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THE EFFECT OF DIGITAL TRANSFORMATION, LIQUIDITY, AND LEVERAGE ON PROFITABILITY IN TRANSPORTATION SECTOR COMPANIES LISTED ON THE INDONESIA STOCK EXCHANGE

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Abstract

This study aims to examine the effect of digital transformation, liquidity, and leverage on the profitability of transportation sector companies listed on the Indonesia Stock Exchange (IDX). This study employs a quantitative approach using secondary data obtained from the annual reports and financial statements of transportation companies published through the IDX and each company's official website. A purposive sampling technique was applied, resulting in a sample of 24 companies observed over the 2021-2024 period, with a total of 96 firm-year observations. The analytical method used is panel data regression, with the Fixed Effect Model (FEM) selected as the most appropriate model based on the Chow and Hausman tests, processed using EViews 12. The results show that digital transformation, proxied by the Digital Transformation Disclosure Index (DTDI), has a negative and significant effect on profitability. Liquidity, proxied by the Current Ratio (CR), has a negative but insignificant effect on profitability, while leverage, proxied by the Debt to Equity Ratio (DER), has a positive but insignificant effect on profitability. These findings indicate that digital investment has not yet translated into higher earnings within the study period, and that liquidity and capital structure decisions require careful managerial attention. The results are expected to provide practical considerations for company management in formulating digital transformation strategies, liquidity management, and funding structure policies to improve corporate profitability.

Keywords: Debt to Equity Ratio; Digital Transformation Disclosure Index; Liquidity; Profitability.

INTRODUCTION

The transportation sector is one of the strategic sectors that plays an important role in supporting national economic growth, serving as a means of public mobility, goods distribution, and support for the smooth running of production and trade activities. In the context of globalization and rapid technological development, transportation is no longer viewed merely as a means of physical mobility, but has also become part of a digital economic ecosystem that demands speed, efficiency, flexibility, and high connectivity. The sector experienced considerable change during the 2021-2024 period, driven by the advancement of digital technology, changes in consumer behavior, increasingly intense business competition, and post-COVID-19 economic recovery conditions, while also facing high operating costs, large capital requirements, and a high level of inter-company competition that requires companies to manage their resources effectively in order to maintain profitability (Andriani, 2024b).

Profitability is a key indicator used to assess how effectively a company generates profit from its operational activities, and in this study is measured using Return on Assets (ROA), which reflects a company's for several transportation companies listed on the IDX during 2021-2024 shows considerable fluctuation: Blue Bird Tbk (BIRD), for instance, recorded an increase in ROA from 0.12% in 2021 to 6.93% in 2024, whereas Mineral Sumberdaya Mandiri Tbk (AKSI) experienced a decline from 12.78% in 2022 to -6.47% in 2024, and

several other companies recorded negative ROA values during part of the observation period. This fluctuation indicates that the profitability of transportation companies is influenced by both internal factors, such as liquidity and leverage, and external factors, such as digital transformation. Digital transformation has become one of the key drivers of major change in Indonesia's transportation and logistics industry. Verhoef et al. (2021) define digital transformation as an organizational change process through the use of digital technology to improve operational efficiency, create new business models, and increase firm value, while Parviainen et al. (2019) emphasize that digital transformation covers not only technology adoption but also changes in business strategy, operational processes, and services; in this study it is measured using the Digital Transformation Disclosure Index (DTDI), obtained through a content analysis of information disclosed in companies' annual reports. Prior findings on the relationship between digital transformation and profitability remain mixed: Hidayat (2025) found a positive effect of digital transformation on profitability, whereas Syamsil Huda and Yolandafitri Zulvia (2025) found that digital transformation negatively affects the profitability of transportation companies because of the high cost of digital investment that has not yet been offset by increased earnings. Liquidity, measured in this study using the Current Ratio (CR), reflects a company's ability to meet its short-term obligations and is an important internal indicator of financial stability (Nurjanah et al., 2025); prior studies show inconsistent results, as Andriani (2024) found a positive effect on profitability, Nurjanah et al. (2025) found no significant effect, while Bolek et al. (2021) found that excessive liquidity can reduce profitability due to underutilized current assets. Leverage, measured using the Debt to Equity Ratio (DER), reflects the extent to which a company relies on debt to finance its assets and operating activities; findings on its effect on profitability also remain inconsistent, as Maulana and Rahayu (2022) found a positive effect because debt can expand a company's operating capacity, whereas Syukri Hadi et al. (2022) and Nawaz et al. (2019) found a negative effect due to the increased financial burden associated with high debt levels. Based on these empirical phenomena and inconsistencies found in prior research, studies that simultaneously examine the effect of digital transformation, liquidity, and leverage on profitability in the transportation sector listed on the IDX remain relatively limited, even though this sector is capital-intensive, has experienced accelerated digitalization since the COVID-19 pandemic, and faces financial dynamics that differ from other sectors. Therefore, this study aims to (1) analyze the effect of digital transformation on the profitability of transportation sector companies listed on the IDX, (2) analyze the effect of liquidity on profitability, and (3) analyze the effect of leverage on profitability, using panel data regression analysis on transportation sector companies listed on the IDX during the 2021-2024 period.

LITERATURE REVIEW

Signaling Theory

This study is grounded in signaling theory, proposed by Spence (1973), which explains that a party possessing better information will convey signals to other parties in order to reduce information asymmetry. Information reflected in financial statements, such as liquidity and leverage levels, serves as an important indicator in assessing a company's ability to manage short-term obligations and its funding structure. In addition, the digital transformation undertaken by a company can be viewed as a positive signal indicating the company's readiness to enhance operational efficiency, competitiveness, and business sustainability amid technological development and industry dynamics. Applied to this study, transportation companies listed on the IDX during 2021-2024 can use their profitability performance, liquidity level, leverage, and digital transformation practices as signals to investors regarding the company's condition and prospects.

Profitability

Profitability is a company's ability to generate profit within a certain period through the effective use of its assets, capital, and operations (Masyitah et al., 2018). Profitability is used by stakeholders (investors, creditors, management) as a benchmark of performance and business feasibility, and is frequently used as the dependent variable when examining the effect of internal variables (financing policy, liquidity, technology investment) or external factors on firm performance (Adam Ibnu Rosyid, 2024). In this study, profitability is measured using Return on Assets (ROA), calculated by comparing net income after tax to total assets. A higher ROA indicates greater efficiency of the company in generating profit from its assets.

Digital Transformation

Digital transformation refers to the integration of digital technology into a company's activities and

strategy, encompassing not only technology adoption but also changes in strategy, operations, innovation, human resources, and services (Verhoef et al., 2021; Parviainen et al., 2019). In this study, digital transformation is measured using the Digital Transformation Disclosure Index (DTDI), adapted from a dictionary of codes covering 15 indicators representing six dimensions: digital strategy, digital technology, digital operations, digital innovation, digital human resources, and digital services (Borrero-Domínguez et al., 2024). Each disclosed indicator in the annual report is scored 1, and 0 otherwise; the DTDI value is the ratio of disclosed indicators to total indicators.

Liquidity

Liquidity reflects a company's ability to meet its short-term obligations using readily convertible assets such as cash and receivables. In this study, liquidity is measured using the Current Ratio (CR), obtained by comparing total current assets with total current liabilities. A higher CR indicates a greater ability of the company to meet its short-term obligations.

Leverage

Leverage measures the extent to which a company uses debt to finance its assets and operating activities. In this study, leverage is measured using the Debt to Equity Ratio (DER), obtained by comparing total debt with total equity. A higher DER indicates a greater reliance on debt relative to the company's own capital.

Conceptual Framework and Hypotheses Development

Based on the theoretical review, empirical phenomena, and prior research findings discussed above, the relationships among the research variables are built upon signaling theory, which explains that information regarding digital transformation, liquidity condition, and funding structure constitutes a signal that can influence investors' perceptions of a company's prospects. Digital transformation is expected to increase operational efficiency, liquidity reflects the company's ability to meet short-term obligations, while leverage describes the company's funding structure that may affect its ability to generate profit. The relationship among the variables of digital transformation (DTDI), liquidity (CR), and leverage (DER) as independent variables, and profitability (ROA) as the dependent variable, is illustrated in the conceptual framework below.

Digital Transformation (DTDI) →(H1)→
Liquidity (CR) →(H2)→ Profitability (ROA)
Leverage (DER) →(H3)→

Digital transformation is understood as the strategic integration of advanced technology into all dimensions of a company's operations to revolutionize business processes and decision-making effectiveness. Digitalization drives internal optimization through advanced information systems and automation, which is reflected in increased investment in intangible assets. Yavuz et al. (2025) found that digital transformation positively affects firms' financial performance through improved operational efficiency and business value creation, a finding reinforced by Yew Liang and Yubin (2025). However, initial digital spending may place pressure on short-term earnings before the benefits of efficiency and revenue growth materialize.

H1: Digital Transformation has a positive and significant effect on Profitability in transportation sector companies listed on the Indonesia Stock Exchange (IDX) for the period 2021-2024.

A healthy liquidity position indicates that a company has adequate capacity to meet its current liabilities without having to sell fixed assets or resort to costly financing, placing the company in a more financially stable position. Putriani (2024) and Mas'adah et al. (2025) found that liquidity has a positive and significant effect on profitability, while Saragih et al. (2019) found a similar positive relationship between the Current Ratio and Return on Assets. Nevertheless, other studies, such as Nurjanah et al. (2025) and Horne and Syaifani (2019), found that liquidity has no significant effect, or is even inversely related to profitability, due to the possibility of idle current assets.

H2: Liquidity has a positive and significant effect on Profitability in transportation sector companies listed on the Indonesia Stock Exchange (IDX) for the period 2021-2024.

The strategic use of debt can boost profitability when the return generated from debt-financed assets exceeds the cost of debt, allowing leverage to function as a financial lever that expands the productive asset base. However, Yohanes (2025) cautions that excessive reliance on debt without strong cash flow support will

burden the company with high interest expenses, eroding net income and increasing insolvency risk, a pattern also found among consumer-sector firms on the IDX.
H3: Leverage has a positive and significant effect on Profitability in transportation sector companies listed on the Indonesia Stock Exchange (IDX) for the period 2021-2024.

METHOD

Population and Sample

The population of this study consists of 40 transportation sector companies listed on the Indonesia Stock Exchange (IDX). The sample was determined using a purposive sampling technique based on the following criteria: (1) transportation sector companies listed on the IDX during the 2021-2024 period, (2) companies that consecutively published financial statements during the 2021-2024 period, and (3) companies that were not delisted during the observation period. After excluding companies that conducted an IPO after 2021, companies that did not publish consecutive financial statements, and companies reporting in foreign currency, 24 companies met the sampling criteria, yielding 96 firm-year observations (24 companies x 4 years). The sampled companies include, among others, Blue Bird Tbk (BIRD), Adi Sarana Armada Tbk (ASSA), Temas Tbk (TMAS), Mineral Sumberdaya Mandiri Tbk (AKSI), Eka Sari Lorena Transport Tbk (LRNA), Mitra International Resources Tbk (MIRA), AirAsia Indonesia Tbk (CMPP), and Indomobil Multi Jasa Tbk (IMJS), together with sixteen other transportation and logistics companies listed on the IDX.

Data Type and Source

This study uses secondary data in the form of annual financial statements of transportation companies obtained from the official IDX website (www.idx.co.id) and the respective companies' official websites, covering the 2021-2024 period. Supporting data were also obtained from journals, books, and other scientific publications relevant to the research problem.

Operational Definition of Variables

This study uses one dependent variable, profitability, and three independent variables: digital transformation, liquidity, and leverage. The operational definition and measurement of each variable are presented in Table 1.

Digital transformation is measured using a disclosure index adapted from a dictionary of codes comprising 15 operational indicators representing six dimensions, namely digital strategy, digital technology, digital operations, digital innovation, digital human resources, and digital services (Borrero-Domínguez et al., 2024). Each indicator disclosed in a company's annual report is given a score of 1, and 0 if not disclosed; the DTDI value is then obtained by dividing the number of disclosed indicators by the total number of indicators used.

Data Analysis Technique

This study uses panel data regression analysis, estimated using EViews 12. The estimation employs three alternative models: the Common Effect Model (CEM), the Fixed Effect Model (FEM), and the Random Effect Model (REM). The most appropriate model is selected through the Chow test (CEM vs. FEM), the Hausman test (FEM vs. REM), and the Lagrange Multiplier test (CEM vs. REM). Hypothesis testing is conducted using the partial t-test, where a probability value below 0.05 indicates that an independent variable has a significant partial effect on the dependent variable, together with the coefficient of determination (R^2) to measure the proportion of variance in profitability explained by the independent variables.

RESULTS AND DISCUSSION

Descriptive Statistics

This study uses 96 firm-year observations from transportation sector companies listed on the IDX during 2021-2024. The descriptive statistics of the research variables are presented in Table 2.

Table 2. Descriptive Statistics

Statistic	ROA (Y)	DTDI (X1)	CR (X2)	DER (X3)
Mean	3.607745	0.426393	2.429560	-0.088747
Median	1.379700	0.433350	1.259650	0.367000
Maximum	207.1498	1.000000	60.85810	41.64760
Minimum	-45.65730	0.000000	0.025100	-90.29810
Std. Dev.	23.92371	0.300245	6.262170	10.57358
Observations	96	96	96	96

Source: EViews 12 output, processed by the researcher (2026)

Profitability (ROA) ranges from -45.66% to 207.15%, with a mean of 3.61% and a standard deviation of 23.92, indicating considerable dispersion in the profit-generating ability of transportation companies during the observation period. Digital transformation (DTDI) ranges from 0.00 to 1.00 with a mean of 0.43, indicating a moderate and relatively even level of digital transformation disclosure among the sampled companies. Liquidity (CR) ranges from 0.03 to 60.86 with a mean of 2.43, reflecting substantial variation in short-term obligation coverage across companies. Leverage (DER) ranges from -90.30 to 41.65 with a mean of -0.09, and the negative minimum and mean values indicate that several sample companies recorded negative equity during the observation period.

Panel Data Model Selection

The Chow test is used to select between the Common Effect Model (CEM) and the Fixed Effect Model (FEM).

Table 3. Chow Test Results

Effects Test	Statistic	d.f.	Prob.
Cross-section F	1.437403	(23,69)	0.1258
Cross-section Chi-square	37.579867	23	0.0282

Source: EViews 12 output (2026)

The Chow test shows a cross-section Chi-square probability of 0.0282, which is below 0.05, indicating that the Fixed Effect Model (FEM) is more appropriate than the Common Effect Model.

Table 4. Hausman Test Results

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	20.138340	3	0.0002

Source: EViews 12 output (2026)

The Hausman test shows a probability value of 0.0002, which is below 0.05, indicating that the Fixed Effect Model (FEM) is more appropriate than the Random Effect Model. Based on the results of the Chow and Hausman tests, the Fixed Effect Model (FEM) was selected as the most appropriate model for estimating the effect of digital transformation, liquidity, and leverage on profitability in this study.

Panel Data Regression Estimation

Table 5. Fixed Effect Model (FEM) Estimation Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	7.685440	1.503564	5.111483***	0.0000
DTDI (X1)	-7.729450	2.156038	-3.585025***	0.0006
CR (X2)	-0.320077	0.387267	-0.826503	0.4114
DER (X3)	0.048086	0.096997	0.495750	0.6216

*Note: *** significant at the 1% level. R-squared = 0.8386; Adjusted R-squared = 0.7778; F-statistic = 13.7895 (Prob. 0.0000); Durbin-Watson stat = 2.2186. Source: EViews 12 output (2026)*

Based on Table 5, the panel data regression equation of this study is as follows:

$$ROA = 7.685440 - 7.729450\ DTDI - 0.320077\ CR + 0.048086\ DER \quad (1)$$

The R-squared value of 0.8386 indicates that 83.86% of the variation in profitability (ROA) can be explained jointly by digital transformation, liquidity, and leverage, while the remaining 16.14% is explained by other factors outside the model. The F-statistic probability of 0.0000 confirms that the model is significant as a whole.

Effect of Digital Transformation on Profitability

The regression results show that digital transformation (DTDI) has a coefficient of -7.729450 with a probability value of 0.0006 (< 0.05), indicating that digital transformation has a negative and significant effect on profitability. This finding does not support H1, which predicted a positive effect. The negative relationship suggests that, during the 2021-2024 period, the implementation and investment associated with digital transformation in the transportation sector required substantial cost and time before generating optimal benefits, so the digitalization efforts undertaken by sample companies had not yet translated into higher profitability. This result is consistent with Syamsil Huda and Yolandafitri Zulvia (2025), who found that digital transformation negatively affects the profitability of infrastructure, transportation, and logistics companies due to the high cost of digital investment, but contrasts with Hidayat (2025) and Yavuz et al. (2025), who found a positive effect of digital transformation on financial performance once efficiency gains materialize.

Effect of Liquidity on Profitability

Liquidity (CR) has a coefficient of -0.320077 with a probability value of 0.4114 (> 0.05), indicating that liquidity has a negative but statistically insignificant effect on profitability. Thus, H2 is not supported. This result indicates that a high level of current assets does not necessarily increase profit if these assets are not utilized productively in operational activities, and is in line with Horne and Syaifani (2019), who found an inverse relationship between liquidity and profitability due to idle cash, as well as with Nurjanah et al. (2025) and Muladi et al. (2025), who found that the Current Ratio has no significant effect on profitability. This finding, however, differs from Putriani (2024), Mas'adah et al. (2025), and Saragih et al. (2019), who found a significant positive effect of liquidity on profitability.

Effect of Leverage on Profitability

Leverage (DER) has a coefficient of 0.048086 with a probability value of 0.6216 (> 0.05), indicating that leverage has a positive but statistically insignificant effect on profitability. Thus, H3 is not supported. This finding suggests that, during the observation period, the use of debt among transportation companies had not yet provided a statistically meaningful increase in profitability, possibly because the return generated from debt-financed assets was not sufficiently distinct from the cost of debt across the sample. This result is broadly consistent with Maulana and Rahayu (2022), who found that the use of debt can support operating capacity, but contrasts with Syukri Hadi et al. (2022) and Nawaz et al. (2019), who found that excessive leverage significantly reduces profitability due to increased financial burden.

CONCLUSION

Based on the results of panel data regression analysis using the Fixed Effect Model (FEM) on 24 transportation sector companies listed on the Indonesia Stock Exchange during the 2021-2024 period, this study concludes the following. First, digital transformation, proxied by the Digital Transformation Disclosure Index (DTDI), has a negative and significant effect on profitability, indicating that the increase in digital transformation disclosure among transportation companies during the study period has not yet been able to increase profitability, as digital implementation and investment require substantial cost and time before generating optimal benefits. Second, liquidity, proxied by the Current Ratio (CR), has a negative and insignificant effect on profitability, indicating that a high level of current assets does not necessarily increase profit if it is not utilized productively in operational activities. Third, leverage, proxied by the Debt to Equity Ratio (DER), has a positive but insignificant effect on profitability, indicating that the use of debt has not been able to meaningfully increase profitability during the observation period.

These findings suggest that investors should not only consider a company's profitability level, but also its digital transformation implementation, liquidity condition, and funding structure before making investment decisions. Transportation companies are encouraged to optimize the implementation of digital transformation so that technology investment can improve operational efficiency and profitability over time, while maintaining an optimal level of liquidity and managing the use of debt effectively to avoid increased financial risk. Future research is recommended to include additional variables that may affect profitability, such as firm size, sales growth, operational efficiency, or corporate governance, and to extend the observation period or sample size to obtain more comprehensive results.

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