Journal of International Conference Proceedings (JICP)
Vol. 8 No. 5, pp. 52-75, January, 2026
E-ISSN: 2621-993X P-ISSN: 2622-0989
https://ejournal.aibpmjournals.com/index.php/JICP/index

The Role of Financial Inclusion Mediation and Technological Innovation in The Relationship Between CEO (Chief Executive Officer) Financial Literacy and Msme Performance

Kalya Meidina[1*], Gregorius Jeandry[2], Asrudin Hormati[3]
[1]Department of Accounting, Faculty of Economics and Business, Khairun University, Ternate, Indonesia
*Email: kalyaaahalid@gmail.com[1]

ARTICLE INFORMATION

Publication information

Research article

HOW TO CITE
Meidina, K., Jeandry, G., & Hormati, A. (2025). The role of financial inclusion mediation and technological innovation in the relationship between CEO financial literacy and MSME performance. *Journal of International Conference Proceedings, 8*(5), 52–75.

DOI:
https://doi.org/10.32535/jicp.v8i5.4366

Received: 25 November 2025
Accepted: 27 December 2025
Published: 31 January 2026

ABSTRACT

This study examines the influence of CEO financial literacy on the performance of Micro, Small, and Medium Enterprises (MSMEs) by analyzing the mediating roles of financial inclusion and technological innovation. The research is motivated by the limited empirical evidence on how managerial financial competence affects MSME competitiveness in developing economies such as Indonesia. Using a quantitative approach, data were collected through structured questionnaires distributed to 100 MSME CEOs in Ternate and analyzed using the Structural Equation Modeling–Partial Least Squares (SEM-PLS) technique. The results indicate that CEO financial literacy has a positive and significant impact on MSME performance. However, financial inclusion was found to be an insignificant mediator, suggesting that access to financial services has not been optimally utilized for productive activities. In contrast, technological innovation significantly mediates the relationship between CEO financial literacy and MSME performance, demonstrating that financially literate CEOs are more likely to adopt digital technologies that enhance efficiency and competitiveness. The findings underscore the strategic importance of strengthening financial literacy and digital transformation among MSMEs to sustain long-term growth and resilience.

Keywords: CEO financial literacy; financial inclusion; MSME performance; SEM-PLS; technological innovation; Ternate; Indonesia

INTRODUCTION

Micro, Small, and Medium Enterprises (MSMEs) play a crucial role in supporting national economic stability. This sector has proven its resilience during financial crises, as observed during the 1997–1998 economic downturn when MSMEs became the backbone of Indonesia's economy (Septiani & Wuryani, 2020). In business operations, MSME actors require capital either from personal funds or financial institutions. Access to bank credit is highly beneficial for sustaining MSME activities. In 2019, approximately 36% of Indonesia's adult population held bank accounts, an increase from 20% in 2014. Although financial access has improved, disparities remain, particularly among low-income groups and women, of whom only 37% possess bank accounts (Afandi, 2022).

The growth of MSMEs demands competitiveness and innovation to sustain business performance. However, many MSME owners have limited managerial knowledge, making their management practices conventional and short-term oriented. Pricing decisions are often based solely on market conditions without considering production or labor costs, which eventually affects business productivity and performance (Anisyah et al., 2021). In addition, challenges related to human resource quality, ownership, capital, and marketing persist, hindering MSMEs from competing with larger enterprises (Nasrullah, 2022). These issues highlight the importance of improving financial knowledge to enhance accountability and long-term sustainability.

A key barrier to MSME performance is the lack of access to capital, largely due to insufficient financial literacy. Financial literacy encompasses the ability to record financial statements, manage debts, and prepare budgets (Lontchi et al., 2023). Many banks are reluctant to approve credit because MSMEs are unable to produce accurate financial reports, even though such reports are essential to monitor business progress (Septiani & Wuryani, 2020). Internal factors such as weak human resources and capital, combined with external constraints from business facilitators, are closely related to financial literacy and financial inclusion (Kusuma et al., 2022).

A high level of financial literacy is essential to prevent financial mismanagement. Financial difficulties do not solely stem from low income but often arise from poor financial planning, misuse of credit, and lack of savings (Hastings & Mitchell, 2020) (Hastings & Mitchell, 2020). Financially literate business owners make more strategic decisions and manage their resources effectively (Malkan, 2022). According to the 2019 Financial Services Authority (OJK) survey, Indonesia's financial literacy index reached 38.03%, up from 29.7% in 2016, indicating an improvement of 8.33% over three years.

Previous studies have yielded mixed results regarding the impact of financial literacy on MSME performance. Most evidence suggests a significant positive relationship, where financial literacy enhances efficiency, working capital management, and decision-making. However, other studies indicate that the effect is not always direct. Certain aspects of financial literacy, such as financial awareness, may have greater influence depending on the context (Alharbi et al., 2022; Frimpong et al., 2022). Moreover, access to digital finance and formal financial services can mediate this relationship, allowing MSMEs to optimize financial literacy in managing risks and fostering growth (Aryanto et al., 2023) (Henny Dwi Anggraheni et al., 2024).

Technological innovation also plays a mediating role by strengthening the relationship between financial literacy and MSME performance. Digital tools such as e-commerce platforms, mobile payments, and social commerce improve operational efficiency and market reach (Hasna, 2021; Frimpong et al., 2022). CEOs with higher financial literacy

are more likely to adopt these technologies effectively, while those with limited literacy tend to face barriers in utilizing them. When financial literacy, financial inclusion, and technological innovation work synergistically, MSMEs can achieve stronger competitiveness and sustainable growth.

Financial literacy significantly affects the quality of MSME financial statements in Ternate. However, limited accounting knowledge and human resources often hinder the preparation of systematic reports, restricting access to formal financing. These findings indicate that improving financial literacy alone is insufficient; mediation through financial inclusion and technological innovation is essential to translate knowledge into business performance (Nindy, 2021).

Technological advancement has rapidly transformed financial systems through financial technology (FinTech), such as crowdfunding, digital payments, and online lending (Aisa, 2021). Nevertheless, many MSMEs remain unbankable due to limited managerial capacity, high lending rates, and restricted access to financial services (Yanti, 2019). The OJK reported an increase in the financial inclusion index from 67.8% in 2016 to 76.19% in 2019, driven by collaboration among the government, OJK, and financial institutions.

This study introduces financial inclusion and technological innovation as mediating variables to strengthen the link between CEO financial literacy and MSME performance. Financial inclusion allows financially literate CEOs to access capital and formal financial services, while technological innovation supports digital adaptation and operational efficiency. The novelty of this study lies in combining both mediators to provide a comprehensive understanding of how CEO financial literacy influences MSME performance. This integrated framework offers new insights into the synergy between internal managerial capability and external digital and financial infrastructure to enhance MSME competitiveness in the digital economy era.

LITERATURE REVIEW

Resource-Based View (RBV) Theory

The Resource-Based View (RBV) emphasizes that a firm's internal resources are the main drivers of sustainable competitive advantage. Firms achieve superior performance when they effectively utilize resources that are valuable, rare, inimitable, and non-substitutable. These resources include both tangible and intangible assets, such as managerial skills, financial expertise, technological capability, and organizational knowledge. RBV highlights that competitive advantage does not only arise from exploiting external opportunities but also from the optimal use and management of internal strengths.

Within the context of MSMEs, the financial literacy of CEOs represents a strategic intangible resource. It equips firms with the ability to manage finances more efficiently, mitigate risks, and make informed strategic decisions. CEOs with strong financial literacy can identify profitable investment opportunities, optimize resource allocation, and ensure business sustainability. As (Duréndez et al., 2023) assert, such knowledge-based capabilities can serve as a source of competitive advantage when effectively managed, since they are firm-specific and difficult for competitors to replicate.

RBV suggests that internal resources are more valuable when aligned with complementary external factors, such as access to finance and technological innovation. Financial inclusion enables MSMEs to obtain capital and other essential financial services, while technological advancement enhances productivity and market reach

(Rahardjo et al., 2022; Hasna, 2021). Thus, the synergy between internal capabilities such as CEO financial literacy and external enablers strengthens overall business performance and resilience.

RBV provides a solid theoretical basis for this study, illustrating how CEO financial literacy, as an internal strategic asset, contributes to MSME performance when reinforced by financial inclusion and digital innovation. This theoretical lens emphasizes the importance of aligning internal competencies with external support systems to sustain competitive advantage in an increasingly dynamic market environment.

MSME Performance

MSME performance can be assessed using various indicators depending on the research context and objectives (Farhani & Taufiqurahman, 2022). One of the key determinants of MSME performance is financial literacy. Financial literacy refers to the ability of business owners to manage, interpret, and utilize financial information effectively to make sound financial decisions that support business sustainability. As highlighted by (Hilmawati & Kusumaningtias, 2021), sufficient financial knowledge among MSME actors enhances business efficiency and overall performance outcomes.

Empirical evidence also indicates that financial inclusion strengthens the relationship between financial literacy and MSME performance. Entrepreneurs with higher financial literacy are better equipped to leverage financial technologies for effective cash flow management and service utilization. Beyond improving accessibility and efficiency, financial inclusion contributes to MSME sustainability by enabling access to formal financial products, which helps mitigate financial risks and enhance business resilience particularly during crises such as the COVID-19 pandemic.

Technological innovations such as mobile banking, QRIS, and e-wallet systems have simplified financial transactions, providing MSMEs with faster and more secure tools for managing finances and payments. These digital solutions play a crucial role in improving operational efficiency, fostering financial discipline, and supporting long-term business growth in an increasingly digital economy.

Financial Literacy

Financial literacy refers to an individual's ability to acquire and apply financial knowledge and skills in managing financial resources effectively. The theory of financial literacy explains how individuals develop financial competencies and how these competencies influence their financial behavior and decision-making (Santiara & Sinarwati, 2023).

In the context of micro, small, and medium enterprises (MSMEs), financial literacy plays a crucial role in enabling business owners to manage financial activities efficiently and sustainably. It encompasses the ability to understand financial products and services, manage cash flow, assess financial risks, and make well-informed financial decisions that support business growth.

Empirical studies show that financial literacy not only enhances operational efficiency but also strengthens business resilience in facing market uncertainties. Financially literate MSME owners are more likely to adopt and utilize digital financial technologies such as electronic payment systems, which improve transaction speed and operational productivity. Moreover, financial literacy contributes to minimizing default risks by promoting structured and accurate financial management practices (Jeandry et al., 2024).

Financial Inclusion

Financial inclusion underscores the need for fair and broad access to financial services across all segments of society. It establishes a strong relationship between access to finance, economic development, poverty reduction, and the empowerment of individuals or groups who were previously excluded from the formal financial system.

In principle, financial inclusion refers to the availability and affordability of financial products and services such as credit, savings accounts, digital payment systems, and insurance for both individuals and enterprises, including MSMEs. In the MSME context, inclusive access enables business owners to secure capital, manage transactions more efficiently, and enhance business performance.

Financial inclusion also plays a critical role in narrowing economic disparities by extending access to formal financial institutions that were once out of reach. Through this access, MSMEs can obtain financing, participate in the digital economy, and engage with e-commerce and fintech platforms (Hilmawati & Kusumaningtias, 2021). The use of formal financial services supports better cash flow management and strengthens risk management practices.

During the COVID-19 pandemic, financial inclusion became an essential factor for MSME survival, as many enterprises relied on relief programs and cashless payment technologies to sustain their operations. Moreover, financial literacy enhances the benefits of inclusion by helping entrepreneurs understand and effectively utilize financial products to foster growth and long-term sustainability. Therefore, policies that expand financial accessibility and promote financial education are key to strengthening MSME resilience and competitiveness.

Financial Technology (Fintech)

The Adoption of financial technology (fintech) among MSMEs still encounters several challenges, including barriers in fund transfers, high transaction costs, and limited access to formal financial services. Fintech, as a relatively new segment of the digital financial industry, aims to enhance financial activities through technological innovation and to provide customized financial solutions that meet specific business needs.

Essentially, fintech represents a convergence of financial services and digital technology that transforms traditional business models into more efficient and modern systems. Conventional transactions that once required physical meetings and cash payments have shifted toward digital interactions, allowing faster, safer, and more convenient processes such as instant online payments (Richard et al., 2024).

The rapid growth of fintech is driven by the evolution of e-finance and mobile technologies, especially following the 2008 global financial crisis. This development is characterized by the integration of electronic financial services with the internet, social media, artificial intelligence (AI), and big data analytics. Traditional financial institutions have begun adapting to these innovations by developing new digital business models, while fintech startups increasingly offer services such as peer-to-peer lending, digital asset management, and microinsurance broadening financial access for both consumers and MSMEs.

Fintech directly contributes to expanding financial inclusion by facilitating access to financial services, education, insurance, and capacity-building programs. It plays a key role in building a more inclusive financial ecosystem where individuals and enterprises can participate equally in economic growth.

In Indonesia, disparities in fintech adoption persist between urban and rural areas. Addressing these gaps requires the expansion of financial education and the development of supportive infrastructure across regions. Strengthening telecommunication networks and establishing clear, consistent regulations are essential to ensure secure and sustainable access to digital financial services. When integrated effectively, fintech, financial inclusion, and financial literacy collectively promote MSME development and foster a more inclusive and resilient economy (Sholihin, 2021).

Hypotheses Development

CEO Financial Literacy Affects MSME Performance

CEO financial literacy refers to an individual's capacity to comprehend, analyze, and manage financial information in order to make informed decisions related to a firm's financial management. This literacy encompasses knowledge of core financial concepts such as budgeting, cash flow control, and risk assessment, all of which are essential for strategic decision-making that supports business sustainability and growth (Milenia Ariyati et al., 2022). CEOs with higher financial literacy are generally more capable of allocating resources efficiently, evaluating profitability, and minimizing financial risks factors that directly enhance MSME performance.

From the perspective of the Resource-Based View (RBV), CEO financial literacy is considered an intellectual asset that represents an internal capability of the firm. RBV posits that competitive advantage is achieved through unique, valuable, and difficult-to-imitate resources, including the CEO's financial knowledge and managerial competences (Diéguez-Soto et al., 2022). A financially literate CEO can therefore optimize resource utilization, formulate robust growth strategies, and respond more effectively to dynamic market challenges.

Empirical studies also support the positive impact of CEO financial literacy on MSME performance. (Frimpong et al., 2022) found that CEOs with strong financial literacy contribute to greater business stability and profitability through well-planned financial management. Similarly, (Duréndez et al., 2023) emphasized that financial literacy among CEOs enhances strategic decision-making, which leads to improved business capacity and competitiveness.
H1: CEO's financial literacy has a positive effect on the performance of MSMEs.

Financial Inclusion mediates the influence of CEO Financial Literacy on MSME Performance

Financial inclusion refers to the accessibility and participation of MSMEs in formal financial services such as credit, savings, and insurance. Broader access to these services enables MSMEs to obtain working capital, manage risks, and strengthen their operational capacity. CEOs with strong financial literacy are more capable of recognizing the benefits of financial inclusion, accessing formal financing, and managing capital more effectively to support business growth.

Within the framework of the Resource-Based View (RBV), internal capabilities such as CEO financial literacy become more effective when complemented by external resources like financial inclusion. RBV posits that firm performance is determined not only by internal strengths but also by the firm's ability to leverage external opportunities. As an external enabler, financial inclusion provides MSMEs especially those led by financially literate CEOs with greater access to capital and financial instruments, allowing them to optimize financial strategies and enhance competitiveness.

Empirical studies provide evidence of the mediating role of financial inclusion in the relationship between CEO financial literacy and MSME performance (Tukan & Nugraeni, 2023) found that financially literate CEOs are more likely to utilize financial services, thereby improving business resilience and performance. Financial inclusion enables financially capable CEOs to secure necessary working capital for business expansion, which contributes to higher MSME performance.
H2: Financial inclusion mediates the influence of CEO's financial literacy on MSME performance.

Technological Innovation Mediates the Influence of CEO Financial Literacy on MSME Performance

Technological innovation within MSMEs encompasses the adoption and utilization of digital technologies such as electronic payment systems, e-commerce platforms, and online tools for marketing and operational management. CEOs with strong financial literacy are better equipped to evaluate the potential benefits, costs, and risks associated with technological investments, enabling them to implement innovations that enhance efficiency, lower operational expenses, and broaden market reach (Lontchi et al., 2023; Hasna, 2021). The integration of digital technologies allows MSMEs to serve a wider customer base, adapt swiftly to changing market demands, and ultimately improve overall business performance.

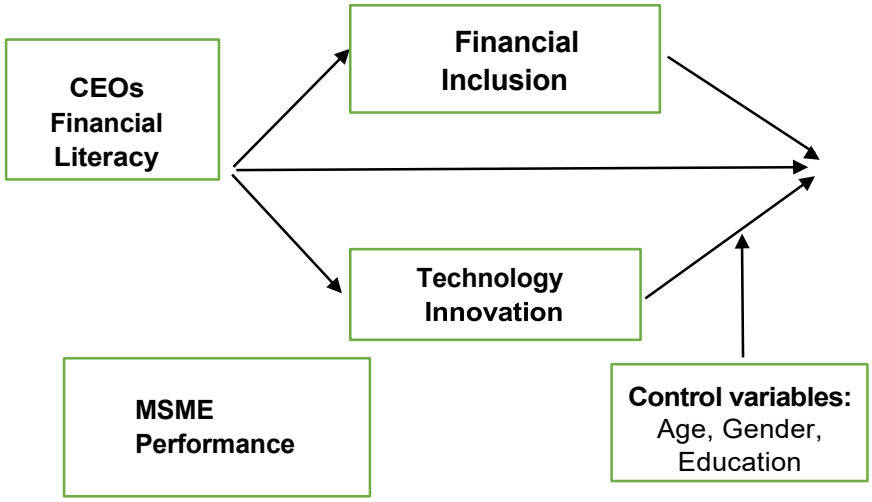
Grounded in the Resource-Based View (RBV**)** theory, technological innovation functions as an external resource that reinforces a firm's internal competencies. CEOs who possess sound financial literacy can allocate resources more strategically, optimize financial capital, and make informed decisions regarding technological investments that enhance productivity and competitiveness. Effective use of technology not only facilitates financial management but also drives continuous innovation, allowing MSMEs to sustain long-term growth in dynamic markets.

Empirical evidence substantiates the mediating role of technological innovation. CEOs with high levels of financial literacy were more likely to adopt digital solutions during the pandemic, which helped maintain MSME performance and productivity. Integration of payment gateways and social commerce platforms enables MSMEs to expand their marketing networks and respond proactively to market fluctuations. Based on these findings, the following hypothesis is proposed:
H3: Technological innovation mediates the influence of CEO financial literacy on the performance of MSMEs.

Conceptual Framework

The study framework model is depicted in Figure 1.

Figure 1. Research Framework



RESEARCH METHOD

This research adopts a quantitative approach that focuses on gathering and analyzing numerical data to objectively measure relationships among variables. Quantitative data consist of information represented in numerical values or transformed into scores and ratings to enable statistical testing. Such an approach allows for systematic assessment and produces measurable evidence of causal relationships (Sugiyono, 2019).

The population of this study comprises Micro, Small, and Medium Enterprises (MSMEs) located in Ternate City, totaling 16,531 business units as reported by the Central Statistics Agency. Samples were selected through a proportional stratified random sampling technique combined with purposive criteria: (a) MSMEs operating for at least one year, (b) CEOs or owners possessing basic financial and digital literacy, and (c) enterprises that utilize financial technology or digital platforms in their operations. A total of 99 respondents participated in the survey, which aligns with the recommended sample size for Partial Least Squares–Structural Equation Modeling (PLS-SEM), typically ranging from 100 to 300 to ensure model stability (Hair et al., 2021). All questionnaire items were rated using a five-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree).

Data were analyzed using SmartPLS version 4.0. The measurement model's validity and reliability were tested through convergent validity, discriminant validity, and composite reliability. Indicators were deemed valid if their outer loading exceeded 0.70, while constructs were considered reliable when the Composite Reliability (CR) was ≥ 0.70 and Cronbach's Alpha ≥ 0.60. Hypothesis testing employed the p-value approach, where significance is established if $p < 0.05$.

This study involved three variable categories: independent, mediating, and dependent variables. CEO Financial Literacy served as the independent variable, measured using eight indicators adapted from (Duréndez et al., 2023) and (Frimpong et al., 2022). Financial Inclusion and Technological Innovation functioned as mediating variables, measured with eight and seven indicators, respectively, based on (Rahardjo et al., 2022) and (Hasna, 2021). All items were contextualized to the Indonesian MSME setting to ensure cultural and empirical relevance.

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RESULTS

Overview of the research object

Data for this study were collected using both online and manual questionnaires distributed to MSME CEOs in Ternate City between May 20, 2025, and June 23, 2025. Manual distribution was conducted through direct face-to-face meetings to facilitate respondents' understanding of the instrument, while online distribution through Google Forms enabled broader reach and cost efficiency. A total of 114 valid responses were obtained, all of which were used for further analysis

Respondent Profile

Table 1. Respondent Profile

Respondent Characteristics		Frequency	Percentage (%)
Age	<30 Years	44	39%
	31-40 years old	37	32%
	41-50 Years	19	17%
	51- 60 Years	11	10%
	>60 Years	3	3%
	TOTAL	114	100%
Gender	Male Male	46	40%
	Woman	68	60%
	TOTAL	114	100%
Education	SMA	50	45,05%
	D3	10	9.01%
	S1	44	39.64%
	S2	7	6.31%
	S3	0	0.00%
	TOTAL	111	100.00%
Business capital	5M - 1M	95	83%
	1M - 5M	18	16%
	5M - 10M	1	1%
	TOTAL	114	100%
Annual Turnover	1JT - 2M	96	84.21%
	2M - 5M	15	13.16%
	>5M	3	2.63%
	TOTAL	114	100.00%
Long Term of Effort	1-3 Years	21	18.42%
	3 - 5 Years	39	34.21%

5 - 10 Years	35	30.70%
>10 Years	19	16.67%
TOTAL	114	100.00%

The respondents comprised MSME CEOs from various business sectors in Ternate, dominated by those engaged in trade (47%), followed by culinary (24%), services (18%), and others (11%). The demographic profile shows that most respondents are under 30 years old (39%), indicating that the MSME sector in Ternate is primarily driven by young entrepreneurs who are more adaptive to technological change and financial literacy development. In terms of gender, 60% were female and 40% male, reflecting a balanced representation of male and female entrepreneurs.

Educationally, 45% of respondents hold a high school diploma, 39.6% hold a bachelor's degree, and smaller proportions hold diploma (9%) and master's degrees (6%). This pattern suggests that MSME ownership spans different educational backgrounds, with increasing awareness of financial management and technology utilization across all levels of education.

Regarding business capital, 83% of respondents operate with initial capital between IDR 5 million and IDR 1 billion, and 84% have annual turnover between IDR 1 million and IDR 2 billion. Most businesses have been running for 3–10 years, suggesting they are in a growth phase with sufficient operational experience.

Descriptive Analysis Test Results
CEO Financial Literacy

Table 2. Descriptive Statistical Test Results of CEO Financial Literacy Variables

Name	Mean	Median	Scale min	Scale max	Standard deviation	Excess kurtosis	Skewness
X1.1	2.886	3	1	5	1.491	-1.477	0.037
X1.2	3.096	3	1	5	1.338	-1.236	-0.179
X1.3	3.158	4	1	5	1.387	-1.226	-0.288
X1.4	3.123	3	1	5	1.464	-1.433	-0.148
X1.5	2.921	3	1	5	1.551	-1.594	0.019
X1.6	3.105	4	1	5	1.404	-1.37	-0.171
X1.7	3.211	4	1	5	1.46	-1.354	-0.287
X1.8	2.86	3	1	5	1.498	-1.5	0.132
Friendly	3,045				1,449	1,399	0,111

Source: Primary data processed, Researcher (2025)

As shown in Table 2, the descriptive statistical analysis presents the mean, standard deviation, kurtosis, and skewness values for each construct measured in this study. These results provide an overview of the central tendency and data distribution across all variables examined. The CEO Financial Literacy variable, which was measured using eight indicators, recorded a mean value of 3.05 and a standard deviation of 1.45. The mean value being higher than the standard deviation indicates a relatively consistent response pattern among participants. The kurtosis value of 1.399 and skewness of –0.111 demonstrate that the data are approximately symmetrical and normally distributed, suggesting that respondents had fairly uniform perceptions regarding CEOs' financial literacy levels.

Financial Inclusion

Table 3. Descriptive Statistical Test Results of Financial Inclusion Variable data

Name	Mean	Median	Scale min	Scale max	Standard deviation	Excess kurtosis	Skewness
Z1.1	3.096	3	1	5	1.426	1.386	-0.044
Z1.2	3.061	3	1	5	1.494	-1.452	-0.138
Z1.3	2.939	3	1	5	1.459	-1.433	0.005
Z1.4	3.211	4	1	5	1.341	-1.121	-0.349
Z1.5	3.175	3	1	5	1.339	-1.146	-0.216
Z1.6	3.096	3	1	5	1.344	-1.238	-0.156
Z1.7	3.105	3	1	5	1.441	-1.339	-0.151
Z1.8	3.07	3	1	5	1.491	-1.43	-0.073
Friendly	3,094				1,417	-1.318	-0,140

Source: Primary data processed, Researcher (2025)

Meanwhile, the Financial Inclusion variable, as presented in Table 3, yielded a mean value of 3.09 with a standard deviation of 1.42. The kurtosis (–1.318) and skewness (–0.140) values indicate a slightly flatter and left-skewed distribution, implying that respondents' perceptions were relatively balanced and spread across the scale. This pattern reflects an even awareness among MSME owners of the accessibility and utilization of formal financial services.

Technological Innovation

Table 4. Descriptive Statistical Test Results Data Variables of technological innovation

Name	Mean	Median	Scale min	Scale max	Standard deviation	Excess kurtosis	Skewness
IT1	2.965	3	1	5	1.584	-1.598	0.018
IT2	3.018	3	1	5	1.395	-1.379	-0.11
IT3	2.886	3	1	5	1.52	-1.495	0.044
IT4	2.904	3	1	5	1.383	-1.389	-0.107
IT5	3.07	3	1	5	1.368	-1.264	-0.087
IT6	3	3	1	5	1.504	-1.481	-0.016
IT7	2.921	3	1	5	1.505	-1.508	-0.036
Friendly	2,966				1,465	-1,445	-0,042

Source: Primary data processed, Researcher (2025)

The Technological Innovation construct, illustrated in Table 4, showed a mean of 2.97 and a standard deviation of 1.46, with kurtosis (–1.445) and skewness (–0.042) values falling within the acceptable normality range (–2 < value < 2). These findings suggest that respondents moderately implemented technological innovation practices such as digital payments and online marketing, with relatively stable response variations.

MSME Performance

Table 5. Descriptive Statistical Test Results of MSME Performance Variables

Name	Mean	Median	Scale min	Scale max	Standard deviation	Excess kurtosis	Skewness
Y1.1	2.816	3	1	5	1.565	-1.565	0.144
Y1.2	2.789	3	1	5	1.334	-1.305	0.124
Y1.3	2.868	3	1	5	1.553	-1.522	0.151
Y1.4	2.877	3	1	5	1.352	-1.325	0.032
Y1.5	2.868	3	1	5	1.507	-1.494	0.118
Y1.6	2.939	3	1	5	1.459	-1.442	0.091
Y1.7	2.912	3	1	5	1.367	-1.336	-0.069
Y1.8	2.956	3	1	5	1.53	-1.502	0.105
Y1.9	2.833	3	1	5	1.407	-1.328	0.091
Friendly	2.873				1.452	-1.424	0.087

Source: Primary data processed, Researcher (2025)

As shown in Table 5, the MSME Performance variable produced a mean of 2.87 and a standard deviation of 1.45, with kurtosis (–1.424) and skewness (–0.087). These values also indicate a normal distribution, confirming that respondents' evaluations of business performance were consistent and statistically reliable.

Evaluation of Measurement Models (Outer Model)

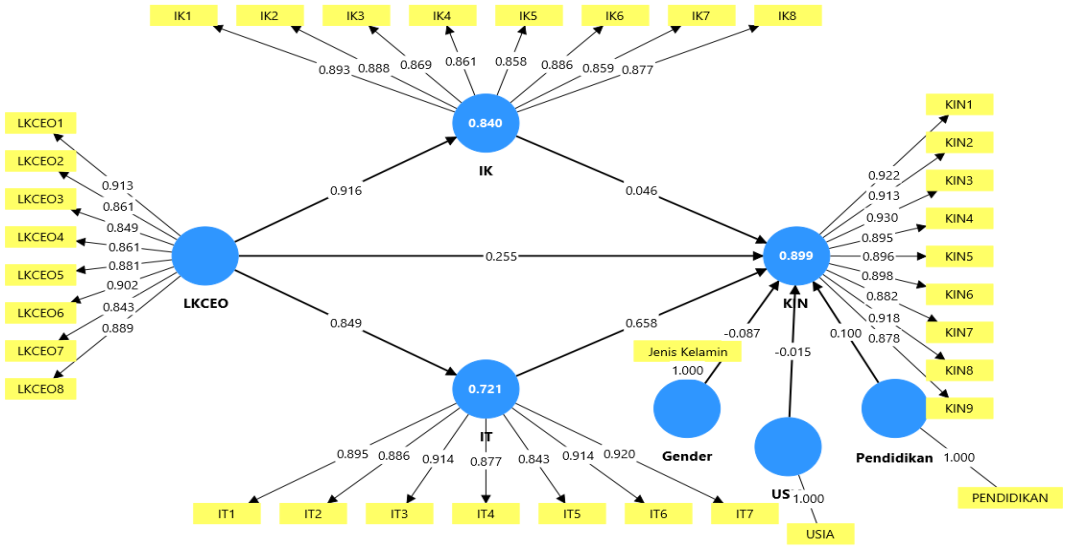
The evaluation of the measurement model in PLS-SEM is conducted to ensure that each indicator accurately represents its corresponding latent construct. This stage focuses on assessing both validity and reliability before proceeding to structural model analysis. Validity is examined through convergent validity and discriminant validity. Convergent validity is determined using the outer loading and Average Variance Extracted (AVE) values, while discriminant validity is assessed using the Heterotrait-Monotrait Ratio (HTMT) to confirm that each construct is distinct. Reliability is tested through Composite Reliability (CR) and Cronbach's Alpha, where values above 0.70 indicate acceptable internal consistency. Overall, this evaluation ensures that the indicators used in the model are both valid and reliable for measuring the latent variables accurately.

Validity Test

Convergent Validity

The convergent validity test was conducted to confirm that each indicator accurately represents its respective latent construct. According to Hair et al. (2022), a construct achieves convergent validity when the outer loading value exceeds 0.70 and the Average Variance Extracted (AVE) value is greater than 0.50.

Figure 2. Value Loading factor



As illustrated in Figure 2, all indicators demonstrate strong loading factors on their respective constructs, indicating that each item effectively reflects the variable it measures.

Table 6. Results of cross loading analysis

	IK	IT	KIN	LKCEO
IK1	0.893			
IK2	0.888			
IK3	0.869			
IK4	0.861			
IK5	0.858			
IK6	0.886			
IK7	0.859			
IK8	0.877			
IT1		0.895		
IT2		0.886		
IT3		0.914		
IT4		0.877		
IT5		0.843		
IT6		0.914		
IT7		0.920		
KIN1			0.922	
KIN2			0.913	
KIN3			0.930	
KIN4			0.895	
KIN5			0.896	
KIN6			0.899	
KIN7			0.881	
KIN8			0.918	
KIN9			0.878	
LKCEO1				0.913
LKCEO2				0.861

LKCEO3				0.849
LKCEO4				0.861
LKCEO5				0.881
LKCEO6				0.902
LKCEO7				0.843
LKCEO8				0.889

Source: Primary data processed, Researcher (2025)

Information:
IK : Financial Inclusion
IT : Technological Innovation
KIN : MSME Performance
LKCEO : CEO Financial Literacy

The detailed outer loading results for all constructs are presented in Table 6. These values range between 0.843 and 0.930, all exceeding the minimum threshold, confirming the indicators' validity.

Table 7. Average Variance Extracted (AVE)

	Average variance extracted (AVE)
IK	0.764
IT	0.798
KIN	0.817
LKCEO	0.766

Source: Primary data processed, Researcher (2025)

Furthermore, the AVE results summarized in Table 7 show that all constructs meet the validity requirement, with Financial Inclusion (0.764), Technological Innovation (0.798), MSME Performance (0.817), and CEO Financial Literacy (0.766) exceeding the 0.50 cutoff. The results confirm that all constructs in this study meet the criteria for convergent validity, indicating that the measurement indicators consistently represent their intended latent variables and are suitable for further model testing.

Discriminant Validity

The discriminant validity assessment aims to confirm that each construct within the model is conceptually and empirically distinct from the others. This validity is established when the square root of the Average Variance Extracted (AVE) for a given construct exceeds its correlation with other constructs, or when each indicator demonstrates a higher cross-loading value on its corresponding construct than on any other construct (Hair et al., 2022).

Table 8. Results of cross loading analysis

	IK	**IT**	**KIN**	**LKCEO**
Z1.1	0.893			
Z1.2	0.888			
Z1.3	0.869			
Z1.4	0.861			
Z1.5	0.858			
Z1.6	0.886			
Z1.7	0.859			
Z1.8	0.877			

	IK	IT	KIN	LKCEO
Z2.1		0.895		
Z2.2		0.886		
Z2.3		0.914		
Z2.4		0.877		
Z2.5		0.843		
Z2.6		0.914		
Z2.7		0.920		
Y.1			0.922	
Y.2			0.913	
Y.3			0.930	
Y.4			0.895	
Y.5			0.896	
Y.6			0.899	
Y.7			0.881	
Y.8			0.918	
Y.9			0.878	
X.1				0.913
X.2				0.861
X.3				0.849
X.4				0.861
X.5				0.881
X.6				0.902
X.7				0.843
X.8				0.889

Source: Primary data processed, Researcher (2025)

As shown in Table 8, the results of the cross-loading analysis indicate that all indicators have the highest loading values on their respective constructs, with no indicators showing higher loading on other constructs. The loading values range from 0.843 to 0.930, all of which exceed the minimum threshold of 0.70. This finding demonstrates that each indicator contributes more strongly to its intended construct than to others, confirming that the constructs in this study are well-differentiated and do not overlap in measurement.

For instance, indicator Z1.1 records a loading of 0.893 on the Financial Inclusion construct, while indicator Z2.7 loads 0.920 on Technological Innovation. Similarly, indicators Y.3 and X.6 show high loadings of 0.930 and 0.902 on MSME Performance and CEO Financial Literacy, respectively. These consistent results can be seen clearly in Figure 2, which visualizes the strength of the relationship between indicators and their corresponding constructs. The discriminant validity results confirm that all constructs in the model are statistically distinct and well-represented by their respective indicators. Thus, the measurement instruments used in this study are valid, reliable, and appropriate for further structural model analysis.

Reliability Test

In this study, the reliability of each construct was assessed using two main indicators: Cronbach's Alpha and Composite Reliability (CR). These two measures were applied to evaluate the internal consistency of the indicator blocks that represent each construct in the research model.

Cronbach's Alpha

As presented in Table 9, the Cronbach's Alpha values for all constructs exceed the minimum reliability threshold of 0.60, indicating a high level of internal consistency. Specifically, Financial Inclusion recorded a value of 0.956, Technological Innovation 0.958, MSME Performance 0.972, and CEO Financial Literacy 0.956. These results confirm that all constructs are internally consistent and reliable, meaning that the indicators used are stable in measuring the respective variables.

Table 9. Cronbach's Alpha

	Cronbach's alpha
IK	0.956
IT	0.958
KIN	0.972
LKCEO	0.956

Source: Primary data processed, Researcher (2025)

Composite Reliability

Table 10. Composite Reliability Results

	Composite reliability (rho_c)
IK	0.963
IT	0.965
KIN	0.976
LKCEO	0.963

Source: Primary data processed, researchers (2025)

The results of the Composite Reliability (CR) test, displayed in Table 10, also demonstrate that all constructs have values above the recommended minimum of 0.70. Financial Inclusion shows a CR value of 0.963, Technological Innovation 0.965, MSME Performance 0.976, and CEO Financial Literacy 0.963. These values indicate that the constructs have a high degree of internal reliability and reflect the consistency of responses among indicators within each construct.

Both Cronbach's Alpha and Composite Reliability results confirm that the measurement model in this study meets the reliability criteria. This indicates that the constructs are measured consistently, and the research instrument is reliable for further structural model analysis.

Structural Model Analysis (Inner Model)

The evaluation of the structural model using the Structural Equation Modeling–Partial Least Squares (SEM-PLS) approach was carried out to determine the model's predictive strength and the significance of relationships among latent variables. This evaluation encompassed the examination of direct and indirect (mediated) effects, the impact of control variables, as well as the assessment of R^2, Q^2, and multicollinearity values.

Direct Effect Analysis

The direct effect test aims to determine the strength and significance of the relationships between the main constructs. The evaluation used the bootstrapping method by examining the path coefficient, t-statistic, and p-value. A relationship is considered significant when the t-statistic is greater than 1.96 and the p-value is less than 0.05.

As presented in Table 11, the results show that not all pathways are significant. The path from Financial Inclusion (IK) to MSME Performance (KIN) is insignificant (β = 0.018; t = 0.111; p = 0.912), indicating that financial access alone does not directly enhance MSME performance. Conversely, Technological Innovation (IT) has a significant positive effect on MSME Performance (β = 0.649; t = 4.298; p = 0.000), confirming that innovation adoption substantially strengthens competitiveness and productivity.

CEO Financial Literacy (LKCEO) significantly influences Financial Inclusion (IK) (β = 0.916; t = 33.946; p = 0.000) and Technological Innovation (IT) (β = 0.849; t = 18.010; p = 0.000), suggesting that financially literate CEOs are more capable of improving access to finance and promoting technological advancement. However, the direct path from CEO Financial Literacy to MSME Performance is not significant (β = 0.308; t = 1.758; p = 0.079), implying that its effect may occur indirectly through mediation mechanisms.

Table 11. Path coeficient Direct Influence

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
I > IN	0.018	0.050	0.160	0.111	0.912
IT -> KIN	0.649	0.637	0.151	4.298	0.000
LKCEO -> ME	0.916	0.917	0.027	33.946	0.000
LKCEO -> IT	0.849	0.850	0.047	18.010	0.000
LKCEO -> KIN	0.308	0.289	0.175	1.758	0.079

Source: Primary data processed, Researcher (2025)

Significant paths include IT → KIN, LKCEO → IK, and LKCEO → IT, while IK → KIN and LKCEO → KIN are insignificant. These results highlight technological innovation as the dominant driver of MSME performance, while CEO financial literacy exerts influence mainly through indirect pathways.

Indirect Effect (Mediation)

The mediation test examined the role of Financial Inclusion (IK) and Technological Innovation (IT) in linking CEO Financial Literacy (LKCEO) to MSME Performance (KIN). Although the direct effect of financial literacy on performance was not significant, mediation analysis (see Table 12) shows a significant indirect effect (β = 0.568; t = 3.518; p = 0.000).

This finding confirms that CEOs with strong financial literacy enhance MSME performance through greater access to financial services and adoption of technological innovations. These results are consistent with (Duréndez et al., 2023), who found that managerial financial competence affects performance indirectly via innovation and risk management.

Table 12. Indirect Influences

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
LKCEO -> KIN	0.568	0.587	0.161	3.518	0.000

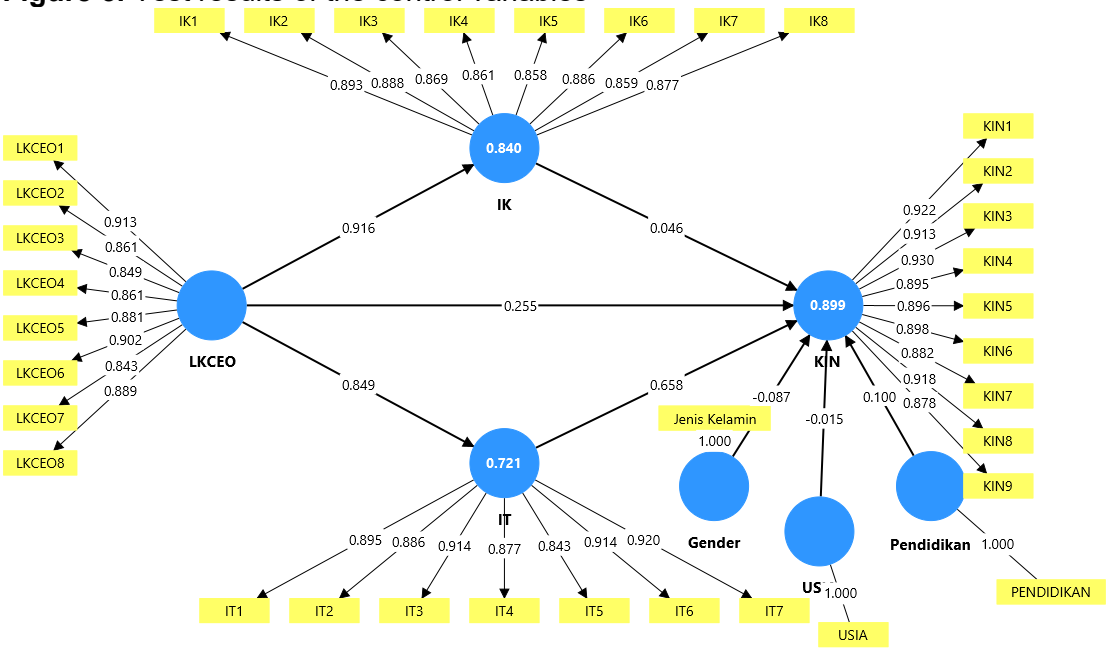
Source: Primary data processed, Researcher (2025)

Journal of International Conference Proceedings (JICP)
Vol. 8 No. 5, pp. 52-75, January, 2026
E-ISSN: 2621-993X P-ISSN: 2622-0989
https://ejournal.aibpmjournals.com/index.php/JICP/index

Control Variable Analysis

The influence of demographic control variables age, education, and gender on MSME performance is presented in Figure 13. The results show no significant effects, as education (β = 0.100; p > 0.05), age (β = –0.015; p > 0.05), and gender (β = –0.087; p > 0.05) all fall below the significance threshold.

Figure 3. Test results of the control variables



These findings indicate that demographic factors do not substantially influence MSME performance. Instead, internal competencies such as CEO financial literacy, technology adoption, and access to finance play a more decisive role. The Variance Inflation Factor (VIF) values for control variables were all below 5, indicating no multicollinearity problem.

R² Value Evaluation

The R² values summarize the explanatory power of independent variables for the endogenous constructs (see Table 13). Results show that Financial Inclusion (IK) has an R² of 0.840, Technological Innovation (IT) has 0.721, and MSME Performance (KIN) has 0.886.

Table 13. R2 test results

	R-square	R-square adjusted
IK	0.840	0.838
IT	0.721	0.719
KIN	0.886	0.883

Source: Primary data processed, Researcher (2025)

These results indicate strong explanatory power for all constructs, confirming that CEO financial literacy, financial inclusion, and technological innovation collectively explain 88.6% of MSME performance variance.

Q² Value Evaluation

The Q² Predict test evaluates the predictive relevance of the model. As displayed in Table 14, all endogenous variables show Q² values above zero (IK = 0.835; IT = 0.713; KIN = 0.762), confirming that the model possesses good predictive capability for all constructs.

Table 14. Q2 test results

	Q^2predict
IK	0.835
IT	0.713
KIN	0.762

Source: Primary data processed, Researcher (2025)

Multicollinearity Test

Table 15. Multicollinearity Test (VIF) Results

	VIVID
IK1	3.849
IK2	4.461
IK3	3.525
IK4	4.159
IK5	3.012
IK6	4.074
IK7	3.227
IK8	3.333
IT1	4.536
IT2	3.938
IT3	4.955
IT4	3.692
IT5	2.968
IT6	5.118
IT7	5.014
KIN1	6.063
KIN2	5.138
KIN3	6.688
KIN4	4.671
KIN5	5.190
KIN6	5.237
KIN7	4.070
KIN8	5.845
KIN9	4.229
LKCEO1	5.858
LKCEO2	3.567
LKCEO3	3.141
LKCEO4	3.641
LKCEO5	4.151
LKCEO6	5.101
LKCEO7	3.155
LKCEO8	4.288

Source: Primary data processed, Researcher (2025)

The multicollinearity test was conducted by examining the Variance Inflation Factor (VIF) values for all indicators. As presented in Table 15, most indicators have VIF values below 5, indicating the absence of serious multicollinearity issues.

Although several indicators such as IT6, KIN1, KIN2, KIN3, KIN5, KIN6, KIN8, and LKCEO6 recorded slightly higher VIF values, all remain within the acceptable range (VIF < 10). Therefore, the indicators were retained in the model, and it can be concluded that the research model is free from serious multicollinearity problems.

DISCUSSION

CEO Financial Literacy and MSME Performance (H1)

The findings indicate that CEO financial literacy has a positive effect on MSME performance. A higher level of financial understanding enables CEOs to manage budgets, control cash flow, record transactions, and assess investment opportunities more effectively. CEOs with sufficient literacy are also more disciplined in preparing reports, separating business and personal finances, and using capital efficiently, which strengthens financial stability and business competitiveness among MSMEs in Ternate.

Based on the Resource-Based View (RBV), financial literacy is considered an internal capability that provides strategic value and is difficult for competitors to imitate. This capability helps CEOs allocate resources efficiently, reduce risk, and formulate strategies that support business continuity (Winarto, 2020).

These findings are consistent with (Duréndez et al., 2023) who found that financial literacy supports better decision-making and enhances profitability. However, they differ from (Idris et al., 2023), who reported that financial literacy has a limited impact in contexts with weak external support such as market access and infrastructure. This study confirms that in the case of MSMEs in Ternate, CEO financial literacy is a crucial internal factor driving business performance, especially when supported by adequate external conditions.

The Role of Financial Inclusion Mediation (H2)

The findings show that financial inclusion does not mediate the relationship between CEO financial literacy and MSME performance. Although financially literate CEOs have better access to formal financial services such as credit and savings, this access does not necessarily improve business outcomes. Respondent data indicate that financial facilities are available but often used for non-productive purposes, such as household or short-term needs, rather than business development. This explains why financial inclusion fails to strengthen the link between CEO financial literacy and MSME performance (Widyandri & Laila, 2022).

From the Resource-Based View (RBV) perspective, financial inclusion should act as an external resource that enhances internal capabilities like financial literacy. However, these resources do not generate added value when they are not managed productively. Access to finance remains potential rather than a competitive advantage without effective management and utilization.

This result aligns with (Kusuma et al., 2022), who emphasized that access to finance has limited impact without adequate literacy and managerial competence. Financial literacy and technological innovation influence MSME performance more strongly than financial inclusion. Conversely, Rahardjo et al. (2019) and (Aryanto et al., 2023) reported that financial inclusion can enhance MSME performance by improving access to working capital. These findings suggest that, in the case of MSMEs in Ternate, the main issue lies not in limited access but in the ineffective and unproductive use of available financial resources.

The Mediating Role of Technological Innovation (H3)
The study demonstrates that technological innovation successfully mediates the relationship between CEO financial literacy and MSME performance. CEOs with strong financial literacy are more inclined to adopt digital technologies, and this technological adoption, in turn, enhances business performance. In essence, financial literacy fosters the capacity to integrate technological innovations that improve the competitiveness and sustainability of MSMEs (Widyastuti et al., 2021).

Empirical evidence supports this relationship MSMEs led by financially literate CEOs tend to utilize digital payment systems, e-commerce platforms, and social media marketing more effectively. Such technological use increases operational efficiency, expands market access, and accelerates customer service processes. Thus, technological innovation functions as a crucial intermediary linking financial literacy to improved business outcomes (Zhao et al., 2010).

Viewed through the Resource-Based View (RBV) framework, technological innovation represents an external resource that complements internal competencies such as financial literacy. The synergy between these two elements enables MSMEs to become more adaptive, efficient, and innovative in responding to market competition.

CONCLUSION

This study examined the effect of CEO financial literacy on MSME performance by incorporating financial inclusion and technological innovation as mediating variables. Based on data obtained from 100 MSME respondents, several conclusions can be drawn:

1. CEO financial literacy has a positive and significant impact on MSME performance. A higher level of financial understanding enables CEOs to manage capital more effectively, control cash flow, and make strategic decisions that enhance business growth.
2. Financial inclusion does not mediate the relationship between CEO financial literacy and MSME performance. Although financially literate CEOs have better access to formal financial services, such access is not always used productively. Many respondents still allocate financing for personal or non-productive purposes, reducing its potential to improve performance.
3. Technological innovation effectively mediates the influence of CEO financial literacy on MSME performance. CEOs with higher financial literacy are more likely to implement digital tools such as electronic payment systems and online marketing which enhance efficiency, expand market reach, and strengthen competitiveness.
4. Control variables including age, gender, and education were found to have no significant effect on MSME performance. This suggests that cognitive and managerial capabilities, particularly financial and technological literacy, play a more critical role in driving business success than demographic characteristics.

LIMITATION

This study acknowledges several limitations that should be considered for future research.

1. The use of a quantitative approach with a closed-ended questionnaire restricts the depth of information obtained. It captures only respondents' perceptions without exploring qualitative dimensions such as personal motivations, challenges, or experiences faced by MSME CEOs.

2. The research population is limited to MSMEs within a specific regional scope, which may affect the generalizability of the findings. The results may not fully represent MSMEs operating in other regions or across different industrial sectors in Indonesia.
3. The research model focuses solely on financial literacy, financial inclusion, and technological innovation. Other influential factors such as government policy support, business characteristics, or environmental conditions were not included, which may provide additional insights if explored in future studies.

ACKNOWLEDGMENT
The authors express gratitude to those who have had the pleasure of cooperating during this study or research.

DECLARATION OF CONFLICTING INTERESTS
Based on the research findings and identified limitations, several recommendations are proposed:

1. For MSME actors, efforts to enhance financial literacy should be prioritized through structured training programs, workshops, and mentoring facilitated by relevant institutions. Furthermore, the use of formal financial services needs to be optimized for productive business purposes, and MSMEs are encouraged to adopt digital technologies more extensively to strengthen efficiency and competitiveness.
2. For future researchers, it is recommended to apply a mixed-method approach to capture deeper qualitative insights into the experiences, motivations, and challenges of MSME owners. Future studies should also broaden the coverage of regions and business sectors while incorporating additional variables such as business characteristics, government policy support, and organizational culture to obtain a more holistic understanding.
3. For comparative analysis, subsequent research should examine differences between regions or MSME sectors to determine whether the impact of CEO financial literacy on business performance varies across contexts. Such comparisons would contribute to a more comprehensive understanding of MSME dynamics throughout Indonesia.

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ABOUT THE AUTHOR(S)

1st Author
Kalya Meidina is an undergraduate student in the Department of Accounting, Faculty of Economics and Business, Khairun University, Ternate, Indonesia. Her academic interests focus on financial literacy, financial inclusion, and technological innovation related to Micro, Small, and Medium Enterprises (MSMEs). She has actively participated in research focusing on the relationship between CEO financial literacy and MSME performance in the context of developing economies.
Email: kalyaaahalid@gmail.com