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DIGITAL TRANSFORMATION AND BANK PERFORMANCE

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Abstract
This study aims to investigate the effect of digitalization on bank profitability among Indonesian Banks. The research employs OLS on panel data of 50 banks in Indonesia during the period 2018–2022.The study reveals a positive impact of digitalization on bank profitability. The result is robust to different measures and empirical settings. Not surprisingly, small banks experience lower profitability than their peers. However, digitalization helps improve the profitability of these banks. This study explains the effect by showing that digitalization does not significantly reduce bank cost in terms of cost to income ratio and increases bank non-interest income through diversification into non-traditional products and services. In addition, the current stage of bank digitalization in Indonesia does not reduce banks' employment costs since it requires staff to support and operate the new system. Practical implications – The research findings are motivations for bankers and policy-makers in designing appropriate strategies toward digitalization. Investors can also consider highly digitalized banks as valuable investments. This research extends the current literature on the relationship between digitalization and bank profitability, with a focus on commercial banks in Indonesia. Given the high involvement of the government and the dominance of several large banks in the banking system, the study also explores whether the effect of digitalization on bank profitability varies with the bank's size. Last but not least, the channels in which digitalization affects bank profitability are also examined.

Keywords: Digital Transformation, Digitalization, Indonesian Banks, Profitability

1. Introduction

Banking is one of the industries that serves as the focal point of community economics through various services it offers. To keep pace with current developments, transitioning to the digital era is necessary to enhance efficiency in service delivery and resource utilization. Digitalization can be defined as the use of technology to transform business models and create new opportunities to increase revenue and generate value. The following processes are part of the 5.0 industrial revolution where technology evolves in every aspect of life and becomes a current business trend. Along with technological advancements, competition in the banking industry has intensified with the emergence of Financial Technology (Fintech) companies, making digital transformation unavoidable. Most banks have realized that establishing a digital ecosystem within a company is a key business development strategy. Existing literature demonstrates that adopting Information Technology (IT) can create a competitive advantage for banks, such as better understanding of customer behavior, thereby enhancing customer satisfaction and relationships.

The emergence of digital transformation in the banking world can drive profitability. When a transaction is conducted through a mobile application, the costs incurred are certainly lower compared to transactions at a branch. Banks can also profit from

customers accustomed to conducting transactions via smartphones, tablets, or PCs. There are three options for a bank to initiate digital transformation. The simplest is to digitize only the front-end. The second approach is to "wrap and digitize" by gradually replacing old infrastructure and integrating middle and back-office operations. Alternatively, companies can choose to become "digital natives" by creating a fully digital bank. Through digital transformation, banks can reduce costs, improve financial performance, and meet consumer demand for more efficient and personalized customer experiences.

The greater the transformation within a bank, the more it is expected to reduce costs and increase profitability. However, becoming a digital native is not necessarily the right solution for every bank. Each bank has different strategies and capabilities, and not all banks are ready to transform into fully digital entities. Supporting digital transformation certainly requires significant investment to prepare such an ecosystem; whether the costs incurred by the bank are proportional to the profitability received is a crucial consideration.

Digitalization forces the banking industry to change its business model and shape the latest information technology ecosystem, aligned with Indonesia's government program through the OJK Blueprint on the 3 Pillars Master Plan for Indonesia's Financial Services Sector 2022-2025 and the 2nd Pillar Roadmap for Indonesia's Banking Development 2020-2025, which serves as a guideline for accelerating digital transformation in banking. The Blueprint is crafted by examining strategic banking environmental analysis to identify opportunities and challenges for banking digitalization, maturity levels measured through the Maturity Assessment for Banks (DMAB), input from stakeholders in various focus group discussions with associations, the banking industry, and information technology service providers, and best practices regulations in various countries including international standards in information technology.

Previous research has focused on the benefits of digitalization and technology development in banking, but few have addressed the impact of digitalization on bank profitability. Previous literature has demonstrated that the adoption of information technology (IT) can create a competitive advantage for banks due to their better understanding of customer behavior, thereby enhancing customer satisfaction and improving customer relationships (Taiminen and Karjaluoto, 2015). In addition, online banking channels help facilitate cross-selling of products and services and increase bank revenue (Pierri and Timmer, 2020). Zhao et al. (2019) also found that digitalization helps banks improve service efficiency. Based on the following exposition, a positive relationship between banking digitalization and profitability has been found in previous literature (Carbo-Valverde et al. (2020), Kriebel and Debener (2020), Malik et al. (2020), Dadoukis et al. (2021), Kolodiziev et al. (2021), Do et al. (2022)).

Other studies have shown that digitalization has a negative effect on bank profitability (Ho and Mallick (2010)). This view is supported by the IT productivity paradox, which states that IT adoption does not always lead to higher performance. Soh and Markus (1995) explain this with the requirement for proper IT management and support teams to translate IT investments into higher productivity. Carr (2003) and Stratopoulos and Dehning (2000) add that IT is readily available and quickly imitated, thus diminishing a bank's competitive advantage over time.

Therefore, there is no consensus on whether digitalization increases or reduces profitability. Nguyen & Haoi (2023) found a positive impact of digitalization on banking profitability in Vietnam in their study. The results are robust across various empirical measures and conditions. It is not surprising that smaller banks and banks with a high

percentage of state ownership have lower profitability compared to similar banks. However, digitalization helps improve the profitability of these banks. With the findings of this research, it is hoped that digitalization will encourage banking as a shortcut to faster financial and economic development.

2. Theorical Background

2.1 Digital Transformation and Bank Profitability

In the process of digital transformation, there is involvement of technology and data-based digital information. In line with the latest technological advancements, companies in the financial industry, including banking, are shifting towards online and digital services. Digital transformation of banks involves integrating digital technology across all banking areas to transform bank operations, including how they communicate with customers.

Despite numerous studies investigating the impact of digital transformation on company productivity, literature on the relationship between digital transformation and bank profitability is relatively sparse and presents varied findings. This may be due to two reasons. Firstly, there is no unified definition of digital transformation. Most studies refer to Gartner's (2022) definition of digital transformation as the use of digital technology to change business models and create new opportunities to increase revenue and create value. This leads to the second challenge - measuring bank digital transformation. Previous research has used various proxies for bank digital transformation. For example, Boateng (2020) and Wijayanti et al. (2021) refer to the adoption of digital factors such as internet banking, ATMs, and mobile payments as digital transformation. Beccalli (2007) uses IT capital investment. Dadoukis et al. (2021) use technology and communication costs as a proportion of total operating costs. IT implementation is measured as a dummy variable, with a value of 1 (0) if the bank is above (below) the median ratio of technology and communication costs to total operating costs in 2018. Recent trends involve using text mining methods to construct a Digital Transformation Index reflecting banking digital transformation. These studies include Cao et al. (2022) and Kriebel and Debener (2020).

Existing literature on digital transformation and bank performance has led to two hypotheses: the "productivity paradox" and "strategic IT opportunities." The "productivity paradox" suggests that digital transformation does not necessarily increase bank profitability. This phenomenon is supported by many empirical studies (especially in the US) that reveal either no or weak relationships between digital transformation and bank performance (Markus and Soh, 1993; Council of Economic Advisors, 2001; McKinsey Global Institute, 2001). Beccalli (2007) argues that there is little relationship between technological innovation and the performance of European banks during the period 1995-2000. Supporting this argument, using a sample of Spanish banks, Martín-Oliver and Salas-Fumás (2008) show that investments in technology adoption have no significant impact on bank profitability. Interestingly, using a sample of banks in America, Ho and Mallick (2010) state that there is a negative impact of technological innovation on bank efficiency. These findings are consistent with the suggestions of Arora and Arora (2013) regarding the negative effects of information technology on operational profits and per-employee profits of Indian banks. Carr (2003) argues that digital transformation can create competitive advantages only in the early stages of development. By the end of the development phase, competitive advantages will disappear when technology becomes accessible and affordable to other competitors. Therefore,

technology investment at this stage can ultimately lead to increased competition, price reductions, and profit declines. On the other hand, "strategic IT opportunities" view digital transformation as an opportunity for banks to achieve their strategic goals, whether cost management or improving quality and revenue (De Bandt and Davis, 2000). Beccalli (2007) adds that competitive advantages come from various organizational dynamic capabilities such as transaction cost reduction, product innovation, and better management capabilities. Thus, the insignificant influence of digital transformation on bank performance found in many studies can be associated with the unseen benefits of digital transformation related to better product and service quality, improved customer relationships, and faster responsiveness.

The author concludes that digital transformation can provide significant benefits and its impact analysis requires appropriate attention and consideration.

H1: There is a significant relationship between digital transformation and bank profitability

2.2 Mechanisms of Impact

Some literature shows that digital transformation tends to have a positive impact on bank profitability in terms of both costs and income. Interestingly, the impact of these managerial advancements can be found more prominently on the revenue side of banks than on the cost side. Kasman (2012) found that the annual cost of the banking industry in Turkey decreased by 23.6% due to technology implementation, although it was inefficient in the 20th century. Moffat (2017) shows the negative impact of mobile, internet channels, and ATMs on the cost-to-income ratio as a proxy for bank performance. Aguegboh et al. (2022), using data from 35 banks in Africa from 2013 to 2015, show that information technology has a significant short-term impact on bank performance; however, in the long term, these applications are more beneficial for the bank's performance. According to Loebbecke and Picot (2015), using technological innovation can significantly reduce bank data processing and storage costs, thereby increasing bank efficiency costs. While Verhoef et al. (2021) show that digital transformation increases bank revenue by expanding the customer base, Zhai et al. (2022) show that technology implementation reduces bank costs by reducing the number of employees and transaction time.

Previous literature indicates that digital transformation has a positive impact on bank profitability with a decrease in operational costs and an increase in income (Nguyen & Haoi, 2023). Additionally, the current stage of bank digital transformation in Vietnam does not reduce bank labor costs because it requires staff to support and operate new systems.

Therefore, digital transformation can positively impact bank performance through cost savings channels and generate revenue. We propose the following hypotheses:

H2: Digital transformation has a positive impact on bank profitability by reducing operating costs

H3: Digital transformation has a positive impact on bank profitability by increasing bank income

3. Methods

This study explores the relationship between bank digitalization and profitability using the following research model:

$PROFITit = \beta 0 + \beta 1 DIGit + \beta k BankSIZE + \varepsilon it$

- β0 is the constant,
- β1, βk are coefficients,
- ϵit represents the error term,
- i & t denote bank and year indicators.

Bank profitability, PROFITit, is measured using return on assets (ROA). The higher a bank's ROA, the greater its profitability. Additionally, net interest margin (NIM) is considered as an alternative measure to ROA (Nguyen & Haoi, 2023).

The main variable in this study is bank digitalization, DIGit . Previous research has used various proxies to measure bank digitalization. The current approach involves text mining methods to construct a Digital Transformation Index reflecting bank digitalization (see Kriebel and Debener, 2020). This method uses a list of relevant keywords from a digitalization dictionary and calculates their frequency in annual bank reports. The assumption is that banks actively involved in digitalization efforts tend to report these aspects more frequently. However, this method may face challenges in selecting appropriate digitalization-related keywords and the assumption that disclosure of digitalization efforts is always accurate, especially in less transparent information environments like Indonesia.

Therefore, this study uses an indicator similar to the approach used by Beccalli (2007) and Dadoukis et al. (2021), namely the growth rate of intangible fixed assets. This is based on the assumption that bank digitalization often involves significant changes in core banking infrastructure, software, and copyrights that can increase the value of bank intangible fixed assets.

Previous studies have shown that bank characteristics such as size, capitalization, credit risk, liquidity, and ownership can influence bank profitability (Nguyen & Haoi, 2023). Therefore, in this research model, the bank size variable (TA) is also included as a control variable.

Variable	Definition	Measurement
Variable Dependent		
ROA	Return on Assets	Net income/total assets
NIM	Net Interest Margin	(Interest income– interest expense)/total earning assets
Variable Independent		
DIG	Bank digitalization	Intangible Assets / Total Assets
TA	Bank Size	Total Assets

This research data from the Indonesia Stock Exchange using a purposive sample of listed banks, covering annual report periods from 2018 to 2022. A total of 30 banks were included, providing 150 sample data points.

4. Results and Discussion

4.1 Descriptive Statistics

Table 1. Descriptive Statistics Result

	N	Minimum	Maximum	Mean	Std. Deviation
NIM	150	-.035200	.104500	.04240467	.019119386
ROA	150	-.802800	.032500	-.00355467	.074912984
DIG	150	.000000	.917088	.02706995	.114104348
BANK_SIZE	150	215169190088	1992544687000000	241771949489180.60	439784614859824.250
Valid N (listwise)	150				

4.2 Regression Equation 1:

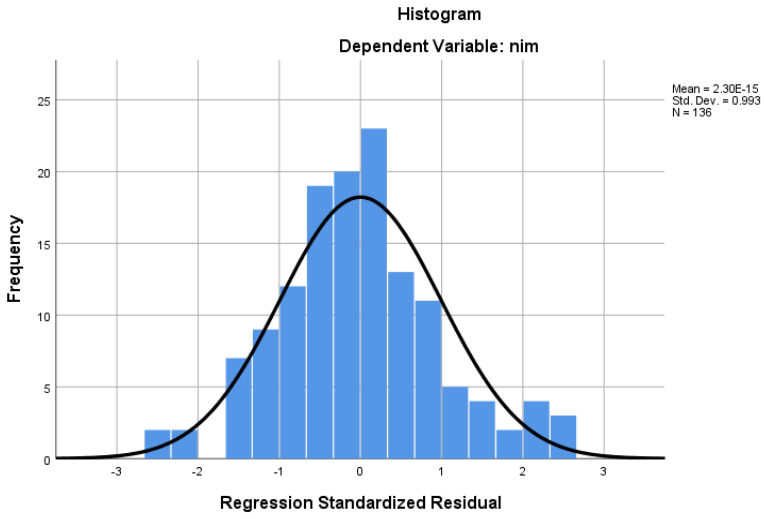
VAR DEPENDENT

(Y1) : ROA

VAR INDEPENDENT

X1 : DIG

X2 : SIZE



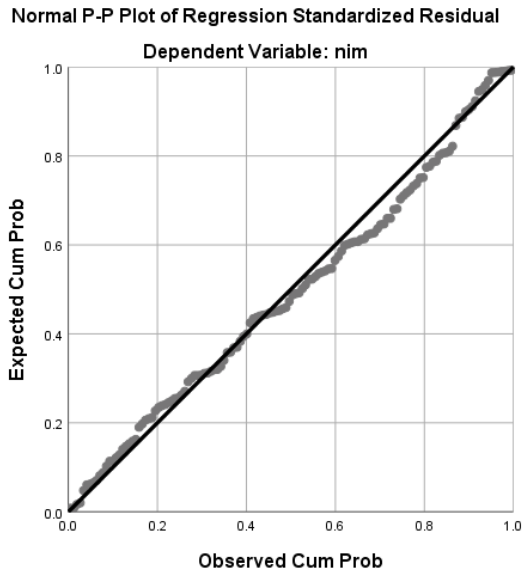


Table 2. Normality Test

One-Sample Kolmogorov-Smirnov Test

		Unstandardized Residual
N		150
Normal Parameters[a,b]	Mean	.0000000
	Std. Deviation	.01121605
Most Extreme Differences	Absolute	.067
	Positive	.067
	Negative	-.039
Test Statistic		.067
Asymp. Sig. (2-tailed)		.200[c,d]

a. Test distribution is Normal.
b. Calculated from data.
c. Lilliefors Significance Correction.
d. This is a lower bound of the true significance.

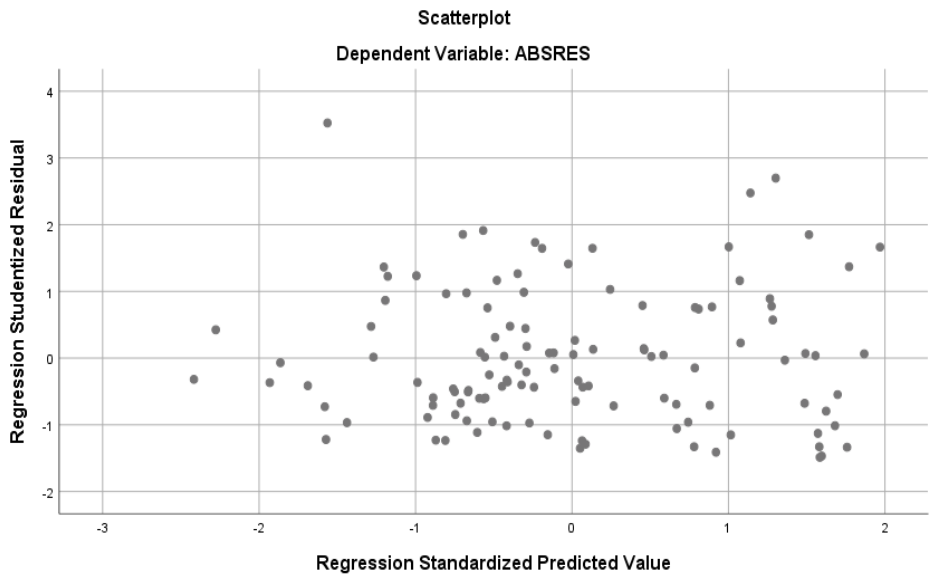
Based on the histogram graph, it is observed that the curve is bell-shaped, indicating that the data is normally distributed. This is further supported by the normality probability plot where data points align closely with the normal line. Additionally, based on the Kolmogorov-Smirnov test, the asym. Sig. (2-tailed) value is 0.200 > 0.05. Therefore, it can be concluded that the data is normally distributed.

Table 3. Heteroskedasticity Test

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.000	.006		-.036	.971
	SIZE	.000	.000	.084	.892	.374
	DIG	-.057	.091	-.059	-.633	.528

a. Dependent Variable: ABSRES



Interpretation of the Homogeneity Test:

Based on the scatter plot, it is observed that the data is scattered randomly. This indicates that the data is not homogeneous. Additionally, this is supported by the results of the Levene's test, which yielded a Sig. value of 0.374 > 0.05 for the Bank Size (SIZE) variable and a Sig. value of 0.528 > 0.05 for the Digitalization (DIG) variable. Therefore, it can be concluded that the data is randomly scattered and not homogeneous.

Table 4. Autocorrelation Test

Model Summary[b]					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.735[a]	.540	.532	.006145897	1.793

a. Predictors: (Constant), DIG, SIZE

b. Dependent Variable: ROA

Interpretation of the Autocorrelation Test:

Based on the Durbin-Watson test result, the Durbin-Watson statistic is 1.793. This value falls within the range between -2 and +2. Therefore, it can be concluded that there is no autocorrelation present.

Table 5. F Test

ANOVA[a]						
Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	.005	2	.003	68.088	.000[b]
	Residual	.004	147	.000		
	Total	.010	149			

a. Dependent Variable: ROA

b. Predictors: (Constant), DIG, SIZE

Interpretation of the F-test:

Based on the F-test result, the F-statistic is 68.088 with a significance level of 0.000, which is less than 0.05. This indicates that the independent variables DIG (Digitalization) and SIZE (Bank Size) together have a significant effect on ROA (Return on Assets). Therefore, we can conclude that DIG and SIZE jointly influence ROA in a statistically significant manner.

Table 6. T Test

Coefficients[a]						
		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	t	Sig.
1	(Constant)	-.109	.010		-10.704	.000
	SIZE	.004	.000	.745	11.657	.000
	DIG	-.388	.156	-.159	-2.481	.015

a. Dependent Variable: ROA

Interpretation of the T-test:
Variable DIG (Digitalization):
- The unstandardized coefficient (B) for DIG is -0.388 with a significance level (Sig.) of 0.015, which is less than 0.05.
- This means that the independent variable DIG has a statistically significant negative effect on the dependent variable ROA (Return on Assets).
- Specifically, for every 1 unit increase in DIG, ROA is expected to decrease by 0.388 units.

Variable SIZE (Bank Size):
- The unstandardized coefficient (B) for SIZE is 0.004 with a significance level (Sig.) of 0.000, which is less than 0.05.
- This indicates that the independent variable SIZE has a statistically significant positive effect on the dependent variable ROA.
- In other words, for every 1 unit increase in SIZE, ROA is expected to increase by 0.004 units.

In summary, based on the T-test results, both DIG and SIZE are found to have significant effects on ROA. DIG negatively affects ROA, whereas SIZE positively affects ROA. These findings suggest that digitalization (DIG) and bank size (SIZE) are important factors influencing the profitability of banks as measured by ROA.

Table 7. R Test

Model Summary[b]					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.735[a]	.540	.532	.006145897	1.793

a. Predictors: (Constant), DIG, SIZE
b. Dependent Variable: ROA

Interpretation of the Coefficient of Determination (Adjusted R-Square):

Based on the test of the Coefficient of Determination, it is found that the Adjusted R-Square value is 0.532. This indicates that 53.2% of the variation in the dependent variable ROA (Return on Assets) can be explained by the independent variables DIG (Digitalization) and SIZE (Bank Size) included in this study.

Therefore, DIG and SIZE together account for approximately 53.2% of the variability observed in ROA among the sampled banks. The remaining 46.8% of the variation in ROA is explained by other variables not included in this study or by factors beyond the scope of the analysis.

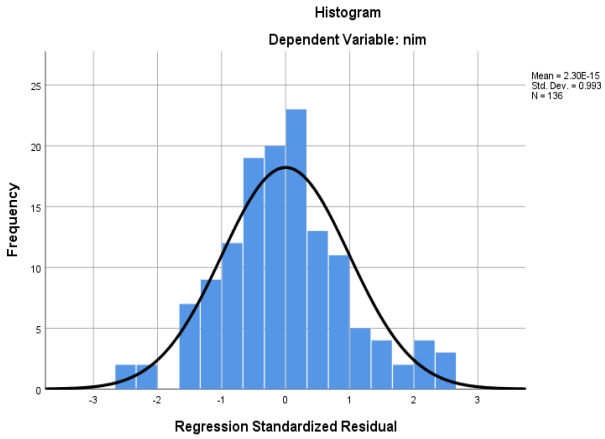
In summary, the Adjusted R-Square value suggests that the model with DIG and SIZE as predictors provides a moderately good fit for explaining the variation in ROA across the selected banks, although there are other factors influencing ROA that are not accounted for in this study.

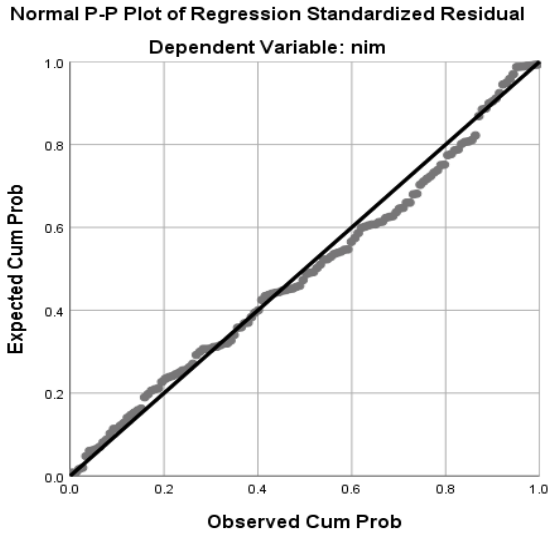
Regression equation 1:
ROA = -0,109 – 0,388 DIG + 0,004 SIZE
Detail:
ROA : *return on asset*
DIG : digital transformation (intangible/total asset)
SIZE : bank size (ln Total Asset)

4.3 Regression Equation 2:
VAR DEPENDEN
(Y2) : NIM
VAR INDEPENDEN :
X1 : DIG
X2 : SIZE

Table 8. Normality Test

One-Sample Kolmogorov-Smirnov Test		
		Unstandardized Residual
N		150
Normal Parameters[a,b]	Mean	.0000000
	Std. Deviation	.01121605
Most Extreme Differences	Absolute	.067
	Positive	.067
	Negative	-.039
Test Statistic		.067
Asymp. Sig. (2-tailed)		.200[c,d]





Interpretation of Normality Test:

Based on the histogram, it can be observed that the curve is bell-shaped. This indicates that the data is normally distributed. This observation is supported by the normality probability plot, where data points align closely with the normality line. Furthermore, according to the Kolmogorov-Smirnov test, the asym. Sig. (2-tailed) value is 0.200 > 0.05. Therefore, it can be concluded that the data is normally distributed.

Table 9. Heteroskedasticity

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.029	.011		2.744	.007
	size	-.001	.000	-.184	-1.935	.055
	dig	-.008	.006	-.126	-1.324	.188

a. Dependent Variable: ABSRES

Interpretation of Homogeneity Test:

Based on the scatter plot, it can be observed that the data points are randomly scattered. This indicates that the data is not homogeneous. Furthermore, this observation is supported by the Geisser test results, which yielded a significance value of 0.055 > 0.05 for the variable Bank Size (SIZE) and a significance value of 0.188 > 0.05 for the variable Digitalization (DIG). Therefore, it can be concluded that the data is randomly dispersed and not homogeneous.

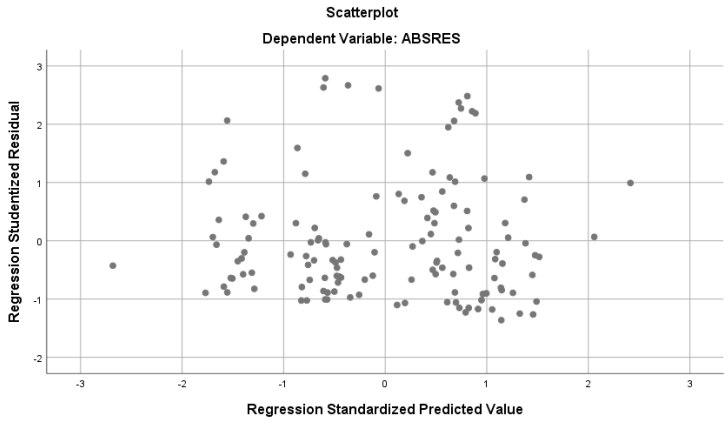


Table 10. Multicollinearity

Coefficients[a]								
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-.054	.017		-3.248	.001		
	size	.003	.001	.466	5.889	.000	.808	1.238
	dig	-.021	.009	-.183	-2.312	.022	.808	1.238

a. Dependent Variable: nim

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Interpretation of Multicollinearity Test

Based on the multicollinearity test results, it is known that the Tolerance values for each independent variable are > 0.01. Additionally, the Variance Inflation Factor (VIF) for each independent variable is < 10. Therefore, it can be concluded that the data does not exhibit multicollinearity.

Table 11. Autocorrelation

Model Summary[b]					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.571[a]	.326	.316	.011300067	1.729

a. Predictors: (Constant), dig, size

b. Dependent Variable: nim

Interpretation of Autocorrelation Test:

Based on the Durbin-Watson test results, the Durbin-Watson statistic is found to be 1.729. This value falls within the range of -2 to +2. Therefore, it can be concluded that there is no evidence of autocorrelation.

Table 12. F Test

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.008	2	.004	32.168	.000[b]
	Residual	.017	147	.000		
	Total	.025	149			

a. Dependent Variable: nim

b. Predictors: (Constant), dig, size

Interpretation of F-test:

Based on the F-test results, the F-statistic value is 32.168 with a significance level of 0.000, which is less than 0.05. Therefore, it can be concluded that the independent variables DIG (Digitalization) and SIZE (Bank Size) together have a significant impact on NIM (Net Interest Margin).

Table 13. T Test

Coefficients[a]						
		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	t	Sig.
1	(Constant)	-.054	.017		-3.248	.001
	size	.003	.001	.466	5.889	.000
	dig	-.021	.009	-.183	-2.312	.022

a. Dependent Variable: nim

Interpretation of T-test results:

1. The independent variable DIG has an Unstandardized Coefficient (B) of -0.021 with a significance level (Sig.) of 0.02, which is less than 0.05. This indicates that the independent variable DIG has a statistically significant negative impact on the dependent variable NIM (Net Interest Margin). Therefore, when DIG increases by 1 unit, NIM is expected to decrease by 0.021 units.

2. The independent variable SIZE has an Unstandardized Coefficient (B) of 0.003 with a significance level (Sig.) of 0.00, which is less than 0.05. This indicates that the independent variable SIZE has a statistically significant positive impact on the dependent variable NIM. Therefore, when SIZE increases by 1 unit, NIM is expected to increase by 0.003 units.

Table 14. R Test

Model Summary[b]					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.571[a]	.326	.316	.011300067	1.729

a. Predictors: (Constant), dig, size

b. Dependent Variable: nim

Interpretation of Coefficient of Determination (R-Square):

Based on the testing of the Coefficient of Determination, it is known that the Adjusted R-Square value is 0.316. This indicates that the independent variables DIG and SIZE collectively explain 31.6% of the variation in the dependent variable NIM (Net Interest Margin). The remaining 68.4% of the variation in NIM is explained by other variables outside the scope of this study.

Regression equation 2:

NIM = -0,054 – 0,021 DIG + 0,003 SIZE

Detail:

NIM : *net interest margin*
DIG : digital transformation (intangible/total asset)
SIZE : bank size (ln Total Asset)

5. Conclusion

This study examines the relationship between bank digitization and profitability using panel data from 30 banks in Indonesia during the period 2018-2022. The study yielded several key conclusions. First, we found that bank digitization helps to enhance profitability. Specifically, a 1% increase in digitization leads to a 0.2-0.6% increase in bank profitability.

With limited information on the test results and significance provided, it can be concluded that there is a significant joint relationship between the independent variables DIG and SIZE and the dependent variables ROA and NIM. There is a specific interaction or combination between the level of digitization (DIG) and company size (SIZE) that jointly affects financial performance, such as Return on Assets (ROA) and Net Interest Margin (NIM). This demonstrates the significant impact of bank digitization on profitability, thus accepting hypothesis H1.

Second, banks with a certain SIZE experience lower profitability compared to their peers. However, digitization helps to improve profitability in these banks. This finding suggests that banks in Indonesia should embrace digitization as an effective approach to enhancing their profitability. Currently, digital transformation in Indonesia is primarily occurring among large corporations and private banks. However, digitization does not reduce banking performance and increase income rapidly, hence H2 and H3 are rejected.

This is due to the fact that digitization requires a lot of effort and investment. Therefore, banks must properly incorporate digitization into their vision, set clear targets,

and establish the right strategies and pathways toward becoming fully digitalized banks, with adequate attention to available Wong et al. (2008) resources and potential, capabilities, customer acceptance of new technology, and cybersecurity issues (see Mbama and Ezepue (2018), Chan et al. (2022)). Additionally, as noted by Wong et al. (2008), given the increasing popularity of e-banking channels, many customers still prefer human interaction in their banking transactions. This suggests that banks should strengthen customer service in traditional banking activities.

For investors seeking value investments, the study suggests considering investing in banks with strong digitization efforts because these banks are more profitable and sustainable. The findings of this study can be applied to similar developing countries where the banking system dominates and plays a crucial role in the financial system, such as Indonesia.

Despite the considerable effort, this research cannot avoid some limitations. First, the study indirectly assesses bank digitization through bank capital investment in information technology rather than considering the level of digitization (i.e., front-end, integrated, and digital native) or various aspects of digitization such as product and service development, banking channels, processes, etc. Second, our study is limited to financial data for Indonesian banks. Extending the study to other countries, particularly cross-country analysis, could validate and generalize the research findings. Moreover, cross-country comparisons are useful in evaluating the role of policies and government schemes in promoting digitization.

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