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The Moderating Role of Firm Size in the Effects of Operational Risk and Digital Transformation on Financial Performance

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Abstract

The financial performance of firms in the Indonesian non-cyclical consumer sector is increasingly influenced by operational risk management and digital transformation, while firm size may shape how these factors translate into performance outcomes. This study employed a quantitative approach using panel data regression on non-cyclical consumer companies listed on the Indonesia Stock Exchange during 2019–2024, with purposive sampling and firm size as a moderating variable, analyzed using EViews and fixed effect model selection. Results show that operational risk has a significant negative effect on financial performance, and digital transformation also negatively affects performance, while firm size strengthens the relationship between both variables and financial performance, with an adjusted R-squared of 0.752 indicating strong explanatory power. This study concludes that integrating operational risk, digital transformation, and firm size provides a comprehensive model for explaining financial performance in Indonesian consumer non-cyclical firms, offering implications for managerial decision-making and corporate strategy development. These findings highlight the importance of strengthening risk governance and accelerating digital adoption in medium and large firms, particularly in emerging markets, where resource differences influence the effectiveness of transformation strategies and financial resilience across industries over time. Policy and managerial recommendations should focus on sustainable digital risk integration strategies.

INTRODUCTION

The non-cyclical consumer sector in Indonesia continues to grow along with increasing demand for quality products (Khayati et al., 2022). However, this growth also faces various challenges, making financial performance a crucial indicator of a company's success. Financial performance reflects a company's ability to manage resources to generate profits and maintain operational stability (Barauskaite & Streimikiene, 2021). In this context, operational risk and digital transformation are strategic factors influencing financial performance. Poorly managed operational risk can lead to losses and reduce efficiency, necessitating effective risk management to maintain company sustainability (Soukaina & Mounir, 2022).

Digital transformation plays a crucial role in improving operational efficiency through automation, real-time data analysis, and product and service innovation. Despite challenges such as high implementation costs and the complexity of technology integration (Farida, 2023), companies that successfully implement it tend to experience increased long-term profitability (Chen & Zhang, 2024). Meanwhile, effective operational risk management can mitigate the negative impact on financial performance (Soukaina & Mounir, 2022). Furthermore, company size has the potential to moderate this relationship, as larger companies generally have more adequate resources to manage risk and adopt digital technologies (Asikin & Nurdin, 2024). While various studies have examined the impact of digital transformation on corporate efficiency and profitability (Guo & Xu, 2021), limited research integrating operational risk and digital transformation in explaining the financial performance of companies in Indonesia remains limited. Therefore, this study aims to provide a more comprehensive understanding of the influence of these two factors on financial performance with the research entitled **"The Moderating Role of Company Size on the Effect of Operational Risk and Digital Transformation on Financial Performance**. " The research results are expected to provide theoretical and practical contributions for companies in formulating more adaptive, innovative and sustainable strategies.

Previous empirical studies have shown mixed findings regarding the impact of digital transformation and operational risk on financial performance. Chen and Zhang (2024) found that digital transformation positively influences firm profitability by improving efficiency and innovation capacity. Similarly, Guo and Xu (2021) highlighted that digitalization enhances firm performance, although the relationship may not be linear. On the other hand, studies such as Fadriyaturrohmah and Manda (2022) and Hapsari (2022) confirm that operational risk negatively affects financial performance, particularly in sectors with high operational complexity such as banking and manufacturing.

However, other studies indicate more complex relationships. For instance, LinG (2025) found that digital transformation may initially reduce financial performance due to high implementation costs, while Yang and Masron (2023) also reported short-term profitability decline in early digital adoption stages. These contradictory findings suggest that the impact of digital transformation and operational risk is not universal and may depend on contextual factors such as firm size, industry characteristics, and resource availability, which remain underexplored in integrated models (Chen & Wang, 2024; Syarkani, 2025; Valaskova et al., 2025; Yan & Ahmad, 2025).

The research gap in this study lies in the limited number of empirical studies that simultaneously examine operational risk and digital transformation within a unified framework, particularly in the Indonesian consumer non-cyclical sector. Moreover, although firm size is often considered a moderating variable in financial performance studies, its role in strengthening or weakening the relationship between digital transformation, operational risk, and financial outcomes has not been sufficiently analyzed in emerging market contexts such as Indonesia.

The urgency of this research is driven by the increasing volatility of business environments and the accelerating adoption of digital technologies across industries. Firms are required not only to invest in digital infrastructure but also to ensure robust risk management systems to prevent financial inefficiencies. In developing economies like Indonesia, where disparities in technological readiness exist among firms, understanding how operational risk and digital transformation interact under different firm sizes becomes essential for sustainable corporate governance and competitiveness.

The novelty of this study is the integration of operational risk and digital transformation within a single analytical model while incorporating firm size as a moderating variable. Unlike previous studies that examine these variables separately or in different sectors, this research focuses specifically on non-cyclical consumer sector companies listed on the Indonesia Stock Exchange during the 2019–2024 period (Anggraeni & Sudarsi, 2025; Pangestuti et al., 2025). This longitudinal and sector-specific approach provides a more comprehensive understanding of how structural firm characteristics influence financial outcomes in the digital era (Ahmed & Islam, 2024; Bruno et al., 2024; Morosan-Danila et al., 2025).

The main purpose of this study is to analyze the effect of operational risk and digital transformation on financial performance and to examine the moderating role of firm size in strengthening or weakening these relationships. This study also aims to provide a more integrated theoretical explanation by combining risk management theory and digital transformation perspective in explaining firm performance outcomes, particularly in emerging market settings.

The objectives and benefits of this research are both theoretical and practical. Theoretically, this study contributes to the development of financial performance literature by integrating operational risk and digital transformation into a unified empirical model. Practically, the findings are expected to assist corporate managers and policymakers in designing more effective strategies for digital adoption and risk mitigation. Ultimately, this research provides insights for companies to optimize financial performance through balanced investment in technology and risk management, while also offering guidance for investors in assessing firm resilience in dynamic market conditions.

METHOD

3.1 Research Design

This study used a quantitative approach to analyze the influence of operational risk and digital transformation on the financial performance of non-cyclical consumer sector companies listed on the Indonesia Stock Exchange. Furthermore, company size serves as a moderating variable to deepen the analysis of the relationships between variables. This study utilizes secondary data in the form of financial statements and annual reports obtained from the Indonesia Stock Exchange (IDX) and the companies' official websites for the 2019–2024 period. The sample was selected using a purposive sampling technique, while data analysis was conducted using panel data regression to examine the relationships between variables across companies and over time. Data analysis was

performed using EViews 9 to estimate panel data regression and determine the best model through CEM, FEM, or REM. The results of this study are expected to provide an understanding of the factors influencing financial performance and their implications for managerial decision-making in the non-cyclical consumer sector in Indonesia.

3.2 Variables and Measurement

Operational definitions are used to clearly explain and measure each research variable. This study includes independent variables (operational risk and digital transformation), a dependent variable (financial performance/ROA), a moderating variable (firm size), and control variables. Measurements for each variable are presented in Table 1:

Table 1. Definition of Operational Variables

Type	Variable Name	Symbol	Formula	Reference
Dependent Variable	Financial performance	ROA	Net Profit/Total Assets	Nam & Tuyen (2024)
Independent Variables	*Operational Risk*	ORK	*Total Assets/Fixed Assets*	Sroka & Wieczorek-Kosmala (2024)
	Digital Transformation	DTL	*Digital intangible assets / total intangible assets*	Lantip & Daljoni (2023)
Moderating Variables	*Size*	SIZE	*Log of Total Assets*	Nam & Tuyen (2024)

3.3 Method of collecting data

The data used in this research activity is secondary data, which is gathered indirectly. The data consists of financial and annual reports from selected companies, which are then analyzed quantitatively. The Indonesia Stock Exchange (via *the website* https://www.idx.co.id/) or the official websites of sample companies in the consumer *non-cyclicals section* listed on the IDX served as the primary data sources.

3.4 Sampling Method

In this study, the sampling method used was *purposive sampling*. This method was chosen based on considerations focused on specific objectives. The sample in this study comprised companies that met the established requirements. The criteria underlying the selection of data as research samples are as follows:

Table 2. Sampling Criteria

Information	Amount
Companies listed on the Indonesia Stock Exchange in the *consumer non-cyclical sector*	132
Companies that IPO after 2019 during the research period 2019-2024.	(61)
Number of companies suspended	(5)
Companies that are worthy of being samples	66
Research year 2019-2024	6
Total data used for research	396
Number of observation data of research samples	78

Based on the sample selection process, 66 of the 132 non-cyclical consumer sector companies listed on the Indonesia Stock Exchange met the research criteria. A total of 318 observations did not meet the criteria due to lack of information on intangible assets and digital transformation, resulting in 78 observations. This number meets the minimum sample requirement according to Hair et al. (2019), which is 10 times the number of variables (7 × 10 = 70 samples).

3.5 Data Testing Method

This study used panel data regression analysis with the help of EViews software. This method allows testing the effect of independent variables on the dependent variable while taking into account variation between individuals and over time, resulting in more accurate and reliable estimates.

The data analysis method in this study is used to test the influence of operational risk, digital transformation, on company financial performance, and to evaluate the role of company size as a moderating variable in this relationship.

3.5.1 Data Suitability Test

To examine the relationship between independent, dependent, and moderating variables, this study uses panel data regression, which combines cross-sectional and time-series data. This method is able to more accurately capture the dynamics of variable relationships and control for unobservable heterogeneity.

Model Testing

This study conducted a Model Selection Test to determine the most appropriate panel data regression model. The Chow Test was used to determine whether the Fixed Effects Model (FEM) was more appropriate. The test results showed a cross-sectional chi-square value of 124.454185 with a p-value of 0.000 < 0.05, thus FEM was selected as the appropriate model. Therefore, the test was continued with the Hausman Test.

Table 3. *Chow* and *Hausman* Test Results

Chow *Test*			
Effects Test	***Statistics***	***df***	***Prob.***
Chi-square cross section	124.454185	18	0.0000
Hausman *Test*			
Effects Test	***Statistics***	***df***	***Prob.***
Random cross section	28.963142	9	0.0007

*Alpha 10%

Source: *e-views output*

The test results showed a statistical value of 28.963142 with a p-value of 0.0007 < 0.05, so FEM was chosen as the most appropriate model. In this study, the LM test was not performed because the results of the Chow Test and the Hausman Test indicated that FEM was the most appropriate model.

Goodness of Fit Test

The test results showed an Adjusted R^2 value of 0.752021, meaning the independent variables in the model were able to explain 75.20% of the variation in ROA, while the remaining 24.80% was influenced by other factors outside the model. These results indicate that the model has good goodness of fit.

Table 4. Results of *the Determination Coefficient Test (R2) and* F Test (Simultaneous Test)

Testing *the Coefficient of Determination (R^2)*			
Testing		***Value***	
Adjusted R- squared		0.752021	
F Test (Simultaneous Test)			
Effects Test	**Prob.**	***Hypothesis***	***Conclusion***
Prob(F-statistic)	**0.000000**	**H0 is rejected**	**Model fit for use**

Source: *e-views output*

F *test*

The test results show an F-statistic value of 9.648540 with a p-value of 0.0000 < 0.05, so the model is declared significant and it is proven that there is at least one independent variable that has a significant effect on the dependent variable.

3.6 Data analysis methods

Data analysis methods are used to process, interpret, and draw conclusions from the data to test hypotheses and answer research questions. This study uses panel data regression to analyze the relationship between independent, dependent, and moderating variables because it combines cross-sectional and time-series data and produces more accurate estimates. The data is then analyzed using:

3.6.1 Descriptive Statistics

Descriptive statistics are used to provide an overview of the data used in this study, including the distribution and characteristics of the variables studied. Descriptive statistics include measures of central tendency, such as the mean, median, and mode, as well as measures of dispersion, such as the standard deviation, variance, and minimum and maximum values of each variable.

3.6.2 Multiple Regression Analysis

Multiple regression analysis was used to examine the relationship between the independent variables, moderating variables, and dependent variables in this study. This regression model aims to measure the influence of operational risk and digital transformation on company financial performance, with company size as a moderating variable. The basic regression equation used in this study is as follows:

$$ROA_{it} = \beta_0 + \beta_1 ORK_{it} + \beta_2 DTL_{it} + \beta_3 CSR_{it} + \beta_4 SIZE_{it} + \beta_5 (ORK_{it} \times SIZE_{it}) + \beta_6 (DTL_{it} \times SIZE_{it}) + \beta_7 (CSR_{it} \times SIZE_{it}) + \beta_8 LIQ_{it} + \beta_9 LEV_{it} + \varepsilon_{it}$$

3.6.3 Partial Test (t-test)

Partial testing is carried out with the aim of testing the influence of each independent variable on the dependent variable with the steps of hypothesis testing. If the p-value of the t statistic ≤ 0.05 then Ho is rejected, conversely if the p-value of the t statistic > 0.05 then Ho is accepted.

RESULTS AND DISCUSSIONS

Description of Research Data

This study uses secondary data from the financial reports and annual reports of non-cyclical consumer sector companies listed on the Indonesia Stock Exchange for the 2019–2023 period. The sample was selected using a purposive sampling technique based on specific criteria, resulting in 128 research samples with complete data and information related to digital transformation.

4.2. Descriptive Statistics

Descriptive statistics were used to describe data characteristics through mean values, standard deviations, and minimum and maximum values. Based on Table 8, the average ROA was 5.822%, with relatively homogeneous data variation. The lowest value, at -11.871%, was found in BWPT (2021), while the highest value, at 22.179%, was found in ADES (2022).

Table 5. Descriptive Statistics of Research Variables

Variables	N	Mean	Maximum	Minimum	Std. Dev.
ROA	78	0.058220	0.221789	-0.11871	0.008206
ORK	78	0.327579	0.771454	0.013853	0.020677
DTR	78	0.257104	0.93750	0.000295	0.029502
SIZE	78	11.07757	13.61247	0.122255	0.486481

Source: e-views 9 output

Based on the processing results in the table above, the following interpretation is obtained:

The Operational Risk (ORK) variable has an average value of 0.327579 with a standard deviation of 0.020677. The digital transformation variable has an average value of 0.257104, indicating that approximately 25.71% of the company's intangible assets are in the form of software investments. The standard deviation of 0.029502 indicates relatively homogeneous variation between companies. ***The firm size variable shows that the variation in*** *firm size* data between one company and another is quite homogeneous.

4.3. Data Analysis

4.3.1. Multiple Regression Analysis

This study uses unbalanced panel multiple regression, combining time series and cross-section data. This method was chosen due to limited digital transformation data, so only companies with complete data were included in the sample. The data processing results are presented in the following regression equation:

ROA = 0.124227 - 0.133778 ORK - 0.145028 DTR -0.005805 SIZE

4.3.2. Hypothesis Testing (t-Test)

The results of the hypothesis testing (t-test) can be seen in table 9. Based on table 11 above, several test results can be seen as follows:

Table 6. ROA Model Regression Analysis Results

Variable	Coefficient	Prob.	Information
ORK	**-0.133778**	**0.0006****	**Significant**
DTL	**-0.145028**	**0.0000****	**Significant**
ORK_SIZE	**0.009317**	**0.0066****	**Significant**
DTR_SIZE	**0.012766**	**0.0000****	**Significant**

Note: Significance Level *10% and **5%

Based on the table, a p-value of 0.0006 <0.05 with an estimated coefficient of -0.133778 can be concluded that there is a significant negative effect of operational risk on financial performance (ROA). From the processing results obtained a p-value of 0.0000 <0.05 with an estimated coefficient of -0.145028 can be concluded that there is a significant negative effect of digital transformation on financial performance (ROA). The processing results are shown by the p-value of t statistics of 0.0066 <0.05 with an estimated coefficient of 0.009317 can be concluded that *size* is proven to moderate the positive effect of operational risk on financial performance (ROA). The processing results are shown by the p-value of t statistics of 0.0000 <0.05 with an estimated coefficient of 0.012766 can be concluded that size is proven to moderate the negative effect of digital transformation on financial performance (ROA)

4.4 Discussion Results Study

4.4.1 The Influence of Operational Risk on Company Financial Performance

These results align with research findings conducted by Hapsari (2022), which stated that operational risk negatively impacts bank financial performance. This finding implies that greater operational risk will decrease a company's financial performance (ROA). These findings also align with research by Fadriyaturrohmah & Manda (2022), which showed that operational risk negatively impacts financial performance. These findings demonstrate that effective operational risk management through increased efficiency and operational cost monitoring is crucial for minimizing risk and improving a company's financial performance (ROA).

4.4.2 The Influence of Digital Transformation on Company Financial Performance

These findings align with an empirical study conducted by LinG (2025), which demonstrated that digital transformation negatively impacted the financial performance of rural commercial banks in Beijing, China. An empirical study by Yang & Masron (2023) found that digital transformation negatively impacted profitability, and an empirical study by Gou & Xu (2021) demonstrated a parabolic relationship between digitalization and financial performance. Implementing digital transformation in non-

cyclical consumer industries requires significant investment in hardware, software, training, and implementation. In the initial stages, costs often exceed the benefits, which can negatively impact a company's financial performance.

4.4.3 Company Size Moderates the Relationship Between Operational Risk and Company Financial Performance

These findings indicate that in large companies, operational risk can drive improved financial performance, while in small companies it tends to decrease performance. These results align with Banani and Mindayani (2023), who found that company size positively moderates the relationship between business risk and company performance.

4.4.4 Firm size *moderates* the relationship between Digital Transformation and Firm Financial Performance

These findings align with research by Kurniawan et al. (2021), which explains that company size moderates the relationship between digital transformation and financial performance, with larger companies better able to optimize digital innovation to improve their performance. Lantip's (2023) findings also support research that found company size acts as a moderator in the relationship between digital transformation and financial performance. These findings indicate that larger companies are able to leverage digital transformation more optimally through economies of scale, broader reach, and more effective information system integration. Furthermore, digital transformation helps improve business process efficiency in complex organizations, thus positively impacting company financial performance.

CONCLUSION

This research is motivated by the importance of understanding the factors influencing the financial performance of companies in Indonesia, particularly operational risk and digital transformation. Although these two factors have been extensively researched, limited research integrates them into a single model. Furthermore, company size is considered a moderating variable due to differences in company capacity to manage risk and implement digital technology. Therefore, this study aims to fill this gap and provide a more comprehensive understanding of the influence of these factors on company financial performance. From the results of the research conducted with the aim of analyzing the influence of operational risk, digital transformation, and the moderating effect of company size on operational risk and digital transformation on financial performance (ROA), it can be concluded that operational risk has a positive and significant effect on financial performance (ROA). Digital transformation has been shown to have a negative and significant effect on company financial performance (ROA). Company size has been shown to strengthen the positive and significant effect of company risk on financial performance (ROA). Company size has been shown to strengthen the positive and significant effect of company digital transformation on financial performance (ROA).

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