

How Digital Financial Literacy Shapes Sustainable Economic Performance: Evidence from Rural MSME

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Abstract

This study examines the effect of digital financial literacy on the sustainable economic performance of rural MSMEs, with technology adoption serving as a mediating mechanism. Data were collected through questionnaires administered to rural micro-entrepreneurs and analyzed using the Structural Equation Modeling (SEM) approach. The results indicate that digital financial literacy has a positive and significant impact on sustainable economic performance. Moreover, technology adoption strengthens this relationship by acting as a key pathway through which financial knowledge is transformed into improved economic outcomes. These findings underscore the importance of enhancing digital financial literacy and promoting the adoption of digital technologies to support business sustainability. The practical implications suggest that policymakers and development institutions should prioritize initiatives that enhance digital financial literacy and facilitate technology adoption to foster the sustainable economic performance of rural enterprises.

Keywords: Digital Financial Literacy, Technology Adoption, Sustainable Economic Performance, Rural MSMEs

Introduction

In recent years, the rapid development of digital technologies has transformed the global economic landscape and fundamentally altered how businesses operate, compete, and sustain their performance (Harianto, Azman, et al., 2025). Digital platforms, mobile applications, and financial technologies have reduced geographical barriers, accelerated transactions, and reshaped traditional business models across industries (Tikno et al., 2024). For micro, small, and medium enterprises (MSMEs), digital transformation offers new opportunities to improve efficiency, access financial services, and integrate into wider markets that were previously difficult to reach (Zhang et al., 2023). However, the benefits of digitalization are not distributed equally, particularly in developing countries where disparities in infrastructure, education, and financial capability remain substantial (Harianto, Fali, et al., 2025).

Rural entrepreneurs often experience greater structural constraints than their urban counterparts, including limited access to formal banking institutions, lower exposure to digital innovation, and restricted opportunities for financial education (Gideon Setyo Budiwitjaksono et al., 2023). These challenges create a digital divide that may prevent rural MSMEs from fully leveraging technological advancements (Girsang & Purba, 2025). Consequently, the success of digital transformation in rural business contexts depends not only on the availability of technology but also on the ability of entrepreneurs to understand, trust, and effectively use digital financial tools (Hardiansyah et al., 2025). In this regard, digital financial literacy emerges as a critical foundation for enabling meaningful participation in the digital economy and for ensuring that technological progress translates into tangible economic benefits (Khairani, Tantri, et al., 2025).

Digital transformation has fundamentally reshaped the way micro, small, and medium enterprises (MSMEs) manage financial activities and sustain their business performance (OECD/INFE, 2022). In rural contexts, where structural limitations such as limited access to formal financial services and technological infrastructure remain prevalent, digital financial literacy becomes an increasingly critical capability for entrepreneurs (Lusardi & Mitchell, 2023). Sustainable economic

performance is no longer determined solely by traditional financial outcomes, but also by the ability of MSMEs to adapt, survive, and grow in dynamic digital environments (Choung et al., 2023). For rural MSMEs, strengthening digital financial literacy is therefore essential to support long-term business continuity and economic resilience (Hou et al., 2025).

Digital financial literacy refers to the knowledge and skills required to understand, evaluate, and utilize digital financial products and services effectively (Khairumi et al., 2025). Entrepreneurs with higher levels of digital financial literacy are better equipped to manage cash flows, utilize digital payment systems, access digital credit, and make informed financial decisions (Kusumawardhani et al., 2023). These competencies contribute positively to business efficiency and support more sustainable economic outcomes (Amelia & Tambunan, 2024). Prior studies suggest that financial literacy enhances business performance by improving financial behavior, planning, and strategic decision-making (Khairani, Tantonio, et al., 2025). However, the effects of financial literacy are often indirect and depend on how knowledge is translated into actual behavior and practice (Hou et al., 2024).

In this regard, technology adoption plays a crucial role in explaining how digital financial literacy translates into sustainable economic performance (Tirtayasa et al., 2025). Technology adoption refers to the extent to which entrepreneurs actively use digital financial tools such as mobile banking, e-wallets, QRIS, fintech lending platforms, and digital bookkeeping applications (Hamzah et al., 2025). The Technology Acceptance Model (TAM) suggests that knowledge and perceived usefulness encourage individuals to adopt technology, which in turn shapes behavioral outcomes (Firmansyah et al., 2022). Entrepreneurs who possess strong digital financial literacy are more likely to adopt and utilize digital financial technologies, thereby improving transaction efficiency, financial transparency, and business control (Chhillar et al., 2024). Through this mechanism, technology adoption becomes a key pathway linking individual capability to organizational outcomes (Nurbayan et al., 2025).

Empirical evidence increasingly highlights that technology adoption enhances MSME performance by improving operational efficiency, expanding market access, and supporting better financial management practices (Alomran et al., 2024). Digital tools enable rural entrepreneurs to reduce transaction costs, access broader customer networks, and manage their financial records more systematically (Nurhidayah et al., 2025). These advantages contribute not only to short-term performance but also to long-term sustainability, resilience, and competitiveness of rural enterprises (Agbaje, 2025). Consequently, technology adoption is not merely a technical choice but a strategic behavior that strengthens the sustainability of MSMEs in rural economies (Sari et al., 2025).

Nevertheless, despite the growing body of literature on digital financial literacy and MSME performance, the mechanisms through which digital financial literacy influences sustainable economic performance remain insufficiently explored, particularly in rural contexts (Ambarwati et al., 2024). Many existing studies focus on direct relationships between literacy and performance, while paying limited attention to the mediating role of technology adoption (Dewi et al., 2025). Moreover, empirical evidence from rural MSMEs in developing countries remains fragmented, even though rural entrepreneurs often face the greatest barriers to digital inclusion. Understanding whether technology adoption acts as a key mechanism in translating digital financial literacy into sustainable economic outcomes is therefore essential.

This study seeks to fill this gap by examining how digital financial literacy shapes sustainable economic performance among rural MSMEs, with technology adoption as a mediating variable. By providing empirical evidence from rural entrepreneurs, this research contributes to the literature on digital finance, MSME sustainability, and development economics. In addition, the findings offer practical implications for policymakers, financial institutions, and development agencies in designing programs that strengthen digital financial literacy and encourage effective technology adoption to support sustainable rural economic development.

Theoretical Review

Digital Financial Literacy

Digital financial literacy is essential for strengthening MSMEs' capacity to survive and grow in the digital era, particularly as financial transactions increasingly rely on digital platforms (Tambunan et al., 2025). It refers to the knowledge and skills required to understand, evaluate, and effectively use digital financial services such as mobile banking, e-wallets, QRIS, online lending, and fintech platforms (Lusardi et al., 2021). Entrepreneurs with higher levels of digital financial literacy are generally better equipped to manage cash flows, plan finances, and make informed financial decisions that support business continuity (Purnama Sari et al., 2025). Previous studies indicate that digital financial literacy contributes to better financial behavior, including budgeting, saving, and responsible borrowing, which are critical for long-term business sustainability (Razaq et al., 2024). In addition, digitally literate entrepreneurs tend to be more adaptive to technological change and more confident in utilizing digital financial tools to improve operational efficiency (Fadli, 2021). This capability becomes even more important for rural MSMEs, which often face limited access to formal financial institutions and financial education (Lubis et al., 2023). Through digital platforms, rural entrepreneurs can overcome geographical barriers, access financial services more easily, and improve their overall business resilience (Tasnim & Azraf, 2025).

Technology Adoption

Technology adoption reflects the extent to which MSMEs actively utilize digital tools in their business operations, including digital payment systems, mobile banking, e-commerce platforms, and digital bookkeeping applications (Arifin, 2025). The adoption of technology is widely recognized as a strategic factor that enhances business efficiency, competitiveness, and sustainability in small enterprises (Armariena et al., 2025). MSMEs that adopt digital technologies are more likely to streamline their operations, reduce transaction costs, and improve service quality for their customers (Wakhyuni et al., 2024). According to the Technology Acceptance Model (TAM), individuals are more likely to adopt technology when they perceive it as useful and easy to use (Mujalli et al., 2025). These perceptions are strongly influenced by the level of digital financial literacy possessed by entrepreneurs (Eryc et al., 2026). When MSME actors understand how digital technologies work and recognize their benefits, they become more willing to integrate them into daily business practices (Pasaribu et al., 2023). Empirical evidence shows that technology adoption supports better financial management, expands market access, and increases transparency in business activities (Al-shami et al., 2024). Therefore, technology adoption functions not only as a technical choice but also as a behavioral mechanism that enables entrepreneurs to transform knowledge into practical outcomes that support business sustainability (Li & Sutunarak, 2024).

Sustainable Economic Performance

Sustainable economic performance refers to the ability of MSMEs to maintain stable business growth, resilience, and long-term viability rather than merely achieving short-term financial gains (Nugraha et al., 2022). It encompasses several dimensions, including income stability, business continuity, adaptability to environmental change, and the ability to withstand economic shocks (Sharabati et al., 2024). In this sense, sustainable performance reflects the overall health of a business and its capacity to survive in increasingly dynamic and competitive markets (Moschovopoulou & Papavassiliou-Alexiou, 2025). Studies indicate that MSMEs with strong internal capabilities, such as sound financial management and effective utilization of digital technology, are more likely to achieve sustainable economic performance (Hussain et al., 2023). Digital tools enable entrepreneurs to monitor their financial conditions more accurately, manage risks more effectively, and make strategic decisions based on reliable information (Prasanna et al., 2021). In rural contexts, where MSMEs often serve as the backbone of local economies, sustainable economic performance is particularly important for supporting community livelihoods and long-term development (OECD, 2021, 2023). Digital transformation provides opportunities for rural enterprises to strengthen their sustainability

by improving access to finance, expanding customer reach, and enhancing business efficiency (Hu et al., 2023).

Methodology

This study employs a quantitative research design using a survey approach to examine the effect of digital financial literacy on sustainable economic performance, with technology adoption as a mediating variable. The study was conducted among rural MSME owners located in several villages of Percut Sei Tuan District, Deli Serdang Regency, Indonesia. This area was selected because it represents rural economic characteristics with increasing exposure to digital financial services. Data were collected through a structured questionnaire distributed to rural micro-entrepreneurs. The respondents were selected using a purposive sampling technique, where participants were chosen based on specific criteria, including being active MSME owners and having experience in using digital financial services. The final sample consisted of 100 respondents. Structural Equation Modeling (SEM) was employed to analyze the relationships among the variables. SEM was chosen because it is appropriate for testing complex models involving latent constructs and mediation effects simultaneously. The analysis followed two main stages. First, the measurement model was evaluated to assess construct validity and reliability using outer loadings, composite reliability, and Average Variance Extracted (AVE). Second, the structural model was assessed by examining path coefficients, R^2 values, and the significance of both direct and indirect effects using the bootstrapping procedure. The mediating effect of technology adoption on the relationship between digital financial literacy and sustainable economic performance was also tested to ensure the robustness of the mediation model.

Results and Discussions

Results

Measurement Model Evaluation

The measurement model was evaluated using factor loadings, Cronbach's alpha, composite reliability (CR), and average variance extracted (AVE). Table 1 presents the results of the convergent validity assessment for all constructs in this study.

Table 1. Convergent Validity

Variable	Code	Outer Loading	Cronbach's Alpha	Composite Reliability	AVE
Digital Financial Literacy	DFL1	0.812	0.901	0.925	0.712
	DFL2	0.845			
	DFL3	0.873			
	DFL4	0.858			
	DFL5	0.829			
Technology Adoption	TA1	0.821	0.887	0.916	0.685
	TA2	0.854			
	TA3	0.868			
	TA4	0.836			
	TA5	0.807			
Sustainable Economic Performance	SEP1	0.835	0.894	0.921	0.699
	SEP2	0.862			
	SEP3	0.879			
	SEP4	0.847			
	SEP5	0.818			

Interpretation of Convergent Validity

This table presents the results of the convergent validity test for the three main variables in this study: digital financial literacy, technology adoption, and sustainable economic performance. The results show that all indicators have outer loading values greater than 0.7, indicating that each item is valid in measuring its respective construct. Furthermore, the Cronbach's alpha and composite

reliability values for all constructs exceed the recommended threshold of 0.7, confirming that the measurement instrument demonstrates strong internal consistency and reliability. The AVE values for all constructs are also above 0.5, indicating adequate convergent validity. Overall, these results suggest that the measurement model used in this study meets the required validity and reliability criteria.

Structural Model Evaluation

The bootstrapping method with 5,000 resamples was applied to evaluate the structural model and determine the significance of the hypothesized relationships. Table 2 presents the results of hypothesis testing, including path coefficients, t-statistics, and p-values.

Table 2. Hypothesis Test Results

Hypothesis	Path	Path Coefficient	T-Statistics	P-Values	Result
H1	Digital Financial Literacy → Sustainable Economic Performance	0.312	3.214	0.001	Supported
H2	Digital Financial Literacy → Technology Adoption	0.548	6.487	0.000	Supported
H3	Technology Adoption → Sustainable Economic Performance	0.421	4.102	0.000	Supported
H4	Digital Financial Literacy → Technology Adoption → Sustainable Economic Performance	0.231	3.556	0.000	Supported

The Influence of Digital Financial Literacy on Technology Adoption

The findings of this study indicate that digital financial literacy has a significant positive effect on technology adoption among rural MSME owners in Percut Sei Tuan District (Munthe et al., 2024). This result suggests that entrepreneurs who possess stronger knowledge and understanding of digital financial services are more likely to adopt and utilize digital technologies such as mobile banking, e-wallets, QRIS, fintech platforms, and digital bookkeeping applications in their business operations (Amirullah & Syakur, 2025). Digital financial literacy enhances confidence, reduces uncertainty, and strengthens entrepreneurs' ability to integrate technology into their daily business practices (Hanafie et al., 2025). This finding is consistent with (Ichim & Vid, 2025; Khairani et al., 2024), who argue that financial literacy increases individuals' awareness of the benefits of digital financial services, thereby encouraging adoption behavior. Similarly, (Amelia et al., 2025) found that MSME actors with higher levels of digital financial literacy demonstrate greater readiness to use fintech and digital payment systems. In line with the Technology Acceptance Model proposed by (Nugraha et al., 2022), individuals are more likely to adopt technology when they perceive it as useful and easy to use perceptions that are strongly shaped by financial knowledge and digital competence (Khairani, Silaban, et al., 2025). From a practical perspective, this result implies that increasing technology adoption among rural MSMEs cannot rely solely on infrastructure availability. Local governments, financial institutions, and development agencies should prioritize training programs that enhance digital financial literacy. Practical education on how to use QRIS, mobile banking, and digital bookkeeping applications will strengthen entrepreneurs' confidence and accelerate the adoption of digital technologies in rural business environments.

The Influence of Digital Financial Literacy on Sustainable Economic Performance

The results of this study also show that digital financial literacy has a significant positive effect on the sustainable economic performance of rural MSMEs (Khairani, Silaban, et al., 2025). This finding indicates that entrepreneurs who understand digital financial concepts and services are better able to manage cash flow, control financial risks, and make strategic business decisions, which

ultimately supports long-term business sustainability. This finding supports (Nasib et al., 2024) who emphasize that individuals with stronger financial knowledge tend to demonstrate more responsible financial behavior and greater financial resilience. Similarly, (Zheng & Bu, 2024) argue that financial literacy improves decision-making quality and strengthens the capacity of entrepreneurs to sustain their business in uncertain environments. (Silalahi et al., 2024) also confirm that MSME owners with higher digital financial literacy tend to achieve better business outcomes, particularly in terms of efficiency, stability, and competitiveness. In the context of rural MSMEs in Percut Sei Tuan, digital financial literacy enables entrepreneurs to better evaluate financial opportunities, utilize digital financial services wisely, and maintain business continuity despite economic challenges. This implies that improving rural MSME performance should focus not only on capital support but also on strengthening entrepreneurs' financial capabilities through continuous education and mentoring programs.

The Influence of Technology Adoption on Sustainable Economic Performance

The findings further reveal that technology adoption has a significant positive effect on sustainable economic performance. This suggests that MSME owners who actively use digital technologies in their business operations tend to experience better efficiency, improved financial management, and stronger long-term business sustainability (Lestari, Nasib, Khairani, Handayani, et al., 2021). This result is consistent with (Lestari, Nasib, Khairani, Martin, et al., 2021), who found that technology adoption enhances business efficiency and competitiveness among small enterprises. (Sharma et al., 2024) also reported that the use of digital platforms improves operational control and market reach, which contributes to better business performance. (Djohan et al., 2025) highlight that digital financial technologies enable entrepreneurs, particularly in rural areas, to reduce transaction costs and expand economic opportunities, thereby supporting long-term sustainability. In practical terms, this finding indicates that encouraging rural MSMEs to adopt digital technologies can significantly strengthen their resilience and competitiveness. Business actors who consistently use digital payment systems, online platforms, and digital financial tools are better positioned to adapt to market changes and maintain stable business performance. Therefore, programs that promote practical digital technology usage are essential for enhancing sustainable economic outcomes among rural entrepreneurs.

The Mediating Role of Technology Adoption

The results of this study confirm that technology adoption significantly mediates the relationship between digital financial literacy and sustainable economic performance (Harefa & Siboro, 2024). This indicates that digital financial literacy not only affects business sustainability directly but also exerts a stronger influence when it is translated into actual behavior through technology usage. In other words, financial knowledge becomes more impactful when entrepreneurs actively apply it by using digital tools in their business activities (Harianto, Razaq, et al., 2025). This finding aligns with (Harianto et al., 2024), who emphasize that financial literacy must be accompanied by behavioral implementation to generate tangible economic outcomes. (Shahadat et al., 2023) also argue that technological usage serves as a critical mechanism that transforms individual capability into organizational performance. Furthermore, (Utama et al., 2024) highlight that the real economic benefits of digital finance emerge when individuals move beyond knowledge toward consistent utilization of digital platforms. In the context of rural MSMEs in Percut Sei Tuan, this finding suggests that strengthening digital financial literacy alone is not sufficient if entrepreneurs are not encouraged to actively adopt technology. Therefore, policy interventions should integrate literacy programs with practical training on the use of digital financial tools. By strengthening both digital financial capability and technology adoption, rural MSMEs can achieve stronger resilience, higher competitiveness, and more sustainable economic performance in the long term.

Conclusions

This study provides empirical evidence that digital financial literacy plays a crucial role in shaping the sustainable economic performance of rural MSMEs in villages of Percut Sei Tuan District, Deli Serdang Regency, Indonesia. The findings indicate that digital financial literacy has both a direct positive effect on sustainable economic performance and an indirect effect through technology adoption. This suggests that financial knowledge alone is not sufficient; rather, it becomes more impactful when it is translated into actual behavior through the use of digital technologies in business activities. The mediating role of technology adoption strengthens this relationship, as the utilization of digital financial tools such as mobile banking, e-wallets, QRIS, fintech platforms, and digital bookkeeping applications serves as a mechanism that transforms financial knowledge into tangible economic outcomes. MSME actors who are more digitally literate tend to be more confident in adopting technology, which in turn supports better financial management, operational efficiency, and long-term business sustainability. The practical implications of this study emphasize that efforts to improve the performance and sustainability of rural MSMEs should focus not only on providing financial access or technological infrastructure, but also on strengthening digital financial literacy. Policymakers, local governments, financial institutions, and development organizations should design continuous and targeted training programs that enhance entrepreneurs' understanding of digital finance while encouraging the practical adoption of digital technologies. By fostering both digital financial capability and technology adoption, rural MSMEs can strengthen their resilience, competitiveness, and long-term economic sustainability.

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