



Researcher paper

Fintech Adoption, Financial Literacy, and Micro, Small, and Medium Enterprises in a Developing Economy

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ABSTRACT

With the rise of financial technology and the importance of financial literacy, our study aims to examine the role of fintech adoption and financial literacy on MSMEs financial performance. Also, we want to determine the moderating roles of fintech adoption and financial literacy on small business performance in Madagascar. The quantitative approach used 400 respondents collected from MSMEs owners in the municipality of Antananarivo, Madagascar. The data were then analyzed using Structural Equation Modeling (SEM-PLS) with *SmartPLS* version 4. Our findings show that financial literacy is positively associated with FinTech adoption. Second, Financial literacy significantly improves the financial performance of MSMEs. Third, FinTech adoption positively enhances the financial performance of MSMEs. Lastly, financial literacy does not moderate the relationship between FinTech adoption and Financial Performance. These results indicate that understanding the basic skills of finance is an asset for MSMEs owners to ensure their business profitability and soundness. Also, leveraging fintech products and services streamlines business operations and drives success and competitiveness. This study provides novel insights into fintech adoption and its impact on MSMEs in Madagascar and is among the few studies to integrate literacy as a moderating factor, particularly in the advancement of financial technology.

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1. INTRODUCTION

A like most of the developing counties, Micro, Small, Medium, and Enterprises (MSMEs) plays a significant role for the socio-economics development (Wang, 2016). In Madagascar it represent 80% of enterprises in country, that generate nearly one quarter of jobs, contribute 90% to the global economy, and make up 90% of African businesses (Urban et al., 2025). Despite its valuable contribution, MSMEs in low-income countries like Madagascar face major challenges, including access to finance, markets, Financial and size constraints, and skills (Sarfo et al., 2023b; Tavengerwei, 2018). Moreover, as on common major issue in developing countries, limited access to finance prevents small businesses from expanding at a larger scale (Asaana, 2026). Access to the market has become challenging for MSMEs, as it is largely dominated and controlled by big industry. Besides, the World Bank reported on 2025 that for Madagascar these challenges expanded to access to skills, where a lack of capacity in operational, marketing, financial, and human management remains a challenge for businesses to thrive. In recent year, many governments have taken initiatives to promote a hospitable entrepreneurial ecosystem. In addition, many countries worldwide have paid close attention to promoting the growth of MSMEs. Since MSMEs are a pillar of the global economy, they improve social and macroeconomic indices and offer job opportunities for youth (Rahmawati et al., 2023). Researchers and policymakers are concerned about MSMEs because of their critical role in fostering an innovative and competitive environment.

Due to the rise of digital technology and advancement, technology has become a part of the financial industry to facilitate transaction and exchanges. Advances in technology and electronic gadgets have led to the widespread use of financial technology products and services. Indeed, financial technology can enhance financial products and expand inclusion through channels such as digital mobile banking, e-wallets, and SMS banking Brody, 2021; Haritha, 2023). However, Finger et al. (2024) argue that to fully realize the benefits of financial technology, a supportive regulatory and technological environment needs to be in place. The widespread use of financial technology is

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hindered by several factors that prevent users from integrating digital technology in their daily operations. Some of the barriers in technology adoption are digital illiteracy, even in friendly, regulated environments, and advanced technological infrastructure (Aoun et al., 2026). This is considered a drawback of digital technology adoption in developing countries, where the lack of necessary skills and know-how to implement these technologies hinders the shift from traditional financial services to more technology-driven services. Thus, users must understand how all the available financial technology products function. The existence of financial technology products shifts, gradually eliminating the need for physical presence at financial institution branches (Asaana, 2026). In the context of Madagascar, despite that some MSMEs move forward to more technology-driven these issues remain evident when it comes to financial services for transaction, exchange, and even for financial management. To explain how this MSMEs cope with the digital transformation and integrated technology for their financial aspect. With this study aim to broaden the understand on how financial literacy and financial technology affect MSMEs in developing countries, since they provide small businesses an alternative way to optimize their profitability and soundness.

Digital financial literacy has become increasingly important for individuals and small business owners to gain a competitive advantage and greater effectiveness (Hidayat-ur-Rehman, 2025). Since the evolution of financial technology, all information, such as financial transactions, reporting, and investment, is available virtually. Budgeting is then important to the development of a profitable business (Broby, 2021). However, the lack of financial literacy remains a great challenge among small business owners. As previously found, Madagascar's financial literacy rate in Madagascar is relatively low at 35 percent, compared to that in developed nations (Sarfo et al., 2023b; Yu et al., 2025). Consequently, financial institutions such as conventional banks, microfinance institutions, and investment banks face difficulties in determining MSMEs' assets and operating income due to low levels of financial literacy. As a result, MSMEs owners do not prepare their financial reports in an overly detailed manner. However, financial institutions require such detailed information about the business's financial statement reporting during the loan application. In this sense, financial literacy is considered a key factor in helping small business owners overcome funding barriers, credit risk, and savings planning challenges (Ichim et al., 2025).

Undeniably, the advancement of financial technology has opened new opportunities for micro-entrepreneurs. Financial technology helps users become more efficient in their time management and cost management. Numerous empirical evidence has been exploring the link between technology and performance, and some have explored the role of financial literacy. For MSMEs, having enough time to focus on their business operations helps them improve performance, as small business owners can manage financial aspects remotely. In many countries, the emergence of financial technology has been recognized as a driving force behind a development approach crucial for the growth of small businesses (Al-shami et al., 2024). In addition, financial technology also contributes significantly to financial inclusion. Thus, financial technology should be the top priority in emerging economies to achieve the SDGs of 2030 (Nguyen & Nguyen, 2018). Despite the importance of financial technology in promoting digital financial literacy and in enhancing the financial performance of MSMEs, based on the Unified Theory of Acceptance and Use of Technology (UTAUT). Previous studies have primarily examined the impact of financial literacy and financial technology on financial stability (Elsayed et al., 2024), employment (Huang et al., 2024), urban economic resilience (He et al., 2024), and digital credit awareness (Sarfo et al., 2023a). Yet, this present research focuses on MSMEs in developing countries with an unstructured market and facing various constraints in regulation, finance, and digitalization. Financial technology has been widely recognized for its significant contributions not only to the development of the financial sector but also to ensuring socio-economic stability. However, only a limited number of studies have investigated the influence of financial literacy and financial technology adoption on MSMEs' financial performance in low-income countries.

To the best of our knowledge, the novelty and the contributions of this study are presented in three perspectives. First, our study examines the role of financial literacy and financial performance among MSMEs in Madagascar. Second, it is one of the few studies to focus on the relationship between financial technology adoption and MSMEs financial performance in Madagascar. Last, we study the moderating role of financial literacy on the impact of financial technology adoption on the financial performance of MSMEs. To sum up, literature has rarely addressed financial literacy and financial technology in Madagascar, yet they remain relevant to the economy in as whole. Our study is aim to explain technology adoption and user behavior (Venkatesh et al., 2003). The findings of this study will assist policies maker and small businesses players in designing an appropriate strategy to improve local businesses by providing financial education and training and by enhancing fintech-related infrastructure and services.

2. LITERATURE REVIEW

2.1. Financial Literacy

Financial literacy emerges as one of the most important elements in managing personal and business finances, particularly for Micro, Small, and Medium Enterprises (Guo et al., 2024). In an increasingly competitive and unpredictable environment, the ability to understand and manage finances effectively is becoming more important.

The most popular definition emphasizes familiarity with the economic environment and understanding of fundamental financial concepts (Kurniasari et al., 2026). Overall, financial literacy refers to both knowledge of the basics of finance and the ability to make sound financial decisions (Cascavilla, 2024). From individual perspective, it is defined as an individual's ability to understand and effectively use various financial concepts in daily life, financial literacy refers to basic knowledge of various financial products, such as savings, investments, and loans, as well as the ability to make sound financial decisions based on available information (Martino et al., 2025). Otherwise, for small and medium-sized enterprises, financial literacy is crucial. They must effectively manage their cash flow, structure their business financing, and make wise investment choices to ensure the sustainability and expansion of their business (Cordes et al., 2026). Financial literacy can determine whether the business succeeds in seizing market opportunities (Widjayanti et al., 2025).

The promotion of financial literacy has been included in the government agenda in many nations due to its great importance in individual decision-making and its impact on economic prosperity (AlSuwaidi & Mertzanis, 2024). Previous literature explained that a lack of financial knowledge is a barrier to the usage, accessibility, and availability of financial services (Sedera et al., 2022). Emphasizes that individuals and businesses can benefit from inclusive finance by understanding the basics of financial principles (Hosen et al., 2025; Reddy et al., 2025). Despite the tremendous advantages that financial literacy can bring to the overall economy and individuals' well-being, many developing countries struggle to identify the right policies to improve financial education among their populations (Lee et al., 2017). Thus, financial education appears to be a pressing issue in developing nations; designing policies to enhance financial knowledge is then required.

Financial literacy is an important lever for SME performance (Abdallah et al., 2024). Research highlights that knowledge leads to better decision-making and improved business performance. Indeed, solid financial literacy improves SMEs' access to financing and their ability to manage finances effectively, positively impacting business outcomes. Knowledge illuminates SMEs in their choices, helps them avoid financial problems, and enables them to seize growth opportunities (Abdallah et al., 2024). Financial literacy involves various skills, such as tracking expenses, saving, managing debt, making investment decisions, and understanding the basics of insurance. For SMEs, financial literacy is important for business success and sustainability. Indeed, companies that understand these principles are better equipped to face financial challenges, manage their resources wisely, and develop strategic plans (Abdallah et al., 2024). This knowledge gives them an advantage, helping them make wise choices, anticipate financial challenges, and ensure expansion in competitive markets. The importance of knowledge extends beyond the benefits to individuals or organizations. Better financial education helps individuals and businesses overcome obstacles effectively, thereby ensuring they can adjust and succeed even in challenging economic contexts (Kumar, 2025).

2.2. Financial Technology

In recent years, financial technology has significantly impacted business productivity, decision-making, and outcomes (Lai et al., 2023). According to Liu and Li (2025), fintech refers to a set of new technologies, including, but not limited to, big data analysis, blockchain, artificial intelligence, and digital payment systems. The adoption of financial technology has significantly changed the way financial services are provided; indeed, it disrupts the traditional paradigm. FinTech brings creative ideas that make financial organizations more cost-effective and user-friendly, thereby changing how they provide goods and services. According to Tanchangya et al. (2025), the adoption of Fintech impacts in the following ways: firstly, the use of technology, particularly mobile phones, computers, or tablets, enables the provision of more diverse goods and services to customers at more reasonable costs than competitors. Secondly, they enable a response to the evolution of consumer behavior. Finally, FinTech increases the competitiveness of companies by offering services that traditional financial institutions do not provide or only offer in a less efficient manner, while also expanding the number of individuals able to access their services. From the investors' perspective, the adoption of FinTech can be seen as a high capacity for adaptability and innovation, as well as greater growth potential (Liu & Li, 2025). Companies with strong financial technologies generally have more agile digital communication channels with investors, such as online publishing platforms, instant financial statements, and data analysis tools, which can attract a variety of institutional and individual investors. Fintech can be beneficial for companies by attracting more experienced investors and analysts, promoting liquidity, and minimizing information asymmetry, which leads to an increase in stock market performance. Moreover, fintech integration enables companies to identify and manage risks more effectively and seize financial opportunities, such as algorithmic financing platforms and data-driven capital allocation strategies (Sun & Zhang, 2023). In this regard, Fintech affects the company's performance, primarily by improving efficiency. Indeed, the automation of processes using digital platforms optimizes administrative tasks and transaction processing

(Tanchangya et al., 2025). The gains in efficiency notably refer to reduced error rates in my human operations, accelerated processing speeds, and an optimized resource allocation. Moreover, the expansion of the market is also an important contribution of fintech. By reducing the requirements for physical infrastructure and enabling service delivery in previously inaccessible regions, digital solutions such as mobile applications and online platforms expand the customer base both geographically and demographically (Khanchel et al., 2025).

2.3. Hypothesis development

This study examined the influence of financial literacy on Fintech adoption in Madagascar. Financial literacy accelerates Fintech adoption in financial services, as individuals and small businesses leverage their financial knowledge to access more technological services. Several previous studies have examined the link between financial literacy and fintech adoption. Anwarul Islam and Khan (2024) argued that there is a positive relationship between Financial Literacy and Fintech Adoption. In addition, several studies confirmed the significant effect of financial literacy on Fintech Adoption (Kurniasari et al., 2025; Kakinuma et al., 2022). Furthermore, in a study by Prabhakaran and Mynavathi (2023) on Indian society using a cross-sectional approach, they found positive correlations between objective financial literacy and fintech adoption, as well as between subjective financial literacy and fintech adoption. Indicating that individuals who consider themselves financially capable, despite potential discrepancies with their actual knowledge, are more likely to use banking and payments services and participate in digital lending activities, compared to those who possess knowledge but lack confidence in their abilities. The conceptual framework is presented in the figure 1, based on the hypothesis development.

Moreover, a study conducted across generations on mobile payment FinTech highlighted that fintech adoption is the driving mechanism that improves financial literacy with positive associations between financial literacy and behavioral intentions, effort expectancy, facilitating conditions, performance expectancy, and social influence (Singh & Sharma, 2023; Aggarwal et al., 2023; Srivastava et al., 2024). This evidence underscores that sufficient knowledge about finance can improve the financial performance of the organization. Specifically, if the MSMEs are equipped with the necessary knowledge and relevant information about finance, they can optimize their financial performance. User innovativeness refers to the willingness to experiment with new technologies. This contradicting evidence, therefore, suggests that there are positive links between digital technology adoption and financial literacy. We developed our hypothesis as follows:

Hypothesis 1. FinTech adoption is positively associated with Financial Literacy

Rosyidiana and Narsa (2024) demonstrate that during the post-pandemic economic recovery, financial literacy has a positive and significant effect on financial performance among MSEs in rural areas. This empirical evidence supported the findings of Nugroho et al. (2023), emphasizing that financial literacy is positive and significant on financial performance as measured by profit and return on investment (ROI). Likewise, a study conducted in Ghana on small-scale enterprises in Ghana, demonstrated that financial literacy has a positive and significant effect on financial performance as measured using the Profit, revenue, and sales dimensions (Tuffour et al., 2025). Tuffour et al. extend that financial literacy has a direct significant effect on SME performance; improvements in owner-manager financial literacy can spur strong financial performance of the company. It is expected that financial knowledge will improve owner-managers' capacity to use sources, manage, and dispose of funds. This may inevitably impact their ability to manage business risks and ultimately their performance (Bellocchi et al., 2024). Moreover, studies on SMEs' managers conducted in China and the United Arab Emirates (UAE) reveal that financial literacy has a positive and strong effect on financial performance (Ali & Li, 2021). Similarly, evidence from a study on 739 micro-enterprises in Ecuador found that financial literacy was an important predictor of financial performance but not growth, and the use of role models predicted returns on assets but no other performance metrics (Engström & McKelvie, 2017). However, in contrast to the above evidence from the case of SMEs in the context of Indonesia, showed that financial literacy had no effect on financial performance (Menne et al., 2023). Thus, this study argues that the higher the financial literacy among MSEs, the Higher their financial performance. We developed our hypothesis as follows:

Hypothesis 2. Financial Literacy is positively associated with financial performance.

There is an influence of Fintech adoption on financial performance, making more Startups adopt Fintech. This influence has been studied among 500 SMEs in Jordan, which found a positive effect of financial technology on SMEs' financial performance, but it is not statistically significant. This means the observed effects may be due to chance and are not strong enough to conclude that financial technology has a significant impact on SMEs' financial performance (Alkhawaldeh et al., 2023). In addition, studies conducted in the banking industry, such as Commercial Bank in Pakistan, show that fintech adoption has a real positive impact on bank competitiveness. This study found

a positive and significant impact of fintech adoption on commercial banks' financial performance (Dwivedi et al., 2021). Moreover, within the context of financial-sector firms listed on the Bahrain Bourse (banks and insurance firms) from 2016 to 2022, Sanad and Al Lawati (2023) found a positive and significant influence of fintech adoption on financial performance. In another word, adopting Fintech, financial reports are more transparent, and shareholders can provide good direction for the progress of the company. From the insight of Jordan, Alafeef et al. (2024), stated that fintech adoption has a positive and significant effect on financial performance. The findings underscore that the implementation of FinTech can improve bank performance by considering efficiency, customer demand, and product offerings. These evidence are supported by Kayed et al. (2024), their study showed that positive influences on Fintech adoption affect Financial Performance. These empirically evidence has been supported across contexts (Kaddumi et al., 2023; Setiawan et al., 2021; Fowowe et al., 2013). Correspondingly, based on this existing evidence, the present study suggests that fintech adoption enhances MSMEs' performance, while financial literacy strengthens this relationship. Therefore, we propose the following hypotheses:

Hypothesis 3. FinTech adoption is positively associated with financial performance.

Hypothesis 4. Financial literacy significantly strengthens the relationship between FinTech adoption and Financial Performance

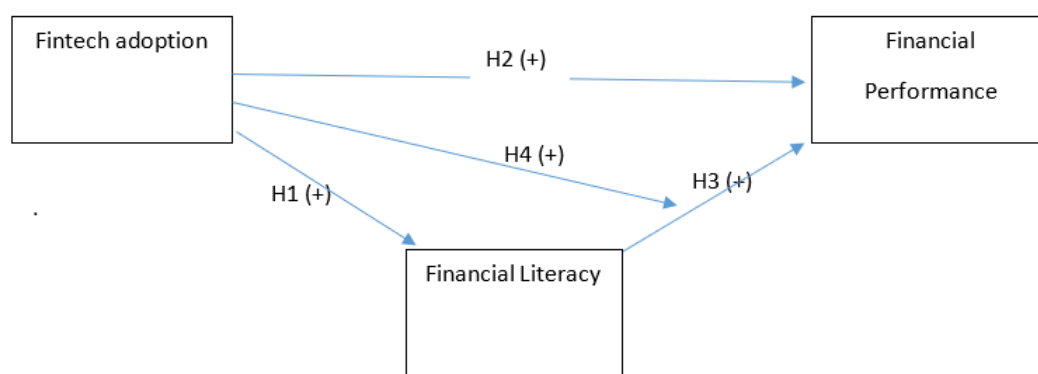


Figure 1. Conceptual framework

3. METHODS

This study employed a quantitative causal design utilizing a survey methodology to empirically test the role of financial literacy and fintech adoption in. Financial literacy measurement was adopted following the studies by Siddik et al. (2023) and Rahmawati et al. (2023). The key items encompassed the necessary elements in basic financial skills, such as financial planning and budgeting, savings and loans, insurance, and investment. The adoption of financial technology was followed by (Dwivedi et al., 2021). The indicator of this variable comprises perceptions of benefits and behavioral usage in Fintech services, usage, trust in Fintech, and perceived risk in Fintech. Lastly, to measure the financial performance of MSEM in Antananarivo, we primarily focus on profitability, liquidity, solvency, and business stability. These measures were designed based on the study by Sardo et al. (2018). All these items were structured in a questionnaire and measured using a 5-point Likert scale, ranging from 1 = strongly disagree to 5 = strongly agree.

In the data collection process, we structured the survey in English and then translated it into French and Malagasy, with the assistance of trained enumerators, since some business owners are more familiar with one of these two languages. Business owners are specifically targeted because they understand more about all the aspects in their business. The use of trained enumerators was to ensure that this study collected enough data to enable a thorough analysis. The data were collected through an offline survey and distributed to micro-, small-, and medium-sized enterprises in Madagascar's capital, Antananarivo. The selection is since most small businesses are concentrated in this district, ensuring that sufficient data can be collected. Our final sample comprises 400 small businesses in the capital city, with diverse activities as presented in Table 1. The data collection was conducted from November 2025 to February 2026.

The survey questionnaire was structured in sub-sections. The first section contains the consent and ethical statement. This section also outlines the study's objective. Upon consent, the respondents agreed to complete the questionnaire voluntarily. The second section contains the demographic information, such as age, gender, and

additional information about the MSMES. The last section contains the items used to measure the dependent and independent variables. The questionnaire was validated by the research lab's ethics committee for ethical clearance before data collection.

Table 1. *MSMEs based on the activity sector*

Sector	Number	Percentage (%)
Food	47	11.75 %
Construction	46	11.50 %
Engineering	44	11.00 %
Therapeutic supplies	44	11.00 %
Packaging	42	10.50 %
Wooden products & furniture	42	10.50 %
Chemicals & cosmetics	39	9.75 %
Leather & textiles	34	8.50 %
Mining	30	7.50 %
Plastic & rubber	26	6.50 %
Other	6	1.50 %

To understand the relationship between financial literacy, financial technology adoption, and the financial performance of small businesses. We performed hypothesis testing and examined the conceptual framework using Partial Least Squares Structural Equation Modeling (PLS-SEM). Data analysis and visualization were performed using SmartPLS version 4 software, which involved assessing the measurement and structural models (Blais & Weber, 2006). The path coefficients were examined using a bootstrapping technique with 5000 subsamples at a 5% significant confidence level. According to Hair et al. (2014), the PLS-SEM approach allows researchers to evaluate the validity and reliability, and mediation effects of the conceptual model in a single, thorough analysis. Also, to make sure the data were appropriate, several diagnostic tests were carried out prior to evaluating the hypotheses. Using Harman's single-factor test, we evaluated possible common technique bias and discovered that no single factor explained most of the variance, suggesting that common method variance is unlikely to skew the findings.

4. RESULTS AND DISCUSSIONS

RESULTS

4.1. Descriptive of the respondents

Table 2 displays the descriptive statistics of the respondents. Regarding gender, 228 of the 400 samples are men (57 percent), and women represent 43 percent (172). Based on this, we can conclude that men slightly dominate in the entrepreneurial activities in developing countries (Kurniasari et al., 2026). Regarding age, our sample shows that most entrepreneurs are between 18 and 35 years old, accounting for 88.8 percent of respondents. Another reason may be that nearly 70 percent of Madagascar's population is under 35. Regarding the age of MSMEs or business maturity, the majority of MSMEs have an age of 5 to 10 years, which represents 42.8 percent, followed by MSMEs under 5 years of establishment. Regarding the MSMEs' size, Micro and Small size enterprises take the biggest portion of the sample, the total of micro and small in combined represents 66.3 percent, or the equivalent of 165. The MSMEs market in the nation is dominated by micro and smaller size enterprises.

Table 2. *Descriptive of the respondent*

Variable	Category	N	%	Variable	Category	N	%
Age (Entrepreneur)	18-25	88	22.0	Gender	Men	228	57.0
	26-35	251	62.8		Women	172	43.0
	36-45	60	15.0	Age of MSME (Maturity)	≤ 5 Years	65	16.3
	40-60	1	0.2		5-10 Years	171	42.8
MSME Size	Micro	128	32.0		10-15 Years	64	16.0
	Small	137	34.3		15-20 Years	27	6.8
	Medium	36	9.0		≥ 20 Years	70	17.5
	Large	99	24.8	TOTAL		400	100

Percentage (%) ; Frequency (N)

4.2. Internal Consistency Reliability Testing

Table 3 presents the Internal Consistency Reliability Test, indicating that all variables used in this study Financial Literacy, Financial Performance, Fintech Adoption, and the interaction variable Fintech Adoption * Financial Literacy have excellent reliability. According to the guidelines established by Hair et al. (2017), a construct is considered reliable and has satisfactory internal consistency if its Cronbach's Alpha value is ≥ 0.70 . Based on this criterion, all variables met and even exceeded this threshold: Financial Literacy (0.870), Financial Performance (0.745), and Fintech Adoption (0.876) all fell above 0.70. The interaction variable showed a perfect value (1.000). Thus, it can be concluded that all measurement instruments (questionnaire items) for these variables were internally consistent and reliable in measuring the intended constructs. Therefore, the collected data is considered high-quality and suitable for further analysis. The results of the reliability test can be seen in the following table:

Table 3. *Internal Consistency Reliability Testing*

Variable	Cronbach Alpha	Description
Financial Literacy	0.870	Very Good
Financial Performance	0.745	Very Good
Fintech Adoption	0.876	Very Good
Fintech Adoption * Financial Literacy	1.000	Very Good

4.3. Convergent Validity Results

Table 4 shows that the measurement model meets the criteria for Convergent Validity and Construct Reliability according to the Partial Least Squares - Structural Equation Modeling (PLS-SEM) guidelines from Hair et al. (2017). Convergent Validity is measured through two main criteria. First, all constructs (Financial Literacy, Financial Performance, Fintech Adoption, and interaction variables) have Average Variance Extracted (AVE) values ≥ 0.50 (0.525, 0.570, 0.549, and 1.000, respectively). This criterion is met, indicating that each latent construct explains more than 50% of the variance in its indicators, so all variables are declared valid. Second, regarding the indicators' factor loadings, most exceed the ideal threshold of ≥ 0.70 . Although several indicators were below 0.70 (and one indicator, FA10, was below 0.50), the overall construct AVE values exceeded 0.50, allowing these indicators to be retained, especially in the context of PLS-SEM research. Furthermore, for Construct Reliability, all variables showed Composite Reliability (CR) values ≥ 0.70 (0.898, 0.840, 0.904, and 1.000, respectively). These high Composite Reliability (CR) values confirm that all constructs are highly reliable and have good internal consistency. In conclusion, the measurement model in this study is valid and reliable for use in further structural analysis.

Table 4. *Convergent Validity Test*

Variable	Indicator	Loading Factor	Composite Reliability	AVE
Fintech Adoption	FA2	0.655	0.904	0.549
	FA3	0.642		
	FA4	0.656		
	FA5	0.760		
	FA6	0.848		
	FA7	0.884		
	FA8	0.903		
	FA10	0.479		
Financial Literacy	FL3	0.637	0.898	0.525
	FL5	0.708		
	FL6	0.715		
	FL7	0.736		
	FL8	0.757		
	FL9	0.789		
	FL11	0.731		

Variable	Indicator	Loading Factor	Composite Reliability	AVE
	FL12	0.714		
Financial Performance	FP1	0.749	0.840	0.570
	FP2	0.863		
	FP3	0.699		
	FP4	0.696		
Fintech Adoption * Financial Literacy	Fintech Adoption * Financial Literacy	1.452	1.000	1.000

4.4. Discriminant Validity Results

Table 5 presents the Discriminant Validity Test. Based on the Fornell-Larcker analysis, the square root of the AVE (located on the diagonal) for each construct is always greater than the correlation coefficient (non-diagonal value) between that construct and the other constructs. Therefore, all constructs in the model (Financial Literacy, Financial Performance, Fintech Adoption, and Interaction) meet the Discriminant Validity criteria established by Hair et al. (2017). This indicates that each latent variable is empirically distinct from the others in the model.

Table 5. *Discriminant Validity Test*

Variable	Financial Literacy	Financial Performance	Fintech Adoption	Fintech Adoption * Financial Literacy
Financial Literacy	0.725			
Financial Performance	0.446	0.755		
Fintech Adoption	0.326	0.345	0.741	
Fintech Adoption * Financial Literacy	-0.256	-0.147	-0.694	1.000

4.5. R-Square Result

The R² test indicates the ability of the independent variables to explain variation in the dependent variable. The R² value for Financial Performance is 0.264, meaning that 26.4% of the total variation in Financial Performance is explained by the independent variables (such as Financial Literacy, Fintech Adoption, and their interaction) included in the model. Based on the general criteria of Hair et al. (2017), where R² ≥ 0.25 is categorized as weak to acceptable moderate, the model's predictive power for Financial Performance is considered adequate. Meanwhile, the R² value for Fintech Adoption is 0.106, indicating that only 10.6% of the variation in Fintech Adoption is explained by the independent variables in the model (assuming these variables are exogenous). This value is below the threshold of 0.25, so the model's predictive power for Fintech Adoption is classified as weak. The Adjusted R² values (0.259 for Financial Performance and 0.104 for Fintech Adoption), which are very close to the original R² values, indicate that the model is efficient and not overly burdened by irrelevant independent variables.

4.6. Hypothesis Testing

The proposed conceptual framework was tested using Structural Equation Modeling (SEM) (Table 6). After evaluating the outer measurement model, the inner structural model was assessed using a bootstrapping procedure with 2,000 resamples to examine the relationships among the constructs. The following section presents the results of the PLS-SEM analysis.

Table 6. Hypothesis Testing

Hypothesis	Original Sample (O)	Sample Mean (M)	T Statistics (O/STDEV)	P Values
Financial Literacy -> Financial Performance	0.380	0.387	7.412	0.000
Fintech Adoption -> Financial Literacy	0.326	0.334	5.800	0.000
Fintech Adoption -> Financial Performance	0.361	0.348	3.002	0.003
Fintech Adoption * Financial Literacy -> Financial Performance	0.138	0.128	1.773	0.077

The results of our research indicate that: Financial Literacy has a significant and positive direct effect on Fintech Adoption (Coefficient 0.326, P-value 0.000). This indicates that better financial understanding leads to higher levels of fintech adoption. Consequently, Hypothesis 1 is accepted. In addition, Financial Literacy has a significant and positive direct effect on Financial Performance (Coefficient 0.380, P-value 0.000). This result indicates that increasing financial literacy can improve financial performance, which confirms Hypothesis 2. Also, Fintech Adoption has a significant and positive direct effect on Financial Performance (Coefficient 0.361, P-value 0.003). This indicates that higher fintech adoption is associated with improved financial performance. On this note, Hypothesis 3 is accepted. Finally, the test of the moderating effect of financial literacy on the link between fintech adoption and financial performance is not significant (Coefficient 0.138, P-value 0.077). Since the P-value (0.077) is greater than 0.05 (and the T-statistic of 1.773 is less than 1.96), the moderation hypothesis is rejected. Empirically, this means that the influence of Financial Literacy on Financial Performance is neither significantly strengthened nor weakened by the level of Fintech Adoption. Following these results, Hypothesis 4 is rejected.

5. Discussion

The empirical finding shows that financial literacy has a significant, positive direct impact on financial performance, which is crucial and strengthens the Human Capital Theory framework (Mubarik et al., 2016). This finding is consistent with recent literature showing that financial knowledge and skills serve as investments, which in turn, enhance individuals' and managers' ability to make optimal financial decisions, minimize risk, and maximize returns (Chamberland et al., 2026). In the MSMEs business context, strong financial literacy enables better budget planning, efficient debt management, and accurate financial statement analysis, all of which directly contribute to profitability and sustainability (Ichim et al., 2025). This argument is supported by Abdallah et al. (2025), financial competence has a significant impact on the performance of small and medium-sized enterprises. Indeed, better financial education strengthens entrepreneurs' financial management skills and optimizes business performance. To manage their businesses, small business owners must make several decisions, among which the most difficult are those related to financial matters. Business owners with well-developed financial literacy skills better understand business-related financial concepts, such as investments, debt, savings, and financial management. This understanding leads to more rational decision-making. Indeed, financial decisions can help SMEs reduce administrative costs, minimize staff turnover, or even engage in profitable investments. Such decisions are based on financial information and made with sound judgment; they positively impact performance. Therefore, these findings provide strong policy implications, namely the need for continued investment in structured financial literacy education programs. Such programs should be viewed as essential socio-economic prerequisites, not merely complementary, to drive improved financial performance across sectors.

The finding highlights that fintech adoption has a significant, positive direct influence on financial literacy, demonstrating that it serves as a fundamental cognitive catalyst for fintech adoption. This finding is consistent with prior studies, in which emphasizes a strong financial understanding enables potential users to rationally evaluate risks and accurately identify fintech's value proposition (Oliveira et al., 2023; Susanto et al., 2021). When individuals master financial concepts, they can reduce the perceived uncertainty and risk inherent in new digital platforms, thereby increasing perceived usefulness and trust in fintech services (Moro et al., 2021). Cognitive biases hinder the adoption of fintech. Indeed, individuals with cognitive biases such as overconfidence, anchoring, disposition, and risk aversion tend to rely on established financial systems and, consequently, are less likely to adopt new fintech solutions. This may be due to a preconceived notion of certainty and reliability in familiar technologies. However, financial literacy mitigates the harmful effects of these biases on the adoption of financial technologies (Song et al., 2023). Although financial literacy cannot eliminate biases, it is essential for reducing their intensity and consequences. This allows small business owners to make more nuanced, informed choices about adopting fintech. This insight has strategic implications: the fintech industry and regulators should not only focus on expanding accessibility but also integrate financial education components into product design and user onboarding. This

ensures that increased fintech adoption is based on informed decision-making, rather than simply following the crowd, thus maximizing fintech's benefits for financial inclusion and stability (Luo et al., 2024).

The findings showing that fintech adoption has a significant, positive direct effect on financial performance provide strong empirical confirmation of fintech's transformative role in the modern economic ecosystem. These results strongly support the view that fintech is an efficiency mechanism and growth catalyst, not simply a technology choice. This positive impact occurs through several channels; the first is increased operational efficiency, where automation of transactions and cash management through fintech reduces operational costs and manual errors (Alkhawaldeh et al., 2023; Song et al., 2023). Second, fintech democratizes access to financing (such as peer-to-peer lending), enabling MSMEs and individuals to obtain capital more quickly and at lower cost, a key driver of expansion (Siano et al., 2020; Yu et al., 2025; Kurniasari et al., 2026). Given the blockage to access to finance in Madagascar, the availability of digital credits by *Mvola*, *Airtel Money*, and *Orange Money* has offered opportunities for the MSMEs to access financing and funds, as most of the small business players, not only in the urban areas but also in the rural areas, are aware of these services (Sarfo et al., 2023b; Xiang et al., 2026). In support of that, Asaana (2026) noted that the number of MSMEs applying for digital credit in online platforms or through peer-to-peer lending has increased over the years. In this sense, the accessibility of digital loans helps small businesses scale up and expand their activities. Finally, fintech applications facilitate data-driven decision-making by providing real-time cash flow analysis, enabling more optimal resource allocation and superior financial performance (Alt et al., 2023). Therefore, these findings underscore the urgency for businesses and individuals to integrate fintech into their financial strategies and for regulators to support this innovation to enhance national economic competitiveness.

The most interesting and counterintuitive finding is the rejection of the moderation hypothesis: the interaction variable Financial Literacy has no moderating effect on the relationship between Fintech Adoption and the Financial Performance of MSMEs in Madagascar. Empirically, this result indicates that Fintech Adoption does not serve as a significant moderator, strengthening or weakening the positive relationship between Financial Literacy and Financial Performance of MSMEs. The rationale is that fintech may only function as a facilitating tool (enabler) and not as a critical multiplier; the cognitive sophistication generated by Financial Literacy is already a strong and independent prerequisite for improving Financial Performance (Ichim et al., 2025). This means that adopted fintech services (especially basic ones) only simplify processes and offer additive convenience, without substantially changing the quality of literacy-driven decisions, thus preventing the emergence of strong synergistic effects (Lontchi et al., 2023). This insight implies that the positive effect of Financial Literacy on Financial Performance is a robust and independent relationship, and future researchers should investigate boundary conditions, for example, by moderating more complex types of fintech (such as robot-advisory), where the interaction effect may be more clearly manifested (Leong, 2018).

6. CONCLUSION

Despite the importance of financial literacy and fintech Adoption, only a few studies have examined their impact on MSMEs in developing countries. This study provides strong empirical evidence regarding the interconnected roles of Financial Literacy and Fintech Adoption in driving Financial Performance, while also revealing nuanced findings about their interaction. Our results confirm that Financial Literacy has a significant and positive effect on Financial Performance, underscoring its role as a form of Human Capital that enables optimal financial decision-making, crucial for small enterprises' profitability and sustainability (Lusardi, 2019). Accordingly, Financial Literacy is identified as a fundamental cognitive catalyst for Fintech Adoption, aligning with the Unified Theory of Acceptance and Use of Technology (UTAUT) by explaining users' intention to adopt information systems and their subsequent use behavior (Venkatesh et al. 2003; Dwivedi et al., 2019). Importantly, Fintech Adoption itself has a direct, significant, and positive impact on Financial Performance, validating its function as an efficiency mechanism and growth catalyst through channels such as operational automation and democratized access to finance (Song et al., 2023).

However, the analysis of the moderation effect yielded a noteworthy and somewhat counterintuitive finding: the interaction between Fintech Adoption and Financial Literacy was not statistically significant in influencing Financial Performance. This suggests that while both factors are individually important, Fintech Adoption does not act as a multiplier, substantially strengthening the relationship between Financial Literacy and financial outcomes. The positive impact of Financial Literacy on Financial Performance appears robust and independent, suggesting that many current fintech services (especially basic ones) may simply serve as enablers that simplify processes, without fundamentally changing the quality of decisions made by financially literate individuals (Liu et al., 2024). This finding warrants strong policy implications: investing in structured Financial Literacy programs is an essential prerequisite for socio-economic development. For the fintech industry, the strategic implication is to integrate education into product design to ensure adoption is driven by informed decision-making (Feld et al., 2021). Future research is recommended to explore the specific boundary conditions

under which synergistic effects may emerge, potentially by analyzing more complex types of fintech (e.g., robo-advisory) or by examining depth of use rather than simply adoption status.

Based on the existing findings, further research should focus on understanding the mechanisms (mediation) and the conditions under which (moderation) the relationship between variables can be maximized. To test the mediation mechanism, it is recommended to include variables such as Financial Decision Quality as a mediator between Financial Literacy and Financial Performance, in line with the Human Capital Theory, which posits that skills should lead to optimal decisions (Lusardi, 2019). Furthermore, in the context of MSMEs, it is necessary to examine whether better access to Financing enabled by Fintech is a mediating variable that drives Financial Performance (Alkhawaldeh et al., 2023; Lontchi et al., 2023; Siddik et al., 2023). Regarding the finding of the absence of a moderating effect, researchers should focus on boundary conditions; interaction tests should separate more sophisticated types of Fintech Adoption (e.g., robo-advisory or Personal Finance Management) from basic services, as the synergy between literacy and technology likely only emerges in Fintech use that requires high cognitive skills (Andreou et al., 2021; Song et al., 2023). For researchers replicating this model, it is recommended to improve the quality of measurement by measuring not only the adoption status, but also the depth and intensity of fintech feature usage and considering the use of objective Financial Performance data from formal reports, especially in the corporate or MSME context, instead of relying solely on perceptions, in order to increase the validity and generalizability of the findings.

Statement of competing interests

The authors declare that no potential competing interest was reported

Declaration of funding

The authors are reporting that no funding was received.

Informed Consent

Informed consent was obtained from all participants prior to their involvement in the study. Due to the nature of the data collection using a survey and the low-risk profile of the study, consent was obtained verbally rather than in written form. Upon consent, the respondents agreed to complete the questionnaire voluntarily. Participants were clearly informed about the purpose of the research, their right to refuse or withdraw at any time, and the use of the collected data strictly for academic purposes. Verbal consent was deemed appropriate in this context to facilitate participation and accommodate local research conditions while maintaining ethical standards.

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