



Jurnal Ekonomi Perusahaan
ISSN: 0854-8154 (print), 2830-1560 (online)

Ownership structure, firm age, and technological capital as determinants of firm performance and value

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ARTICLE INFORMATION ABSTRACT

Flow:

Received: Feb 16, 2026

Reviewed: Feb 26, 2026

Accepted: Feb 26, 2026

Published: Feb 27, 2026

Keywords:

technological capital, firm value, ownership

How to cite:

Pane, Z.I., Triyani, Y., & Wangsih, I.C. (2026). Ownership structure, firm age, and technological capital as determinants of firm performance and value. *Jurnal Ekonomi Perusahaan*, 32(2), 133-145.
<https://doi.org/10.46806/jep.v32i2.1979>

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This study examines the effects of ownership structure, firm age, and technological capital on firm performance and firm value. Using a final sample of 99 observations from manufacturing sector companies in Indonesia over the period 2020–2022, the findings reveal that only firm age and technological capital have a positive and statistically significant effect on firm performance. Further analysis indicates only technological capital has a positive and significant effect on firm value. These results suggest that the longer a firm operates, the greater its production scale and cost-efficiency capabilities become; however, such maturity alone is insufficient to convince investors. In contrast, a firm's ability to adapt to and develop technological capabilities not only enhances profitability but also increases its stock price in capital market.

INTRODUCTION

Firms performance and value are two major goals that directors, shareholders, and other stakeholders strive to achieve optimally. For directors, these two major goals are mandatory because they expect bonuses, compensation, and other similar benefits. Therefore, various methods are used, such as earnings management (A. M. Sari & Cahyaningtyas, 2024). For shareholders, a higher rate of return on shares is compensation for good firms performance and value, so various disclosures from them are highly expected, for example social responsibility (Putri & Suwitho, 2015).

Firms performance and value certainly cannot be obtained instantly, it takes a long time to achieve it because created by avoiding a bad reputation (Dewi, 2013 cited by Kurnianto, Abdusshomad, and Kalbuana 2023). Furthermore, technological developments also help create firms performance and value. Technology fosters innovation by easily integrating people, institutions, and entities into a single process. (Muchlis et al., 2021), productivity increasing (Kumbadewi et al., 2021) even creating general public health and creating new job opportunities leads to green technology (Yarova et al., 2025).

Based on the explanation above, its important to determine significance of managerial and institutional ownership, firms age and technology implementation on firms performance and value for two reasons. First, it complements the study of technology implementation across various sectors. Technology implementation testing has been examined in three previous studies, namely on companies in the Jakarta Islamic Center (JII) (Pane et al., 2025), Jakarta Stock Industrial Classification (JASICA) (Wangsih & Pane, 2024) serta logistic and transportation sector (Pane & Wangsih, 2024) while this research uses the basic chemistry sector. Second, strengthening measurement of technology implementation in companies so that it can be used in other research, especially in accounting field.

The novelty of this research is that it examines technology implementation alongside managerial and institutional roles. This novelty is crucial for assessing whether technology implementation and roles of other parties are significant. Furthermore, this novelty broadens scope of research regarding factors that can influence firms performance and value.

LITERATURE REVIEW

Institutional Ownership

Institutional ownership refers to the presence of external parties holding shares in a company. These external parties may include insurance companies, banks, investment firms, and other institutional entities (Darmayanti et al., 2018 cited by Sari and Wulandari 2021). Institutional ownership primarily functions as a monitoring mechanism over managerial behavior (Gillan dan Stark, 2005 cited by Lastyanto and Setiawan 2022) In addition, institutional ownership plays an important role in overseeing managerial performance, particularly in relation to financial reporting (Nurdiniah & Pradika, 2017 cited by Novianti and Isyuardhana 2021) as well as monitoring the company's investment activities (Siregar et al., 2022).

Numerous studies have examined institutional ownership in relation to various other variables, such as independent commissioners, audit committees, audit quality, and earnings management (Siregar et al., 2022), leverage (Novianti & Isyuardhana, 2021) as well as managerial ownership and dividend policy (D. M. Sari & Wulandari,

2021). Furthermore, institutional ownership has also been associated with firm value (D. M. Sari & Wulandari, 2021), financial reporting integrity (Novianti & Isyнуwardhana, 2021) and tax avoidance practices (Siregar et al., 2022).

Managerial ownership

Managerial ownership refers to a condition in which members of management hold shares in the company, thereby directly participating in the decision-making process. The allocation of share ownership to managers encourages more active involvement in corporate governance and operational management. The role of managerial ownership becomes significant due to the presence of a sense of ownership, which may motivate management to improve performance and, ultimately, enhance firm value (Lestari et al., 2022). Furthermore, managerial ownership functions as a mechanism to align the interests of managers and shareholders. By holding shares in the company, managers are expected to act in accordance with corporate objectives, particularly in efforts to maximize shareholder wealth (Santoso & Andarsari, 2022).

Managerial ownership has been extensively examined in prior studies in relation to various variables. One of the commonly associated variables is earnings management (Immanuel & Hasnawati, 2022). In addition, managerial ownership has also been linked to tax avoidance practices, as share ownership by management may encourage more prudent decision-making behavior (Apriliansi & Wulandari, 2023).

Firms age

Firm age refers to the length of time calculated from the establishment of a company until it begins its operational activities (Ulum et al, 2009 cited by Wibisana, Mardani, and Wahono 2018). Firm age has several strategic implications, one of which relates to long-term investment decision-making. Companies that have operated for a longer period generally possess greater experience, organizational stability, and accumulated resources, which enable them to formulate and implement more sustainable investment policies.

Technological capital

In an increasingly digitalized business environment, companies are required to possess adequate technological resources, both in the form of information technology infrastructure and human resources with educational backgrounds in engineering or technology. The presence of information technology provides various strategic benefits for firms.

First, information technology contributes to the enhancement of firm value. Prior research indicates that the implementation of big data can increase firm value by fostering innovation that integrates individuals, institutions, entities, and business processes more effectively (Muchlis et al., 2021). Second, technology adoption may also influence market reactions. Companies that announce the adoption of blockchain technology tend to receive positive market responses, as such technology is believed to improve operational efficiency and ultimately enhance corporate performance, both directly and indirectly (Ali et al., 2023).

Beyond information technology infrastructure, the educational background of top management is also considered to have a positive impact on firm performance. Several studies suggest that directors with educational backgrounds in engineering or

technology are more likely to promote innovation and accelerate digital transformation. This is because they are more effective in supervising and directing innovation in line with their understanding of relevant specific technologies (Li et al., 2019). Furthermore, the presence of directors with such backgrounds may provide greater opportunities for corporate growth (Celikyurt & Donmez, 2017), support strategic alignment with the development of a digital-based economy (Luo et al., 2024) and encourage higher allocations for research and development in technology (Yavuz & Iacoviello, 2023).

Given these positive impacts, information technology and the presence of directors with engineering or technological backgrounds can be categorized as components of technological capital. This concept represents the accumulation of technology-based resources owned by a firm that potentially generates strategic value added.

Previous studies demonstrate that technological capital can enhance firm value (Beng & Pane, 2024; Pane, 2023). However, investment in technological capital also entails certain consequences. One potential risk is financial distress due to the substantial cost allocations required for technology development and implementation (Pane, 2021). Moreover, technology adoption that is not accompanied by adequate employee training and competency development may lead to workforce reductions (Wangsih & Pane, 2024).

Furthermore, technological capital has been widely examined across various industry sectors, including transportation and logistics (Pane, 2021), manufacturing (Pane, 2023) and companies listed in the Jakarta Islamic Index (Pane et al., 2025).

Firms performance

Optimal firm performance represents one of the primary objectives in organizational management. Financial performance serves as a key indicator reflecting the effectiveness and efficiency of a company in achieving its established goals and strategic direction. Through the measurement of financial performance, firms are able to evaluate the extent to which their resources have been managed productively and have generated value added for stakeholders (Daat, 2019). In practice, stakeholders generally consider profit reported in financial statements as the main indicator in assessing firm performance. Profit is viewed as a representation of the company's future performance prospects, as it reflects the firm's ability to manage resources efficiently and effectively. Therefore, the level of profit generated is frequently used as a basis for economic decision-making by investors, creditors, and management (Chandra & Augustine, 2019).

The measurement of firm performance is diverse. For example, Return on Assets (ROA) is commonly used to assess a company's efficiency in utilizing its assets (Chandra & Augustine, 2019). Other commonly applied indicators include liquidity, solvency, profitability, and market ratios (Esomar & Chritianty, 2021), net profit margin dan gross profit margin (Lowardi & Abdi, 2021).

Firms value

Firm value represents the amount that prospective investors are willing to pay for a company, which is reflected in its stock price (Suad, 2008 cited by Rusmana & Purnaman, 2020). Firm value is considered a reflection of the entity's success, both in terms of past performance and future prospects. The assessment of firm value is generally conducted through the analysis of financial statements, taking into account

various indicators such as the level of assets, liabilities, and the market value of outstanding shares. Through this information, stakeholders are able to comprehensively evaluate the company's financial position and growth potential (Rusmana & Purnaman, 2020).

Firm value can be measured using several approaches. First, Tobin's Q is widely applied, as it is considered to provide more comprehensive information by incorporating both debt and equity components of the firm (Rusmana & Purnaman, 2020). Second, Price to Book Value (PBV) is frequently used because it reflects the company's growth prospects (Meiliya & Rahmawati, 2022).

Financial performance represents an achievement that companies continuously strive to attain in order to maintain business sustainability. Therefore, every policy and strategic action undertaken is expected to generate a positive impact on corporate performance. Prior studies provide mixed evidence regarding the relationship between managerial ownership and firm performance.

Two studies report that managerial ownership has a positive and significant effect on firm performance, suggesting that share ownership by management reduces conflicts of interest between managers and external shareholders (Sutrisni & Riduwan, 2022) and encourages managers to act more prudently in decision-making processes (Gunawan & Wijaya, 2020). However, another study finds no significant effect, which may be attributed to the misalignment of interests between managers and owners (Yulianti & Cahyonowati, 2023). A on these arguments and inconsistent findings, the following hypothesis is proposed:

H₁ : managerial ownership has a positive and significant effect on firm performance

Institutional ownership also plays an important role in influencing firm performance. The presence of institutional investors as shareholders is believed to enhance the effectiveness of managerial monitoring, thereby promoting better corporate governance practices. Through stricter monitoring mechanisms, institutional ownership has the potential to improve operational efficiency and the quality of decision-making, which ultimately leads to better firm performance.

Empirical evidence provides mixed findings. Two studies report that institutional ownership has a positive effect on firm performance, as it strengthens cost control mechanisms (Sutrisni & Riduwan, 2022) and minimizes fraudulent activities (Sitanggang, 2021). However, another study finds no significant effect, which may be attributed to the relatively low proportion of institutional shareholding (Nurmayanti & Shanti, 2023). Based on these arguments and prior findings, the following hypothesis is proposed:

H₂ : institutional ownership has a positive and significant effect on firm performance

The longer a firm has been in operation, the more its performance is generally expected to improve. This expectation is based on the accumulation of experience, enhanced managerial capabilities, and the strengthening of operational systems and procedures over time. Firms with longer operational histories typically exhibit greater stability, broader access to financing, and stronger reputations among stakeholders, which may contribute to sustained performance improvement.

Empirical evidence also presents mixed findings. Two studies suggest that older firms tend to perform better because they have experienced various business cycles and challenges (Cahyani and Sulistyowati, 2023 cited by Kusnarti & Iswara, 2025) and possess more abundant resources and information (Evatriana & Setiawati, 2024). However, another study finds no significant effect, arguing that older firms may face limitations due to lower human resource quality (Darma Riswan & Lidya Martha, 2024). Based on these arguments, the following hypothesis is proposed :

H₃ : firm age has a significant effect on firm performance

A firm’s ability to adapt to changes in the business environment is expected to generate a positive impact on both performance and long-term sustainability. Adaptability enables firms to respond more effectively to market dynamics, technological advancements, and regulatory changes. Therefore, companies with higher levels of flexibility and responsiveness are more likely to maintain competitiveness and achieve sustained performance improvement over time.

Previous studies indicate that technological capital can enhance firm value (Pane, 2023; Pane et al., 2025). Building upon these findings, this study proposes the following hypothesis :

H₄ : technological capital has a significant effect on firm performance.

Based on the four proposed hypotheses, the conceptual framework of this study is developed as follows Figure 1.

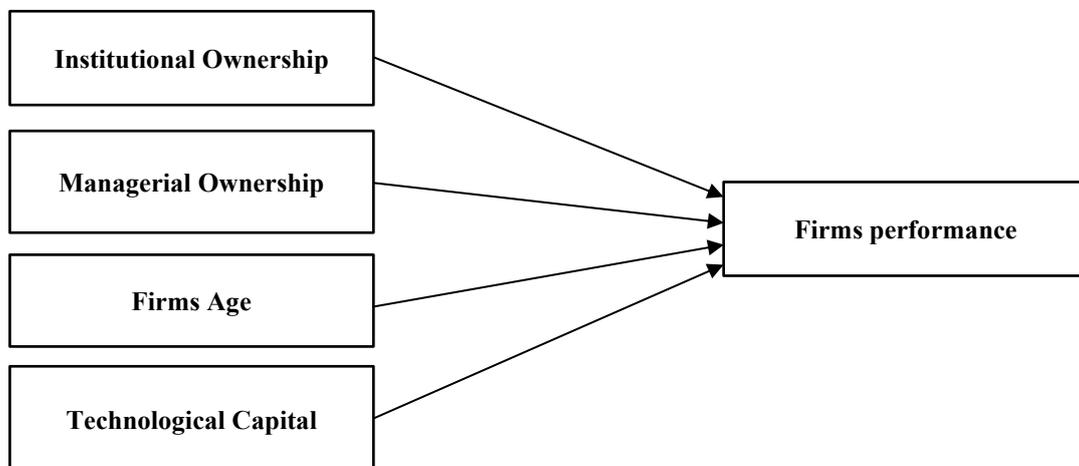


Figure 1. Conceptual Framework

RESEARCH METHODOLOGY

This study employs a quantitative approach. Quantitative research is designed to test theories by analyzing relationships among variables using statistical procedures. Through this approach, the hypotheses formulated earlier can be empirically examined based on numerical data, thereby producing objective and measurable conclusions (Creswell & Creswell, 2018).

The study utilizes secondary data obtained from companies’ financial statements and annual reports covering the period 2020–2022. The sampling technique

applied is purposive sampling, focusing on manufacturing companies that meet three specific criteria. First, the companies must provide complete financial statements and annual reports for each year during the observation period. Second, the financial statements must be presented in Indonesian Rupiah. Third, the companies must not report losses in their financial statements during the study period.

This study employs four independent variables. The detailed operational definitions and measurements of these variables are presented in the following Table 1.

Table 1. detail variable measurement

Variable	Measurement
Dependent	
Firms performance	Return on Asset = net profit / total asset
Independent	
Managerial ownership	Total management share / total number outstanding share
Institutional ownership	\sum Institutional shares owned / total number of outstanding shares
Firms age	Current period – beginning firm years
Technological capital	
<ul style="list-style-type: none"> Technology adaptation : Firm-specific technology refers to technological systems, processes, or innovations that are developed and utilized internally by the company to support its operational and strategic activities. 	$TECH = \frac{\sum X_{ij}}{n_j}$ <p>where, X_{ij} = total score achieved n_j = total score.</p>
<ul style="list-style-type: none"> Engineering / technology education background : The presence of directors with educational backgrounds in technology or engineering at the undergraduate, master's, or doctoral level 	Score : 0, not disclose 1, generally disclose 2, descriptive disclose

RESULT

This study was conducted in three main stages. The first stage involved testing the research model, and the results are presented as follows Table 2. Based on Table 2, the results indicate that this study employs the fixed effect model. The selection of this model is based on the results of the model specification test, which suggest that the fixed effect approach is the most appropriate model for explaining the relationships among the variables in this study.

Tabel 2. Model test result

Method	Test	Value	Result
Chow test	Common effect vs Fixed effec	Prob : 0,000	Fixed effect
Haustman test	Fixed effect vs Random effect	Prob : 0,024	Fixed effect

If necessary, a brief explanation regarding the classical assumption tests (normality, multicollinearity, heteroskedasticity, and autocorrelation tests) can also be added to ensure that the methodology section is more comprehensive and systematically structured.

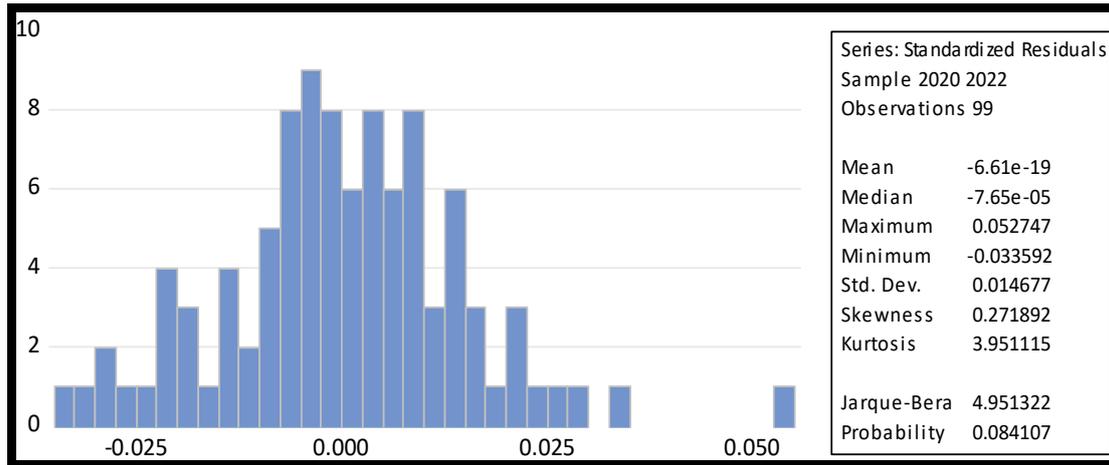


Figure 2. Normality test result

Based on Figure 2, the Jarque–Bera value is 4.95 with a probability value of 0.08. Since the probability value is greater than significance level of 0.05, it can be concluded that the data in this study are normally distributed. Therefore, the research model does not suffer from normality issues.

Table 3. Heteroscedasticity test

Variable	t-statistic	Probability	Result
Managerial ownership	-0.454645	0.6510	No heteroskedasticity
Institutional ownership	-0.788266	0.4336	No heteroskedasticity
Company age	-0.868295	0.3886	No heteroskedasticity
Technological capital	-0.972388	0.3347	No heteroskedasticity

Based on Table 3, all independent variables have probability values above the 0.05 significance level. These results indicate research model does not experience heteroskedasticity issues.

Table 4. Multicollinearity test

	X1 MANAJ	X2 INSTI	X3 AGE	X4 TECH
X1_MANAJ	1	-0.5968	-0.0308	-0.3244
X2_INSTI	-0.5968	1	0.0756	0.1377
X3_AGE	-0.0308	0.0756	1	0.2146
X4_TECH	-0.3244	0.1377	0.2146	1

Based on Table 4, all variables have correlation values below 0.90. These results indicate that there is no high correlation among the independent variables and concluded does not fulfill multicollinearity issues.

Table 5. Autocorrelation test

Test	Value
Durbin Watson	2.334720

Table 5 above shows Durbin–Watson value fulfill condition $dU < DW < 4 - dU$ ($1.5683 < 2.334 < 2.4317$), it confirms regression model does not exhibit autocorrelation problems.

DISCUSSION

The third stage of this study involves hypothesis testing. The results of the hypothesis testing are presented as follow.

Table 6. Hypothesis result

Variable	Coefficient	Prediction	Significant	Result
Managerial Ownership	0.081757	+	0.5173	Not significant
Institutional ownership	0.071334	+	0.4812	Not significant
Companies age	0.006940	+	0.0064*	Significant
Technological capital	0.033944	+	0.0190**	Significant
Adjusted R-square	0.850379			
Dependent variable	ROA			
Significant level	1% (*) ; 5% (**); 10% (***)			

First, firm age has a positive and statistically significant effect on firm performance (p -value $0.0064 < 0.01$), indicating **H₃ accepted**. This finding is consistent with prior studies (Cahyani dan Sulistyowati, 2023 cited by Kusnarti & Iswara, 2025; Evatriana & Setiawati, 2024), The results suggest that the longer a firm operates, the better its performance tends to be. With more extensive operational experience, firms have greater opportunities to expand market share, optimize cost structures, and enhance their risk management capabilities. Furthermore, sustained operations over a longer period contribute to the development of a stronger reputation among stakeholders, which ultimately supports continuous improvements in firm performance.

Second, technological capital has a positive and statistically significant effect on firm performance (p -value $0,0190 < 0,05$) indicating **H₄ accepted**. This result is in line with previous studies (Pane, 2023; Pane et al., 2025), demonstrate that a firm's ability to adapt to technological advancements, as well as the presence of directors with educational backgrounds in technology-related fields, can contribute to increased corporate profitability. This effect may be attributed to the role of technology in reducing operational costs, minimizing human error, and accelerating transaction processing. Such improvements in efficiency and effectiveness ultimately enhance service quality, thereby positively influencing firm performance and profitability.

Third, adjusted R-square value is 0.850379 (85,03%). This result indicates that the independent variables collectively explain approximately 85% of the variation in firm performance, while the remaining 15% is influenced by other variables not included in the research model. These findings suggest proposed model possesses relatively strong explanatory in explaining firm performance.

Table 7. hypothesis result

Variable	Coefficient	Prediction	Significant	Result
Managerial Ownership	0.382577	+	0.2784	Not significant
Institutional ownership	-0.098571	+	0.6949	Not significant
Companies age	0.004119	+	0.2933	Not significant
Technological capital	0.409752	+	0.0040*	Significant
Adjusted R-square	0.099747			
Dependent variable	PBV			
Significant level	1% (*) ; 5% (**); 10% (***)			

The results presented in Table 7 above constitute an extension of the previous analysis by examining the significance of the four independent variables on firm value as the dependent variable. Based on the findings, technological capital is proven to have a positive and statistically significant effect on firm value.

This result is consistent with prior studies demonstrating that investment in and strengthening of a firm's technological capacity can enhance market perception and overall firm value (Pane, 2023; Pane et al., 2025), indicate firm's ability to adapt to technological advancements increases investor confidence in firms future sustainability prospects. Such confidence shapes positive market expectations, which are ultimately reflected in rising stock prices in subsequent periods.

Therefore, technological adaptation not only affects operational performance but also contributes to the enhancement of firm value through capital market mechanisms.

CONCLUSION

This study examines the effects of managerial ownership, institutional ownership, firm age, and technological capital on firm performance. The findings indicate that only firm age and technological capital have a significant effect on firm performance. This implies that the longer an entity operates, the greater its ability to generate profits. These results are consistent with the argument that a firm's capacity to adapt to technological developments—supported by directors with educational backgrounds in engineering or technology—enhances organizational performance.

This study further extends the analysis by replacing firm performance with firm value as the dependent variable. The results show that, among the four independent variables, only technological capital has a statistically significant effect. This finding suggests that a firm's capability to develop and adopt technology, accompanied by leadership with engineering or technology-related educational backgrounds, enhances productivity and strengthens investor confidence. As a result, investors are more inclined to increase their capital investment in the company, which ultimately leads to higher stock prices.

Nevertheless, this study has two limitations. First, the measurement of technological adaptation relies on content analysis, which may introduce subjectivity in the assessment process. Second, the adjusted R-square value in the extended model is relatively low at 0.09 (9%), indicating that firm value is not fully explained by the four independent variables included in this study. Therefore, future research is recommended to incorporate additional variables to improve the adjusted R-square value while simultaneously reducing the potential subjectivity inherent in content analysis, such as including research and development (R&D) expenditure as an alternative proxy for technological capability.

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