

Digital Transformation and Firm Performance: Evidence from Indonesian Listed Banks

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ABSTRACT

The rapid expansion of the digital economy has accelerated digital transformation across the banking industry, making digital technologies a strategic investment for enhancing competitiveness. However, whether digital transformation improves firm performance remains an open empirical question, particularly in emerging markets. This study investigates the effect of digital transformation on the financial performance of Indonesian listed banks and examines whether CEO experience moderates this relationship. Using a purposive sampling approach, the study analyzes 430 firm-year observations of banks listed on the Indonesia Stock Exchange during 2013–2022. Ordinary Least Squares (OLS) regression is employed as the primary estimation method, while System Generalized Method of Moments (Sys-GMM) and an alternative profitability measure are used to assess the robustness of the findings. The empirical results reveal that digital transformation has a significant negative effect on firm performance, suggesting that investments in digital assets do not immediately generate financial benefits. Furthermore, CEO experience does not significantly moderate the relationship between digital transformation and firm performance. Additional heterogeneity analysis indicates that the negative effect is more pronounced among private banks and smaller banks, whereas it is insignificant for state-owned banks. These findings contribute to the literature on digital transformation by highlighting that digital investments alone are insufficient to enhance firm performance without complementary organizational capabilities and effective implementation strategies.

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1. Introduction

The Indonesian government is currently placing particular emphasis on the path of the digital economy. Among the subjects deliberated during the G20 Summit in Bali, digital transformation stands out as a key topic of discussion. President of the Republic of Indonesia, Joko Widodo, expressed his optimism that Indonesia will become the fourth-largest economic power in the world by 2045. It should be noted that Indonesia's digital economy is growing rapidly compared to other countries in Southeast Asia. The value of Indonesia's digital economy reached \$70 billion in 2021 and is predicted to double by 2025 (East Ventures, 2023).

The development of infrastructure to support the digital economy ecosystem will continue to be enhanced, with the expectation that digital transformation will continue to progress. This support from the Indonesian government aims to encourage firms to transform towards digitization, based on the concept of Environmental, Social, and Governance (ESG). Firm performance standards will not only focus on economic gains but also consider environmental, social, and governance aspects. This support and encouragement can be seen in the overall digital competitiveness index of Indonesia, which has increased for four consecutive years, with a median score of 38.5 in 2023 (East Ventures, 2023). Recent research results indicate that the digital economy has a significant impact on a country's industrial development, contributing to the overall growth of a nation (Chen et al., 2022).

As a result, in recent years, several firms have been actively undergoing digital transformation, particularly in the banking sector in Indonesia. This transformation is a means of enhancing consumer services through the adoption of technologies such as the Internet of Things (IoT), cloud computing, and Artificial Intelligence (AI). The adoption of general-purpose technologies (GPT), technologies capable of replacing human functions, as frequently observed with AI (bots) replacing tellers on a bank's website, or super-applications (super-apps) on consumers' smartphones, has made various banking transactions more accessible and straightforward. Consequently, technology can be viewed as a strategic resource for firms in the industry competition to improve their performance (Teece, 2018). Competition in the financial services sector is currently intense due to the emergence of FinTech (Financial Technology) firms. This makes digital transformation imperative for banks to maintain their competitive positions. However, extensive digital transformation does not imply a directionless strategy without considering its impact on performance improvement.

Based on existing research, this study addresses the research gap by investigating the relationship between digital transformation and firm performance, which remains inconclusive in the existing literature, particularly in emerging economies. The primary objective of this study is to examine the effect of digital transformation on firm performance in Indonesian listed banks. In addition, this study investigates whether CEO experience moderates the relationship between digital transformation and firm performance and explores whether this relationship varies across firm characteristics, including ownership structure and firm size.

This study contributes to the literature in two ways. First, it provides empirical evidence on the relationship between digital transformation and firm performance in an emerging economy where existing findings remain inconclusive. From the perspective of the Resource-Based View (RBV) theory proposed by Barney (1991), the resources a firm possesses should be heterogeneous and not easily transferable. In the dynamics of competition and technological change, firms must continuously renew their capabilities and resources (Teece et al., 1997), making them heterogeneous and distinctive compared to their competitors in a creative and unique way (Herri, 2011). Digital technology can serve as a strategic resource for firms because it possesses characteristics that are rare, not easily replicable, and imitable (Karim et al., 2022). On the other hand, the relationship between digital transformation and productivity is a long-standing issue and can have adverse effects on a firm's financial performance (Gebauer et al., 2020).

Second, it extends the literature by examining the moderating role of CEO experience and firm heterogeneity based on ownership structure and firm size in the Indonesian banking sector. The variation in digital transformation within a country depends on the Human Development Index (HDI). Countries with low HDI significantly influence digital capabilities, thus positively impacting firm performance (Heredia et al., 2022). Therefore, a more in-depth investigation is needed into the heterogeneity of each firm in managing its resources, considering the characteristics of each firm's CEO, firm characteristics based on size classification, and types of firms based on majority ownership, State-Owned Enterprises (SOEs) and private enterprises (Hamori & Koyuncu, 2006; Karim et al., 2022; Zhang et al., 2023).

Literature Review

The Resource-Based View (RBV) theory has become one of the most successful theoretical approaches in the field of strategic management. According to Barney (1991), the RBV theory, with its focus on the internal aspects of an organization, refers to an organization's sustainable competitive advantage and places a greater emphasis on its internal capabilities. Organizations can determine their strategies based on their organizational capabilities, ranging from the identification, exploitation, adaptation, protection, and sustainable evaluation of resources to possess valuable

resources. In the context of the digital economy, technology serves as a strategic resource for firms due to its rare, non-replicable, and non-imitable nature. In a dynamic competitive environment, firms must continuously update their capabilities and resources to achieve core competitiveness (Karim et al., 2022) enabling them to achieve efficiency and better firm performance (Teece et al., 1997; Teece, 2018).

Upper echelons theory, as proposed by Hambrick & Mason (1984) asserts that the function of top management is to formulate strategic policies for a firm to achieve its goals. Hence, each critical strategic decision will differ among firms. This heterogeneity among firms arises from the characteristics of their top management, such as capabilities, skills, and leadership experience. These characteristics directly influence strategic decision-making and firm performance (Zhang, Lu, & Liang, 2023; Ting, Azizan, & Kweh, 2015; Herri, 2011; Hamori & Koyuncu, 2006) .

Hypotheses Development

Digital disruption has transformed firms' perspective on profit, with technological resources becoming the key to corporate transformation. Intellectual property, the nature of knowledge, complementary assets, standards, and timing all remain central to the source of profit stemming from innovation in managing technology. Digital technology is categorized into two types: general-purpose technologies (GPTs) and enabling technologies (ETs). GPTs enhance production efficiency, while ETs can serve as strategic resources for firms due to their exclusivity, rarity, and difficulty to replicate, thereby positively impacting firm performance (Teece, 2018).

The development of Information and Communication Technology (ICT) infrastructure is a key factor in the positive relationship between digital technology and firm performance. The implementation of ETs as strategic resources, such as cloud computing, e-commerce, IMIS, big data, and AI, increases sales and resultant profitability, improves communication with stakeholders, enhances information management, streamlines supply chain management, provides one-stop services, and reduces the need for human labor (Gupta & Bose, 2019; Karim et al., 2022).

For some firms, digital transformation will shape a new character due to the manifestation of the combination of digital economics and traditional firms. The positive effects include innovation in products, efficiency, and increased firm productivity (Bertschek et al., 2013) as well as firm performance (Wen et al., 2022). Additionally, it can reduce costs and improve the speed of business processes. In e-commerce, real-time data updates help expedite issue resolution at every stage of the business process, from sales to management, transportation, and product storage processes. Over time, this increases the rate of capital flow, contributing to higher firm productivity (Goldfarb & Tucker, 2019). In the case of production automation (GPT), it directly results in labor substitution, which can reduce labor demand and ultimately lower a firm's operational costs (Acemoglu et al., 2014).

In the banking sector, changes in consumer behavior demand new ways of using financial services. The emergence of FinTech firms poses a threat to traditional banking institutions in the financial services sector. The urgency for banks to undergo digital transformation and become digital banks is undeniable. This transformation involves a clear direction and maintaining profitability by investing in digital assets, making changes from operations to consumer experience, and fostering a cultural shift within the organization (Cuesta et al., 2015). Furthermore, the key to successful digital banking transformation lies in having a strong market knowledge and good products, resulting in product innovation and improved financial services, including functionality, flexibility, and ease of use for both customers and employees. Ultimately, this creates value for the firm and builds societal trust in the firm, leading to improved firm efficiency (Diener & Špaček, 2021; Do, Pham, et al., 2022), reduced operational costs (Kitsios et al., 2021), and positive impact on future firm performance (Maury, 2022).

On the other hand, some studies suggest that digital transformation can have a negative impact on firm productivity (Solow, 1987). This may occur because technological transformation is not solely about technology; the alignment of vision between leaders and organizational members becomes crucial in driving technological change (Tabrizi B et al., 2019). Both the use of general-purpose technologies (GPT) and enabling technologies (ET) require substantial investments in digital assets and demand expertise and skills to utilize them, leading to increased operational and management costs, and a reduction in total asset turnover (Hanelt et al., 2021). The business logic behind large investments naturally comes with high risks and often falls short of achieving increased profitability, not meeting expectations (Gebauer et al., 2020).

H1: Digital transformation is significantly positive to the firm performance

From the perspective of the upper echelon's theory in the context of digital transformation, the role of the CEO becomes crucial for investigation. The character of the CEO in making strategic decisions directly influences firm performance, and rookie CEOs often bring a different decision-making style that is required by the firm (Hamori & Koyuncu, 2006). In the context of digital transformation, according to the research by Zhang et al. (2023) rookie CEOs face significant pressure and risks, presenting substantial challenges. Experienced CEOs tend to adopt a more cautious decision-making style to avoid jeopardizing the careers they have built. However, the research by Zhang et al (2023) does not extend to its impact on firm performance, stopping at the point of examining that rookie CEOs are willing to present strategic plans for digital transformation, but the substantive digital transformation does not occur in the short term, and investments in digital assets remain very low. This empirical research will determine whether the level of CEO experience has an influence on the relationship between digital transformation and firm performance.

One of the hindering factors for digital transformation is the lack of strong support from executive leaders in adopting new technology. The courage to adopt a digital strategy aggressively and radically and to align it with the business portfolio is the most critical factor for incumbent firms to counter the effects of digital disruption. Adapting to the dynamics of change and a firm's business portfolio requires an experienced CEO with the courage to make strategic decisions that benefit the firm (Bughin et al., 2017). Within the heterogeneity of firms, the CEO is also a key factor in achieving differentiation for the firm to enhance core competitiveness and maintain a position in the midst of dynamic industry competition (Herri, 2011).

H2: CEO experience level is an impact factor on the relationship between digital transformation and firm performance

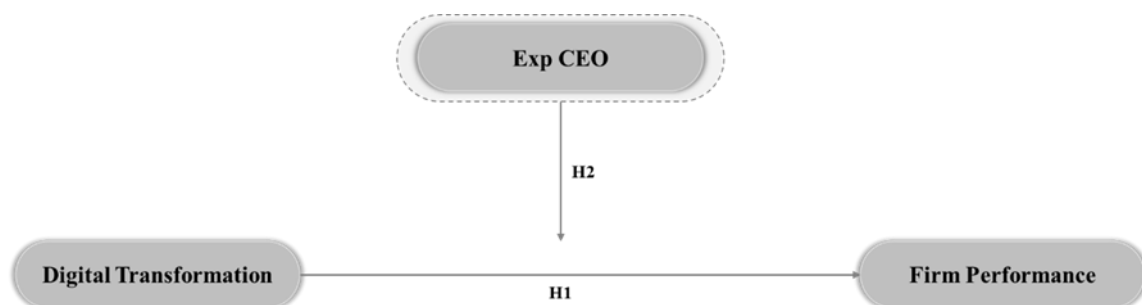


Figure 1. Research Framework

2. Methods

2.1. Data Collection and Sample

This study utilizes panel data from Indonesian listed firms between 2013 and 2022. The sample was selected using purposive sampling from the banking sector listed on the Indonesia Stock Exchange (IDX), resulting in a total of 470 firm-year observations. These observations were winsorized at the 1 percent and 99 percent levels.

2.2. Measures

2.2.1. Dependent Variable

Building on existing research Maury (2022), Zhai, Yang, & Chan (Zhai et al., 2022), his study employs return on total assets (ROA) as a measure of firm performance, reflecting a firm's profitability. Since the research focuses on the impact of digital transformation on profitability, non-financial performance was excluded. ROA was calculated as net earnings divided by total assets

2.2.2. Independent Variable

Digital transformation is measured using the percentage of assets related to digital transformation to total assets (Zhang et al., 2023). Digital assets include ownership or lease rights of ATM machine hardware, computers, applications or software, and other technology devices. This digital asset is used to measure the portion of technology use in the firm's business operations as a form of the

firm's transformation process towards digitalization. The mathematical expression is given by Eq. (1),

$$DT_{i,t} = \frac{\text{Digital Assets}_{i,t}}{\text{Total Assets}_{i,t}} \times 100\% \quad (1)$$

2.2.3. Moderator Variable

Based on Zhang et al. (2023) CEO experience was constructed as the moderator variable using dummy, experience equals 1 if CEOs who held at least one CEO position at a different firm before their current position; and 0 otherwise. To avoid CEO tenure effects, we retain data on the CEO succession year and the following 3 years; this helps observe CEOs decision-making style.

2.2.4. Control Variable

In the literature (Wen et al., 2022), firm age, firm size, top1 shareholder, independent director proportion, board size, financial leverage, and firm growth are among the variables that may affect firm performance, and thus controlled for. Firm age (AGE) is defined as the number of years the firm has existed. Firm size (SIZE) is the natural logarithm of total assets. Top shareholder (TOP) is represented by the proportion of the largest shareholder. The independent director proportion (Indep) is represented by the number of independent directors divided by the number of directors. Board size (BSIZE) is represented by the number of directors in a board. Financial leverage (LEV) is represented by the total asset-liability ratio. Firm Growth (GROWTH) is denoted by the operating revenue growth rate. Tenure (TENURE) is represented by CEOs tenure.

2.3. Model Specification

To test the effect of digital transformation on firm performance, the following econometric models are constructed:

$$ROA_{i,t} = \alpha_0 + \alpha_1 DT_{i,t} + \sum \text{Controls}_{i,t} + \varepsilon_{i,t} \quad (2)$$

To investigate the moderating effect of experienced CEO, econometric models were specified as follows:

$$ROA_{i,t} = \alpha_0 + \alpha_1 EXP_{i,t} + \sum \text{Controls}_{i,t} + \varepsilon_{i,t} \quad (3)$$

$$ROA_{i,t} = \alpha_0 + \alpha_1 DT_{i,t} + \alpha_2 DT_{i,t} * EXP_{i,t} + \alpha_3 EXP_{i,t} + \sum \text{Controls}_{i,t} + \varepsilon_{i,t} \quad (4)$$

where $ROA_{i,t}$ represents net earnings to total assets; $DT_{i,t}$ represents digital transformation; $EXP_{i,t}$ represents experienced CEO; $DT_{i,t} * EXP_{i,t}$ the interaction of digital transformation and experienced CEO; α_2 indicates the moderating effect of experienced CEO; and $\text{Controls}_{i,t}$ represents control variables and $\varepsilon_{i,t}$ refers to the random interference items.

We use Ordinary Least Square (OLS) to estimate the model (2) in STATA version 13. To assess the robustness of the baseline regression we use system generalized method of moments (Sys-GMM) to avoid endogeneity issues from reverse causality between digital transformation and firm performance.

3. Results

3.1. Descriptive statistics

Table 1. Description of statistics

Variables	N	Mean	SD	Min	Max
ROA	430	0.004	0.022	-0.181	0.041
DT	430	0.421	0.610	0.010	7.470
EXP	430	0.174	0.380	0.000	1.000
SIZE	430	3.493	1.801	-0.420	7.597
AGE	430	3.626	0.533	1.099	4.691
TOP	430	4.072	0.360	3.091	4.605
BSIZE	430	1.772	0.419	0.693	2.485
INDEP	430	0.207	0.128	0.100	1.000
LEV	430	0.838	0.084	0.330	1.290

Table 1. shows the descriptive statistics. The average of DT is 0.421%, the standard deviation is 0.610%, and the maximum and minimum are 7.470% and 0.010%, respectively, implying differences in digital transformation. The average of ROA is 0.004 (0.4%), the standard deviation is 0.022 (2.2%), and the maximum and minimum are 0.041 (4.1%) and -0.181 (-18.1%). respectively, indicating a wide variation in firm performance among enterprises.

3.2. Baseline regresion

The maximum variance inflation factor value was $5.66 < 10$, suggesting that there was no serious multicollinearity. The baseline findings of Eq. (2) is shown in Table 2. The coefficients of DT were -0.006, significantly negative at 1 percent level, suggesting that digital transformation can significantly alleviate the firm performance, which is consistent with the findings of Hanelt et al. (2021), Gebauer et al. (2020), and Tabrizi et al. (2019) findings that not all firms can benefit from digital transformation and may fail to reach the expected performance.

Table 2. Baseline regression results

Variables	ROA
DT	-0.006*** (0.002)
SIZE	0.003 (0.002)
AGE	-0.022** (0.009)
TOP	-0.00 (0.004)
BSIZE	-0.001 (0.006)
INDEP	-0.014 (0.017)
LEV	-0.008 (0.013)
GROWTH	0.041*** (0.005)
TENURE	0.001 (0.001)
Constant	0.091** (0.038)
Hausman Test	0.000
Wald test	0.000
Mean VIF	2.210
Number of Obs.	430
R2	0.100
Adj.R2	0.287
F-Stat.	0.000

Notes: *, **, ***Significant 10, 5 and 1 per cent levels, respectively. Standard error in the parenthesis

4.3. Robustness test

Tabel 3. presents endogeneity test. First to avoid endogeneity, system generalized method of moments (Sys-GMM) was used for the endogeneity test. Second, gross profit (PROFIT) was adopted as proxy variables for firm performance (Karim et al., 2022).

The results have used several stages from including multicollinierity, heteroskedasticity, autocorrelation, validity, and model fit test. The maximum variance inflation factor value was $5.57 < 10$, suggesting that there was no serious multicollinearity. The Arellano-Bond (AR1) was $0.011 < 0.05$, the Arellano-Bond (AR2) was $0.716 > 0.05$. The prob > chi2 form hansen test was $0.000 > 0.05$ and f-statistic value was $0.000 < 0.005$. The coefficients of DT were significantly negative at 5 percent level, which is consistent with the findings of baseline regression.

The results presented in Tabel 3. show that the direction and significance of the coefficient of digital transformation were significantly negative in all robustness tests. After considering a series of potential endogeneity issues, the results of the digital transformation may significantly reduce firm performance.

Table 3. Robustness tests

Variables	Baseline	Robustness	
	OLS	OLS	Sys-GMM
	ROA	PROFIT	ROA
DT	-0.006*** (0.002)	-0.022*** (0.008)	-0.008** (0.003)
Constant	0.091** (0.038)	-0.087 (0.136)	0.037* (0.022)
Controls	Yes	Yes	Yes
Hausman Test	0.000	0.177	
Wald test	0.000		
Mean VIF	2.210	2.210	2.210
AR(1)			0.011
AR(2)			0.716
Hansen test			0.251
No. of Instruments			15
No. of Observation	430	430	344
R2	0.100	0.541	
Adj.R2	0.287	0.494	
F-Stat.	0.000	0.000	0.000

Notes: *, **, ***Significant 10, 5 and 1 per cent levels, respectively. Standard error in the parenthesis

4.4. Moderating of experienced CEO

The empirical results of the moderating effect of experienced CEO based on Eq. (3) and Eq. (4) are listed in Table 4. The coefficients of experienced CEO in column (1) is insignificant. The interaction between digital transformation and experienced CEO is used to examine the moderating effect of experienced CEO. The results are shown in column (2) suggesting that experienced CEO can insignificantly affect the relationship of digital transformation on firm performance, not supporting hypothesis 2.

Table 4. Results of moderating effect of experienced CEO

Variables	(1) ROA	(2) ROA	Variables	(1) ROA	(2) ROA
DT		-0.006*** (0.002)	LEV	0.008 (0.012)	-0.007 (0.013)
DT*EXP		0.002 (0.007)	GROWTH	0.041*** (0.005)	0.041*** (0.005)
EXP	-0.000 (0.003)	-0.001 (0.004)	TENURE	0.001 (0.002)	0.001 (0.002)
SIZE	0.002 (0.002)	0.003 (0.002)	Constant	0.077** (0.038)	0.091** (0.038)
AGE	-0.021** (0.009)	-0.022*** (0.009)	Hausman Test	0.000	0.000
TOP	-0.004 (0.004)	-0.005 (0.004)	Wald test	0.000	0.000
			Mean VIF	2.21	2.19
BSIZE	-0.002 (0.006)	-0.001 (0.006)	Number of Obs.	430	430
INDEP	-0.012 (0.017)	-0.014 (0.017)	R ²	0.043	0.102
			Adj.R ²	0.255	0.286
			F-Stat.	0.000	0.000

Notes: *, **, ***Significant 10, 5 and 1 per cent levels, respectively. Standard error in the parenthesis

4.5. Further analysis

Moreover, Different impacts of digital transformation on firm performance may differ on heterogeneity firms. First, it classifies firms by size (number of employees), based on Organisation for Economic Co-operation and Development (OECD), fewer than 10 employees (micro); fewer than 500 employees (small and medium enterprises/SMEs); more than 500 employees (large). Second, divides firms into two types private and state-owned enterprises (Karim et al., 2022). State-owned enterprises (SOEs) may be affected by the influence of the national strategy "Digital national transformation".

Table 5. Results of heterogeneity firms

Variables	Firm Heterogeneity			
	SMEs	Large	SOEs	Private
	ROA	ROA	ROA	ROA
DT	-0.009*** (0.003)	-0.005** (0.002)	-0.014 (0.013)	-0.008*** (0.002)
Constant	0.097** (0.040)	0.095*** (0.026)	0.051 (0.068)	0.032** (0.016)
Controls	Yes	Yes	Yes	Yes
Hausman Test	0.520	0.000	0.000	0.000
Wald test	0.000	0.000	0.000	0.000
Mean VIF	1.41	1.46	2.51	1.37
Number of Obs.	90	340	69	361
R2	0.366	0.005	0.078	0.123
Adj.R2	0.944	0.289	0.726	0.437
F-Stat.	0.000	0.000	0.000	0.000

Notes: *, **, ***Significant 10, 5 and 1 per cent levels, respectively. Standard error in the parenthesis

Based on Tabel 5. the empirical evidence indicates that digital transformation has distinct negative impacts on the heterogeneity of banking firms in Indonesia. The negative impact on SMEs is significant at the 1 percent level, and it is significant at the 5 percent level for large firms. Furthermore, the negative effect of digital transformation on state-owned enterprises (SOEs) surprisingly does not influence firm performance. On the contrary, private firms are negatively affected by digital transformation. This empirical evidence reinforces previous research findings (Hanelt et al., 2021; Gebauer et al., 2020; Tabrizi et al., 2019) that many firms fail to achieve improved performance due to digital transformation.

4. Discussion

This study, based on upper echelons theory and the Resource-Based View (RBV), examines the general condition of the banking industry in Indonesia using data from listed firms between 2013 and 2020. The empirical analysis reveals that digital transformation can significantly decrease firm performance. CEO characteristics based on their level of experience do not affect the negative relationship between digital transformation and firm performance.

The negative impact of digital transformation is attributed to the fact that technology adoption requires substantial investment in digital assets, demanding expertise and skills for its utilization, which subsequently raises operational and management costs, reduces total asset turnover (Hanelt et al., 2021) resulting in a significant decline in revenue for firms (Gebauer et al., 2020). Achieving the desired conditions indeed requires a radical and aggressive transformation (Bughin et al., 2017), but it needs to be clearly directed so that investments in digital assets can yield better profitability. Changes can involve business models, operations, consumer experience, and a cultural shift within the organization (Cuesta et al., 2016).

Technology is a strategic resource for firms if they continue to explore their capabilities and resources so that they become heterogeneous and characterized in the midst of industrial competition (Karim et al., 2022; Herri, 2011; Teece et al., 1997). From the results of this research investigation, when viewed from the heterogeneity of the firm, SOEs tend to be resistant to the negative effects of digital transformation.

From this empirical study, it can be concluded that in the context of digital transformation, the heterogeneity of firms within the banking industry in Indonesia, as well as the characteristics of a CEO based on their level of experience, do not influence firm performance. Investments in digital assets, whether in large or SMEs, have failed to achieve improved firm performance. However, state-owned enterprises are more prepared to face the effects of technological disruption, although they have not yet reached high performance; they are, at the very least, more resistant.

The findings of this study contribute to the literature in several ways. First, they add to the existing literature on digital transformation, which remains a topic of debate, especially in developing countries. Digital transformation negatively impacts the performance of banking firms in Indonesia, in line with previous research emphasizing that heterogeneity among countries is a consideration in the context of the relationship between digital transformation and firm performance. Second, the study explores the moderating effect of an experienced CEO on the relationship between digital transformation and firm performance based on the upper echelons

theory, extending relevant research on experienced CEOs. However, the influence of an experienced CEO on digital transformation and firm performance was found to be insignificant. Third, based on the RBV, technology and human resources within firms have not yet become strategic resources for banking firms in Indonesia.

Further research is needed to strengthen the findings of this study. To follow up on the results of this research investigation, several studies are required. First, expanding the sample data to include firms from various industry sectors. Second, from the perspective of the Resource-Based View (RBV), a firm's resources, including both the CEO and employees, as well as technology, can become strategic assets for the firm. How a CEO's ability to lead the firm in managing the resources within the organization is measured, including their managerial skills and their utilization of technology to achieve greater efficiency, not just productivity alone, reduce operational costs (Kitsios et al., 2021), and have a positive impact on future firm performance (Maury, 2022; Do et al., 2022; Diener, 2021; Kitsios, Giatsidis, & Kamariotou, 2021). Furthermore, broadening the perspective on digital transformation can also encompass corporate governance with concepts such as ESG (Environmental, Social, and Governance) and Sustainability Development Goals. The level of firm sustainability has a strong influence on firm performance (Putra & Adrianto, 2020) to understand what factors make state-owned enterprises more resilient to the negative effects of digital transformation.

5. Conclusion

This study examines the effect of digital transformation on firm performance in Indonesian listed banks by drawing on the Resource-Based View (RBV) and Upper Echelons Theory. Using panel data from 2013–2022, the findings indicate that digital transformation has a significant negative effect on firm performance, while CEO experience does not significantly moderate this relationship. Furthermore, the heterogeneity analysis reveals that the negative effect is more pronounced among private and smaller banks, whereas it is insignificant for state-owned banks.

These findings contribute to the ongoing debate on the performance implications of digital transformation, particularly in emerging economies. While digital technologies are often viewed as strategic resources, the results suggest that investments in digital assets alone are insufficient to improve financial performance. In line with the RBV, digital technologies create value only when supported by complementary organizational capabilities and effective implementation. Moreover, the insignificant moderating effect of CEO experience implies that successful digital transformation depends on broader organizational capabilities rather than prior executive experience alone. From a managerial perspective, bank managers should view digital transformation as a long-term organizational strategy rather than merely a technological investment. Greater attention should be given to developing digital capabilities, organizational learning, and strategic alignment to ensure that digital investments generate sustainable value. For policymakers, strengthening the digital ecosystem and institutional support may help improve the effectiveness of digital transformation within the banking sector.

This study is limited to Indonesian listed banks and measures digital transformation primarily through digital asset investment. Future research may employ broader measures of digital transformation and examine additional organizational factors, such as digital leadership, corporate governance, and digital capability, to better explain how digital transformation contributes to sustainable firm performance.

6. References

- Acemoglu, D., Autor, D., Dorn, D., Hanson, G. H., & Price, B. (2014). Return of the Solow Paradox? IT, Productivity, and Employment in US Manufacturing. *American Economic Review*, 104(5), 394–399. <https://doi.org/10.1257/aer.104.5.394>
- Barney, J. B. (1991). Firm Resources and Sustained Competitive Advantage. *Journal of Management*, 17(1), 99–120. <https://doi.org/10.1177/014920639101700108>
- Bertschek, I., Cerquera, D., & Klein, G. J. (2013). More bits - more bucks? Measuring the impact of broadband internet on firm performance. In *Information Economics and Policy* (Vol. 25, Issue 3). <https://doi.org/10.1016/j.infoecopol.2012.11.002>
- Bughin, J., McCarthy, B., & Chui, M. (2017). A Survey of Executives Reveals How Businesses Succeed with AI. *Harvard Business Review*.

- Chen, N., Sun, D., & Chen, J. (2022). Digital transformation, labour share, and industrial heterogeneity. *Journal of Innovation and Knowledge*, 7(2), 100173.
<https://doi.org/10.1016/j.jik.2022.100173>
- Cuesta, C., Ruesta, M., Tuesta, D., & Urbiola, P. (2015). The digital transformation of the banking industry. *BBVA Research*, 1(4), 1–10.
https://search.proquest.com/openview/11ce65b78981d47e569f962119de968c/1?pq-origsite=gscholar&cbl=2026366&diss=y%0Ahttps://repositorio.iscte-iul.pt/bitstream/10071/24025/1/master_maria_garcia_jesus.pdf
- Cuesta, C., Ruesta, M., Tuesta, D., & Urbiola, P. (2016). The digital transformation of the banking industry. *BBVA Research*.
- Diener, F., & Špacek, M. (2021). Digital transformation in banking: A managerial perspective on barriers to change. *Sustainability (Switzerland)*, 13(4), 1–26.
<https://doi.org/10.3390/su13042032>
- Diener, F., & Špaček, M. (2021). Digital Transformation in Banking: A Managerial Perspective on Barriers to Change. *Sustainability*, 13(4), 2032. <https://doi.org/10.3390/su13042032>
- Do, T. D., An, H., Pham, T., & Thalassinou, E. I. (2022). The Impact of Digital Transformation on Performance : Evidence from Vietnamese Commercial Banks. *Journal of Risk and Financial Management*, 15(21).
- Do, T. D., Pham, H. A. T., Thalassinou, E. I., & Le, H. A. (2022). The Impact of Digital Transformation on Performance: Evidence from Vietnamese Commercial Banks. *Journal of Risk and Financial Management*, 15(1), 21. <https://doi.org/10.3390/jrfm15010021>
- East Ventures. (2023). *East Ventures – Digital Competitiveness Index 2023*.
<https://east.vc/reports/east-ventures-digital-competitiveness-index-2023/>
- Gebauer, H., Fleisch, E., Lamprecht, C., & Wortmann, F. (2020). Growth paths for overcoming the digitalization paradox. *Business Horizons*, 63(3), 313–323.
<https://doi.org/10.1016/j.bushor.2020.01.005>
- Gupta, G., & Bose, I. (2019). Strategic learning for digital market pioneering: Examining the transformation of Wishberry's crowdfunding model. *Technological Forecasting and Social Change*, 146, 865–876. <https://doi.org/10.1016/j.techfore.2018.06.020>
- Hambrick, D. C. ., & Mason, P. A. . (1984). Upper Echelons : The Organizationas a Reflectionof Its Top Managers. In *The Academy of Management Review* (Vol. 9, Issue 2, pp. 193–206).
- Hamori, M., & Koyuncu, B. (2006). Experience matters? The impact of prior CEO experience on firm performance. *Human Resource Management*, 54(1), 23–44.
<https://doi.org/10.1002/hrm>
- Hanelt, A., Bohnsack, R., Marz, D., & Antunes Marante, C. (2021). A Systematic Review of the Literature on Digital Transformation: Insights and Implications for Strategy and Organizational Change. *Journal of Management Studies*, 58(5), 1159–1197.
<https://doi.org/10.1111/joms.12639>
- Heredia, J., Castillo-Vergara, M., Geldes, C., Carbajal Gamarra, F. M., Flores, A., & Heredia, W. (2022). How do digital capabilities affect firm performance? The mediating role of technological capabilities in the “new normal.” *Journal of Innovation & Knowledge*, 7(2), 100171. <https://doi.org/10.1016/j.jik.2022.100171>
- Herri, H. (2011). Firms Performance And Top Management Characteristics In Indonesia. *International Business & Economics Research Journal (IBER)*, 10(8), 15.
<https://doi.org/10.19030/iber.v10i8.5374>
- Karim, M. S., Nahar, S., & Demirbag, M. (2022). Resource-Based Perspective on ICT Use and Firm Performance: A Meta-analysis Investigating the Moderating Role of Cross-Country ICT Development Status. *Technological Forecasting and Social Change*, 179(March), 121626.
<https://doi.org/10.1016/j.techfore.2022.121626>
- Kitsios, F., Giatsidis, I., & Kamariotou, M. (2021). Digital transformation and strategy in the

- banking sector: Evaluating the acceptance rate of e-services. *Journal of Open Innovation: Technology, Market, and Complexity*, 7(3). <https://doi.org/10.3390/joitmc7030204>
- Maury, B. (2022). Strategic CSR and firm performance: The role of prospector and growth strategies. *Journal of Economics and Business*, 118(September 2021). <https://doi.org/10.1016/j.jeconbus.2021.106031>
- Putra, E. D., & Adrianto, F. (2020). Analisis Tata Kelola Perusahaan Pada Perusahaan Sustainable & Responsible Investment (SRI) Studi Empiris Perusahaan Besar di Indonesia. *Kajian Ekonomi Dan Keuangan*, 4(1), 39–63. <https://doi.org/10.31685/kek.v4i1.481>
- Solow, R. M. (1987). We'd Better Watch Out. *The New York Times Book Review*. <http://ci.nii.ac.jp/naid/10007455402/>
- Tabrizi B, Lam E, Girard K, & Irvin V. (2019). Digital Transformation Is Not About Technology. *Harvard Business Review*, 1–6.
- Teece, D. J. (2018). Profiting from innovation in the digital economy: Enabling technologies, standards, and licensing models in the wireless world. *Research Policy*, 47(8), 1367–1387. <https://doi.org/10.1016/j.respol.2017.01.015>
- Teece, D. J., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic Management Journal*, 18(7), 509–533. [https://doi.org/10.1002/\(SICI\)1097-0266\(199708\)18:7<509::AID-SMJ882>3.0.CO;2-Z](https://doi.org/10.1002/(SICI)1097-0266(199708)18:7<509::AID-SMJ882>3.0.CO;2-Z)
- Teece, D. J., Pisano, G., & Shuen, A. (2009). Dynamic capabilities and strategic management. *Knowledge and Strategy*, 18(April 1991), 77–116. <https://doi.org/10.4337/9781035334995.00014>
- Ting, I. W. K., Azizan, N. A. B., & Kweh, Q. L. (2015). Upper Echelon Theory Revisited: The Relationship between CEO Personal Characteristics and Financial Leverage Decision. *Procedia - Social and Behavioral Sciences*, 195, 686–694. <https://doi.org/10.1016/j.sbspro.2015.06.276>
- Wen, H., Zhong, Q., & Lee, C. C. (2022). Digitalization, competition strategy and corporate innovation: Evidence from Chinese manufacturing listed companies. *International Review of Financial Analysis*, 82(March), 102166. <https://doi.org/10.1016/j.irfa.2022.102166>
- Zhai, H., Yang, M., & Chan, K. C. (2022). Does digital transformation enhance a firm's performance? Evidence from China. *Technology in Society*, 68(December 2021), 101841. <https://doi.org/10.1016/j.techsoc.2021.101841>
- Zhang, W., Lu, C., & Liang, S. (2023). More words but less investment: Rookie CEOs and firms' digital transformations. *China Journal of Accounting Research*, 100305. <https://doi.org/10.1016/j.cjar.2023.100305>