypothesis. This negative coefficient suggests that banks with higher levels of digital transformation disclosure in their annual reports tend to experience lower ROA during the observed period.

The regression results indicate that the firm size variable has an estimated coefficient of -0.0004 with a p-value of 0.3137. As this p-value exceeds the 0.05 threshold, firm size does not have a statistically significant impact on ROA. This finding implies that differences in asset scale alone do not explain variations in ROA within the model. Accordingly, firm size functions as a control variable, accounting for variations in bank size rather than serving as a primary determinant of financial performance.

Discussion

Digital Transformation and Financial Performance. The panel data regression results confirm that digital transformation has a negative and statistically significant effect on the financial performance of banking companies, as proxied by ROA, thereby supporting the study hypothesis. The negative coefficient indicates that higher digital transformation disclosure intensity in annual reports is associated with lower ROA among banking companies during the research period.

Since digital transformation is measured through a text analysis approach specifically by counting the frequency of digital-related keywords in annual reports the findings should not be interpreted as evidence that digital transformation is inherently detrimental to firm value. Rather, the results more appropriately indicate that banks with higher digital transformation disclosure tend to exhibit lower ROA during the study period. This may reflect the fact that elevated digital disclosure signals an ongoing digitalization process, while the financial benefits of such efforts require time to materialize in company performance.

These findings are consistent with Daeli and Wedari (2025), who found that digital transformation negatively affects bank profitability in Indonesia, and with Nguyen-Thi-Huong et al. (2023), who demonstrated that digital transformation negatively impacts bank

performance as measured by ROA and ROE. Both studies suggest that digital transformation in the banking sector does not always translate immediately into improved profitability, particularly when companies are still navigating technology investment, system integration, and organizational adjustment.

Theoretically, these findings can be explained through both the Resource-Based View and Dynamic Capability Theory. From an RBV perspective, digital transformation can be viewed as a strategic resource involving technology, information systems, data, and organizational capabilities. However, digital resources do not automatically produce superior performance unless effectively managed to generate economic value – consistent with Guo and Xu (2021), who note that digital transformation entails both benefits and costs. While it can support efficiency and innovation, it also necessitates integration costs, management costs, and organizational adjustment.

From a Dynamic Capability Theory perspective, firms must possess the ability to realign their resources and capabilities in response to environmental change. In the banking context, this encompasses technology system readiness, cybersecurity, digital service integration, and human resource adaptation. When this adaptation process is not yet optimal, the costs of digital transformation may become visible before its financial benefits are realized. The negative effect of digital transformation on ROA in this study can therefore be interpreted as an indication that the benefits of digital transformation have not yet been fully realized in the short term.

These findings contrast with those of Pratiningsih and Wardhani (2024), who found that digitalization positively affects bank profitability in Indonesia, and with Degely et al. (2026), who demonstrated that digital transformation can improve banking financial performance. These differences may stem from variation in research periods, digital transformation measurement methods, sample sizes, analytical models, and the characteristics of the firms studied. In this study, digital transformation is proxied through the intensity of digital keyword disclosure in annual reports, meaning the results reflect the relationship between digital transformation disclosure and ROA, rather than a direct measure of digitalization implementation success.

Firm Size and Financial Performance. The regression results indicate that firm size does not have a statistically significant effect on ROA. This suggests that asset scale alone does not explain variation in bank financial performance during the study period. Although larger banks generally possess greater resources, infrastructure, and investment capacity, these advantages do not necessarily guarantee higher ROA.

This finding indicates that bank size is not the sole determinant of profitability. In the banking sector, ROA is shaped not only by the magnitude of assets but by the effectiveness with which those assets are managed to generate returns. Silpiani and Kusumawardani (2025) explain that ROA reflects a bank's capacity to leverage its assets for profit generation. Consequently, larger banks do not necessarily achieve higher ROA if their assets are not managed effectively.

This result differs from Degely et al. (2026), who found that firm size moderates the effect of digital transformation on banking financial performance. The divergence may be attributed to the differing roles assigned to firm size in each study. In Degely et al. (2026), firm size is employed as a moderating variable, with the analysis focused on whether firm size amplifies or attenuates the effect of digital transformation on financial performance. In the present study, firm size is used as a control variable to account for differences in asset scale across banks. The result therefore indicates only that firm size does not have a direct and significant effect on ROA within the tested model.

Nonetheless, the inclusion of firm size as a control variable remains appropriate, as it helps ensure that the effect of digital transformation on ROA is assessed with asset scale differences taken into account. The non-significant result, however, suggests that variation in ROA among banking companies during the study period is more likely driven by factors beyond firm size.

CONCLUSION

The results of this study provide evidence that digital transformation is negatively associated with ROA among banking firms listed on the Indonesia Stock Exchange during the 2021–2024 period. The statistical findings support the proposed hypothesis, indicating that greater disclosure of digital transformation activities has not yet translated into higher profitability during the observation period.

The findings are in line with the results reported by Daeli and Wedari (2025) as well as Nguyen-Thi-Huong et al. (2023), both of whom documented a negative relationship between digital transformation and banking performance. The results also support the argument of Guo and Xu (2021), who suggest that digital transformation involves both potential benefits and substantial costs, meaning that its financial advantages may not be realized immediately. In contrast, the findings differ from those of Pratiningsih and Wardhani (2024) and Degely et al. (2026), who reported positive performance outcomes associated with digitalization initiatives. These inconsistencies across studies imply that the financial consequences of digital transformation may depend on factors such as the research setting, measurement approach, analytical design, and characteristics of the sampled firms.

The study also finds that firm size does not have a statistically significant effect on ROA, indicating that asset scale alone does not adequately explain variation in bank financial performance within this study's model. Furthermore, the R-squared value of 0.102998 indicates that digital transformation and firm size together explain 10.30% of the variation in ROA, with the remainder attributable to variables outside the model.

This study has several limitations: it is confined to banking sector companies listed on the IDX, and the research period covers only 2021–2024, meaning the findings may not fully generalize to other sectors or longer timeframes. Future research is encouraged to extend the observation period and to incorporate alternative financial performance proxies – such as ROE, NIM, or operational efficiency ratios – to provide a more comprehensive picture of banking company performance.

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