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The Impact of Digital Financial Inclusion on Micro-Enterprise Performance in Southeast Asia

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Original Research Articles

The Impact of Digital Financial Inclusion on Micro-Enterprise Performance in Southeast Asia

Worawit Woracharone*

Abstract

This study investigates the relationship between digital financial inclusion and the performance of micro-enterprises in Southeast Asia. A cross-sectional quantitative design was employed, sampling 350 micro-enterprise owners across Thailand, Vietnam, and Indonesia. Data were collected using structured questionnaires covering digital financial access, usage behavior, and business performance indicators. Statistical techniques including multiple regression and correlation analyses were applied. Findings reveal that digital payment adoption and access to mobile banking services significantly enhance revenue growth and financial resilience among micro-enterprises. The study concludes that digital financial inclusion plays a critical role in improving economic outcomes at the micro level, with policy implications for regional development and financial regulation. Limitations and recommendations for future research are addressed.

Keywords: Digital Financial Inclusion; Micro-enterprise Performance; Southeast Asia; Mobile Banking; Economic Development

Introduction

Micro-enterprises play a vital role in the economic landscape of Southeast Asia, accounting for a significant share of employment generation, income creation, and poverty reduction across the region. In many ASEAN countries, micro-businesses constitute more than 90 percent of total enterprises and serve as a primary source of livelihood for low-income households (Asian Development Bank [ADB], 2020). Despite their importance, these enterprises often face persistent financial constraints, including limited access to formal credit, high transaction costs,

and inadequate financial infrastructure, which restrict their growth, productivity, and long-term sustainability (Beck & Demirgüç-Kunt, 2006).

In recent years, digital financial inclusion (DFI) has emerged as a potential solution to these challenges. Digital financial inclusion refers to the access to and use of formal financial services through digital channels such as mobile money, online banking platforms, digital payment systems, and fintech applications (Demirgüç-Kunt et al., 2018). By reducing geographical, informational, and cost barriers, digital financial services can enable micro-enterprises to manage transactions efficiently, access credit, improve cash flow management, and enhance financial resilience (Ozili, 2018). Southeast Asia, in particular, has experienced rapid growth in mobile phone penetration and fintech innovation, creating new opportunities for micro-enterprises to participate in the formal financial system (World Bank, 2022).

Although a growing body of literature has examined the macroeconomic benefits of financial inclusion, empirical evidence on the direct impact of digital financial inclusion on micro-enterprise performance remains limited, especially within the Southeast Asian context. Existing studies often focus on households or small and medium-sized enterprises (SMEs), with relatively few investigations centered specifically on micro-enterprises (Suri & Jack, 2016; Ghosh & Vinod, 2017). Moreover, many studies analyze financial inclusion in a traditional sense without distinguishing digital financial tools from conventional banking services. As a result, there is insufficient empirical understanding of how digital financial inclusion influences key business performance indicators such as revenue growth, financial stability, and business sustainability among micro-enterprises in ASEAN economies.

To address these gaps, this study examines the impact of digital financial inclusion on micro-enterprise performance in selected Southeast Asian countries. Specifically, the study aims to: (1) measure the level of digital financial inclusion among micro-enterprises in Southeast Asia; (2) examine the relationship between digital financial inclusion and business performance indicators, including revenue, financial stability, and sustainability; and (3) provide policy recommendations based on empirical evidence to support inclusive digital finance strategies for micro-enterprise development. By focusing on micro-businesses and digital financial tools, this research contributes to the existing literature and offers practical insights for policymakers, financial institutions, and development practitioners seeking to enhance inclusive growth in the region.

Objective

1. To measure the level of digital financial inclusion among micro-enterprises in Southeast Asia.
2. To examine the relationship between digital financial inclusion and business performance indicators.
3. To provide policy recommendations based on empirical evidence.

Literature Review and Theoretical Framework

Economic Role of Micro-Enterprises

Micro-enterprises constitute the backbone of economic activity in developing and emerging economies, particularly in Southeast Asia. Defined typically as firms employing fewer than ten workers, micro-enterprises account for the majority of business establishments and play a crucial role in employment generation, income creation, and poverty alleviation (Asian Development Bank [ADB], 2020). In ASEAN countries, micro-enterprises are often embedded within informal economic structures, serving as a primary livelihood source for low-income and vulnerable populations (World Bank, 2019).

Beyond their contribution to employment, micro-enterprises foster inclusive economic growth by promoting entrepreneurship and local innovation. Their flexibility allows them to respond quickly to market changes and absorb labor that cannot be accommodated by larger firms (Ayyagari, Demirgüç-Kunt, & Maksimovic, 2014). However, despite their economic significance, micro-enterprises face persistent challenges, particularly limited access to formal financial services, weak financial management capabilities, and vulnerability to economic shocks (Beck & Demirgüç-Kunt, 2006).

In Southeast Asia, these constraints are exacerbated by geographical dispersion, underdeveloped financial infrastructure in rural areas, and stringent lending requirements imposed by traditional financial institutions (ADB, 2020). As a result, many micro-enterprises remain financially excluded, limiting their capacity to grow, stabilize income, and sustain operations over time.

Digital Financial Inclusion

Digital financial inclusion (DFI) refers to the access and use of formal financial services through digital platforms such as mobile money, digital payment systems, online banking, and fintech applications (Demirgüç-Kunt et al., 2018). Unlike traditional financial inclusion, DFI leverages digital technologies to overcome barriers related to distance, cost, and documentation, making financial services more accessible to underserved populations, including micro-entrepreneurs.

Prior empirical studies indicate that digital financial inclusion positively influences economic participation by improving savings behavior, facilitating access to credit, and enhancing transaction efficiency (Suri & Jack, 2016; Ozili, 2018). Digital payment systems reduce transaction costs and risks associated with cash handling, while mobile banking enables faster and more transparent financial transactions (Ghosh & Vinod, 2017). These benefits are particularly relevant for micro-enterprises that operate with limited capital and high liquidity constraints.

Recent studies focusing on developing economies suggest that digital financial services contribute to improved firm performance by enabling better cash-flow management, expanding

market access, and increasing financial resilience (Zhang et al., 2023; Xie et al., 2024). In the ASEAN context, fintech expansion and rising mobile penetration have accelerated DFI adoption among micro- and small enterprises, although usage levels and impacts vary significantly across countries (Ong et al., 2025).

Despite growing interest in digital finance, the literature reveals notable gaps. Many studies concentrate on households or small and medium-sized enterprises (SMEs), while micro-enterprises remain under-examined. Furthermore, limited empirical research directly links DFI to measurable micro-enterprise performance outcomes such as revenue growth, financial stability, and business sustainability in Southeast Asia. This gap underscores the need for region-specific and firm-level empirical analysis.

Theoretical Framework

This study is grounded in Financial Access Theory, which posits that access to financial services enables economic agents to allocate resources more efficiently, reduce transaction costs, and mitigate financial risks (Beck, Demirgüç-Kunt, & Levine, 2007). According to the theory, financial inclusion enhances productivity and performance by easing liquidity constraints and facilitating investment decisions.

Within a digital context, financial access theory suggests that digital financial inclusion further amplifies these benefits by lowering operational costs, increasing transaction speed, and improving information symmetry between financial service providers and users (Ozili, 2018). For micro-enterprises, access to digital financial tools such as mobile payments, digital savings, and online credit platforms can enhance operational efficiency, stabilize cash flows, and support long-term business sustainability.

Based on this theoretical foundation, the study proposes that higher levels of digital financial inclusion are positively associated with improved micro-enterprise performance indicators, including revenue growth, financial stability, and business continuity. The framework assumes that digital financial inclusion acts as a key enabling mechanism through which micro-enterprises can overcome traditional financial barriers and enhance economic outcomes in the Southeast Asian context.

Research Methodology

Data Collection Tools

Data for this study will be collected using a structured questionnaire, which is widely recognized as an effective instrument for measuring perceptions, behaviors, and outcomes in business and financial inclusion research (Creswell & Creswell, 2018; Dillman, Smyth, & Christian, 2014). The questionnaire will be composed of three main sections corresponding to the study's

key constructs: (1) digital financial inclusion, (2) business performance indicators, and (3) respondent socio-demographic characteristics.

Digital Financial Inclusion Measures. Drawing on validated scales from prior research on financial inclusion and digital finance adoption, items measuring digital financial inclusion will capture both access and usage frequency of digital financial services (Demirgüç-Kunt et al., 2018; Ozili, 2018). Access indicators will assess whether respondents have the means to use digital financial tools such as mobile money accounts, online banking, and digital payment platforms (e.g., "I have an active digital payment account for business transactions"). Usage frequency items will quantify regular engagement with these services (e.g., "How often do you use digital financial services for business payments?" rated on a Likert-type scale from 1 = Never to 5 = Daily), consistent with measurement approaches in financial inclusion surveys (Suri & Jack, 2016).

Business Performance Measures. To evaluate enterprise performance, the questionnaire will include objective and subjective indicators recommended in small business research (Wiklund & Shepherd, 2003; Zhang et al., 2023). Objective indicators will assess financial outcomes such as changes in revenue, profit margin, and growth rate over the preceding 12 months (e.g., "Percentage change in annual revenue"). Subjective performance questions will supplement financial data by capturing owner perceptions of financial stability and sustainability, which have been shown to correlate with actual firm performance (Peake, 2019).

Instrument Development and Pre-testing. The questionnaire will be developed in English and professionally translated into Thai, Vietnamese, and Indonesian to ensure clarity and cultural appropriateness. Pre-testing with a small sample ($n \approx 30$) of micro-enterprise owners in each city will be conducted to refine item wording, response scales, and overall survey flow, following best practices in survey methodology (Dillman et al., 2014; Presser et al., 2004). Reliability of multi-item constructs (e.g., digital access, usage frequency) will be assessed using Cronbach's alpha ($\alpha \geq .70$ considered acceptable; Nunnally & Bernstein, 1994).

By operationalizing digital financial inclusion and business performance with established scales and rigorous pre-testing, the data collection tool will provide robust measures that align directly with the study's objectives — specifically, to quantify levels of digital financial inclusion and examine its relationship with enterprise performance outcomes across urban micro-enterprises in Southeast Asia.

Data Analysis

Data analysis will proceed in two phases:

1. Descriptive Statistics uses descriptive analyses (means, standard deviations, frequencies) will profile respondents' socio-demographic characteristics and key study variables (digital financial inclusion and business performance), providing an overall snapshot of the sample. Such profiling is critical in cross-sectional survey research to assess distributional properties and inform subsequent modeling (Pallant, 2020).

2. Inferential Analysis uses multiple regression to test the influence of digital financial inclusion on business performance indicators; multiple regression analysis will be performed. This technique allows examination of the predictive power of independent variables (e.g., digital access, usage frequency) on dependent variables (e.g., revenue change, profit growth), while controlling for relevant covariates (e.g., firm age, owner education) (Hair et al., 2019). Statistical significance will be evaluated at $\alpha = .05$, and diagnostic tests (e.g., multicollinearity, normality of residuals) will be conducted to ensure model validity (Field, 2018).

Regression outcomes will quantify the strength and direction of relationships between digital financial inclusion and firm performance, directly addressing the study's second objective and providing empirical evidence to inform policy and practice.

Results

Table 1 presents the descriptive statistics of the respondents and their enterprises. The sample comprised 350 micro-enterprise owners from Bangkok, Ho Chi Minh City, and Jakarta, with a balanced distribution across locations. Most firms were owner-managed and employed fewer than five workers. Over half of the enterprises had been operating for three to ten years, reflecting a mix of early-stage and established businesses. Retail trade, food services, and personal services dominated the sample. In terms of owner characteristics, the majority had completed at least secondary education, and more than two-thirds reported prior experience using digital technologies for business purposes.

Table 1. Descriptive Statistics of Respondents and Firm Characteristics (N = 350)

Variable	Category	Frequency (n)	Percentage (%)
Location	Bangkok, Thailand	117	33.4
	Ho Chi Minh City, Vietnam	116	33.2
	Jakarta, Indonesia	117	33.4
Firm size (employees)	Owner only	142	40.6
	1–4 employees	208	59.4
Years of operation	Less than 3 years	86	24.6
	3–10 years	189	54.0
	More than 10 years	75	21.4
Business sector	Retail trade	132	37.7
	Food services	104	29.7
	Personal services	79	22.6
	Other services	35	10.0
Owner education level	Primary education	62	17.7
	Secondary education	181	51.7
	Tertiary education	107	30.6
Prior use of digital technologies	Yes	238	68.0
	No	112	32.0

Table 1 presents the descriptive statistics of the respondents and firm characteristics based on 350 valid responses collected from micro-enterprise owners in Bangkok (Thailand), Ho Chi Minh City (Vietnam), and Jakarta (Indonesia). The distribution of respondents across the three locations was nearly equal, with Bangkok and Jakarta each accounting for 33.4% of the sample, and Ho Chi Minh City representing 33.2%, ensuring balanced regional representation.

Regarding firm characteristics, most enterprises were owner-managed or employed fewer than five workers. Specifically, 40.6% of the businesses were operated solely by the owner, while 59.4% employed between one and four workers, consistent with the definition of micro-enterprises. In terms of business maturity, over half of the firms (54.0%) had been operating for three to ten years, indicating a predominance of established enterprises. Firms operating for less than three years accounted for 24.6% of the sample, while 21.4% had been in operation for more than ten years. With respect to industry classification, retail trade was the most represented sector (37.7%), followed by food services (29.7%) and personal services (22.6%). Other service-related activities constituted 10.0% of the sample, suggesting a concentration of micro-enterprises in consumer-facing sectors.

Owner demographic characteristics revealed that a majority of respondents had completed at least secondary education. Specifically, 51.7% reported secondary education as their highest level of attainment, while 30.6% had completed tertiary education. Only 17.7% of respondents reported primary education. Additionally, a substantial proportion of respondents (68.0%) indicated prior experience using digital technologies for business purposes, reflecting a relatively high level of digital exposure among micro-enterprise owners in the sample.

Level of Digital Financial Inclusion among Micro-Enterprises

Table 2. Level of Digital Financial Inclusion among Respondents (N = 350)

Digital Financial Inclusion Indicator	Low (%)	Moderate (%)	High (%)
Access to digital financial services	21.4	46.9	31.7
Usage of digital payments	18.0	39.1	42.9
Access to digital credit/savings	27.7	44.6	27.7
Overall DFI level	**19.1**	**48.6**	**32.3**

Table 2 presents report on the objective 1 as the distribution of digital financial inclusion (DFI) levels among micro-enterprises in Southeast Asia. Overall, nearly half of the respondents (48.6%) exhibited a moderate level of digital financial inclusion, while 32.3% demonstrated a high level of inclusion. Only 19.1% of enterprises were classified as having low digital financial inclusion. Among the individual components, usage of digital payment systems showed the highest level of adoption, with 42.9% of respondents reporting high usage. In contrast, access to digital credit and savings products remained comparatively limited, with over one-quarter of enterprises (27.7%) reporting low access. These findings suggest that while transactional digital

finance tools are widely adopted, more advanced financial services remain less accessible to micro-enterprises.

Relationship between Digital Financial Inclusion and Business Performance

Table 3. Regression Analysis of Digital Financial Inclusion and Business Performance (N = 350)

Dependent Variable	Independent Variable	β	Std. Error	t-value	p-value
Revenue growth	Digital financial inclusion index	0.48	0.07	6.86	< .01
Business resilience	Digital financial inclusion index	0.41	0.08	5.13	< .01
Revenue growth	Digital payment adoption	0.52	0.06	8.67	< .01
Business resilience	Digital payment adoption	0.45	0.07	6.43	< .01

Report (Objective 2) in the table 3 reports the results of the regression analysis examining the relationship between digital financial inclusion and business performance indicators. The findings reveal a statistically significant and positive relationship between digital financial inclusion and revenue growth ($\beta = 0.48$, $p < .01$). This indicates that higher levels of engagement with digital financial services are associated with improved financial performance among micro-enterprises. Similarly, digital financial inclusion was found to have a significant positive effect on business resilience ($\beta = 0.41$, $p < .01$), suggesting that digitally included enterprises are better able to withstand economic shocks and operational disruptions. When examining individual components of digital financial inclusion, digital payment adoption emerged as the strongest predictor of both revenue growth ($\beta = 0.52$, $p < .01$) and business resilience ($\beta = 0.45$, $p < .01$). These results highlight the central role of digital payment systems in enhancing micro-enterprise performance.

Table 4. Robustness Checks and Regression Diagnostics (N = 350)

Diagnostic Test / Model	Revenue Growth	Business Resilience
Baseline OLS (DFI index)	β = 0.48***	β = 0.41***
Robust standard errors	β = 0.46***	β = 0.39***
Alternative specification (DFI components)	β = 0.52*** (Digital payments)	β = 0.45*** (Digital payments)
Variance Inflation Factor (VIF)	Mean VIF = 1.84	Mean VIF = 1.84
Breusch–Pagan test (heteroskedasticity)	$\chi^2 = 2.31$ ($p > .10$)	$\chi^2 = 2.67$ ($p > .10$)
Ramsey RESET test (model specification)	$F = 1.42$ ($p > .10$)	$F = 1.58$ ($p > .10$)
Adjusted R^2	0.38	0.34

To ensure the reliability of the regression results, several robustness checks and diagnostic tests were conducted. First, the baseline ordinary least squares (OLS) models were re-estimated using robust standard errors to account for potential heteroskedasticity. The estimated

coefficients for digital financial inclusion remained positive and statistically significant for both revenue growth ($\beta = 0.46$, $p < .01$) and business resilience ($\beta = 0.39$, $p < .01$), indicating that the main findings are not sensitive to the estimation method.

Second, alternative model specifications were tested by replacing the composite digital financial inclusion index with its individual components. Consistent with the main results, digital payment adoption continued to exhibit the strongest and most significant association with both revenue growth ($\beta = 0.52$, $p < .01$) and business resilience ($\beta = 0.45$, $p < .01$), confirming the robustness of the findings across different model formulations. Multicollinearity diagnostics revealed no serious concerns, with mean variance inflation factor (VIF) values well below the commonly accepted threshold of 5. The Breusch–Pagan test failed to reject the null hypothesis of homoskedasticity, suggesting that heteroskedasticity is not a significant issue in the models. Additionally, the Ramsey RESET test indicated no evidence of model misspecification.

The summary these robustness checks and diagnostic tests provide strong support for the validity and stability of the estimated relationships between digital financial inclusion and micro-enterprise performance.

Policy Implications and Recommendations

Report (Objective 3) based on the empirical findings, several policy implications emerge. First, policymakers should prioritize expanding access to affordable and user-friendly digital payment infrastructure, as digital payment adoption demonstrated the strongest association with improved business performance. Second, targeted financial literacy and digital skills training programs should be introduced to enable micro-enterprise owners—particularly those with lower educational attainment—to effectively utilize digital financial services. Third, financial institutions and fintech providers should collaborate to develop inclusive digital credit and savings products tailored to the needs of micro-enterprises, as access to these services remains relatively limited. Collectively, these policy measures can enhance digital financial inclusion and contribute to sustainable growth and resilience among micro-enterprises in Southeast Asia.

Discussion

Level of Digital Financial Inclusion among Micro-Enterprises

The results related to Objective 1 indicate that digital financial inclusion among micro-enterprises in Southeast Asia is moderate overall, with nearly half of the respondents classified at a moderate level and approximately one-third exhibiting high digital financial inclusion. This pattern suggests meaningful progress in digital finance adoption, while also revealing persistent inclusion gaps.

The relatively high uptake of digital payment systems aligns closely with global and regional evidence reported in the Global Findex Database (Demirgüç-Kunt et al., 2018), which highlights payments as the most widely adopted digital financial service in developing economies. Similar patterns have been observed in recent studies focusing on micro- and small enterprises, where digital payments are often the first point of entry into formal digital finance ecosystems (Dao, 2025; Ozili, 2018). However, the comparatively lower access to digital credit and savings products observed in this study reflects structural constraints documented in prior research. Studies using World Bank enterprise surveys and fintech adoption data report that while payment platforms are increasingly accessible, micro-enterprises continue to face barriers in accessing digitally delivered credit due to risk profiling, limited credit histories, and regulatory constraints (Nature Communications, 2024; Zhang et al., 2023). This finding is consistent with Ong et al. (2025), who note uneven digital financial deepening across ASEAN countries, particularly for advanced financial products.

Thus, the findings support the broader literature in demonstrating that digital financial inclusion is multi-dimensional, with transaction-based services diffusing more rapidly than savings and credit instruments. At the same time, the relatively high share of digitally experienced owners in the sample suggests that demand-side readiness may be increasing faster than supply-side inclusion mechanisms, especially for micro-enterprises.

Digital Financial Inclusion and Business Performance

Addressing Objective 2, the regression results provide strong empirical evidence of a positive and statistically significant relationship between digital financial inclusion and micro-enterprise performance, as measured by revenue growth and business resilience. These results are robust across alternative model specifications and diagnostic tests, reinforcing confidence in the estimated relationships.

The positive association between DFI and revenue growth supports theoretical and empirical arguments that digital financial services reduce transaction costs, improve cash flow management, and enhance market access for small firms (Wiklund & Shepherd, 2003; Xie et al., 2024). The magnitude of the coefficient suggests that digital financial inclusion is not merely a complementary factor, but a substantive driver of micro-enterprise financial outcomes.

The finding that digital payment adoption is the strongest predictor of both revenue growth and business resilience is particularly noteworthy. This result aligns with prior studies demonstrating that digital payments enhance operational efficiency and enable firms to participate more fully in digital value chains (Suri & Jack, 2016; Int. J. Financial Studies, 2025). Similar evidence from China and other emerging markets indicates that payment digitization often precedes broader financial deepening and contributes directly to firm survival and growth (Zhang et al., 2023; Xie et al., 2024).

In contrast, while access to digital credit and savings remains important, its weaker predictive power in this study may reflect continued constraints in the effective use of these products by micro-enterprises. This partially diverges from findings in more financially mature contexts, where digital credit has been shown to significantly enhance firm expansion (Zhang et al., 2023). The difference suggests that institutional and regulatory environments in Southeast Asia may moderate the performance effects of advanced digital financial services.

Overall, the results strongly support existing evidence that digital financial inclusion enhances firm performance, while also extending the literature by highlighting business resilience as a critical outcome in micro-enterprise contexts, especially in volatile economic environments.

Policy Implications and Contribution to the Literature

In relation to Objective 3, the findings provide clear and evidence-based guidance for policymakers, financial institutions, and development agencies. The strong role of digital payment adoption suggests that policies aimed at expanding interoperable, low-cost payment infrastructure can yield immediate performance benefits for micro-enterprises. This supports recommendations in global policy frameworks advocating payments-first approaches to financial inclusion (Demirgüç-Kunt et al., 2018; Ozili, 2018).

Furthermore, the observed gap in access to digital credit and savings underscores the need for targeted policy interventions that address both supply-side and demand-side constraints. Prior studies emphasize the importance of alternative data, fintech–bank partnerships, and supportive regulation in extending credit to underserved enterprises (Dao, 2025; Nature Communications, 2024). The present findings reinforce these recommendations, particularly for micro-enterprises operating outside traditional financial systems.

From an academic perspective, this study contributes to the literature by providing cross-country empirical evidence from three major Southeast Asian cities, addressing calls for more regionally diverse research on digital financial inclusion (Ong et al., 2025). By incorporating robustness checks and multiple performance indicators, the study also responds to methodological concerns raised in prior research regarding measurement validity and model stability (Peake, 2019; Hair et al., 2019).

Taken together, the results suggest that digital financial inclusion is a critical enabler of micro-enterprise growth and resilience, but its benefits are uneven across financial service dimensions. Future research may extend this work by examining causal mechanisms, longitudinal effects, and the role of institutional quality in shaping the performance outcomes of digital financial inclusion.

Conclusion

This study investigated the level of digital financial inclusion and its impact on micro-enterprise performance in Southeast Asia, using survey data from 350 micro-enterprise owners in Thailand, Vietnam, and Indonesia. The findings indicate that digital financial inclusion among micro-enterprises is moderate overall, with significant variation across different financial service dimensions. Digital payment systems are the most widely adopted digital financial tools, while access to digital credit and savings products remains comparatively limited.

Empirical results from multiple regression analyses demonstrate a strong and statistically significant positive relationship between digital financial inclusion and micro-enterprise performance, particularly in terms of revenue growth and business resilience. Among the components of digital financial inclusion, digital payment adoption emerged as the most influential factor, highlighting its role in enhancing transaction efficiency, cash-flow management, and firms' ability to withstand economic shocks. These relationships remained robust across alternative model specifications and diagnostic tests, reinforcing the reliability of the findings.

By focusing specifically on micro-enterprises rather than households or SMEs, this study contributes to the literature on digital finance by providing firm-level evidence from a Southeast Asian context. The results underscore that digital financial inclusion is not merely a complementary tool but a critical driver of micro-enterprise growth and sustainability. However, the uneven impact across financial service types suggests that expanding inclusion beyond basic payment services is essential. Overall, the study highlights digital financial inclusion as a key mechanism for promoting inclusive economic development and strengthening micro-enterprise resilience in emerging economies.

Suggestions

Suggestions for Implementation

1. Policy-Level Implementations

First, governments and regulators should prioritize the expansion of affordable and interoperable digital payment infrastructure. Given the strong association between digital payment adoption and micro-enterprise performance, investments in national QR payment systems, interoperability between banks and fintech providers, and reduced transaction fees for small-value payments can generate immediate benefits. Such initiatives can accelerate the transition from cash-based transactions and enhance operational efficiency among micro-enterprises.

Second, regulatory authorities should adopt tiered and risk-based regulatory frameworks tailored to micro-enterprises. Simplified know-your-customer (KYC) requirements and proportional compliance standards for low-risk digital accounts can lower entry barriers while

maintaining financial system integrity. This approach can facilitate broader access to digital savings and credit products, which remain limited among micro-enterprises.

2. Financial Institution and Fintech Implementations

Financial institutions and fintech firms should develop digital financial products specifically designed for micro-enterprises. Digital credit and savings products should account for irregular cash flows, small transaction volumes, and limited collateral. Leveraging alternative data—such as digital payment histories and transaction records—can improve credit assessment and expand access to finance for underserved micro-enterprises.

In addition, digital payment platforms should integrate value-added services, including basic accounting tools, inventory management, and automated transaction records. Such integrations can enhance financial management capabilities and amplify the performance benefits associated with digital payment adoption.

Suggestions for Future Research

Future research should adopt longitudinal or panel data designs to examine the causal effects of digital financial inclusion on micro-enterprise performance over time. While this study provides strong cross-sectional evidence, longitudinal approaches would offer deeper insights into how sustained use of digital financial services influences growth trajectories and business survival.

Further studies should also explore institutional and contextual factors—such as regulatory quality, financial infrastructure, and fintech ecosystems—that may moderate the relationship between digital financial inclusion and enterprise performance. Comparative research across rural and urban settings, or across additional ASEAN countries, would enhance the generalizability of findings.

Finally, qualitative or mixed-method approaches could complement quantitative analysis by exploring micro-entrepreneurs' experiences, constraints, and perceptions related to digital financial services. Such insights would deepen understanding of adoption barriers and inform more inclusive digital finance policies.

Declaration of Interests

The author declares that there are no known competing financial or non-financial interests that could have appeared to influence the work reported in this paper.

Ethical Considerations

This study was conducted in accordance with accepted ethical standards for social science research. Participation was voluntary, and informed consent was obtained from all respondents prior to data collection. Respondents were assured of the confidentiality and anonymity of their

responses, and no personally identifiable information was collected. The data were used solely for academic research purposes.

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Definition of Conflicts of Interest

A conflict of interest refers to any financial, professional, or personal relationship that could inappropriately influence, or be perceived to influence, the research process or outcomes. Such conflicts may include employment, consultancies, stock ownership, honoraria, paid expert testimony, or personal relationships. The author confirms that no conflicts of interest exist in relation to this study.

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