Adoption of Digital Payment Systems and its Effect on Financial Efficiency of Micro Enterprises in Rural Areas

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ABSTRACT

The increasing penetration of digital technologies has prompted rural microenterprises to adopt digital payment systems to enhance financial management and operational efficiency. This study investigates the adoption of digital payment systems such as QRIS, e-wallets, and mobile banking and their effects on the financial efficiency of micro enterprises in rural areas. The research aims to understand how the transition from traditional cash-based transactions to digital platforms influences cost reduction, transaction speed, and financial record accuracy among rural entrepreneurs. Using a mixed-method approach, data were collected through surveys and interviews with microenterprise owners who have adopted digital payment systems. Quantitative findings reveal a significant positive correlation between the frequency of digital payment use and improvements in financial management efficiency, particularly in reducing operational costs and enhancing transaction traceability. Qualitative analysis further highlights that digital payment adoption encourages better budgeting behavior and business transparency. However, barriers such as limited digital literacy and unstable internet access remain key challenges in rural implementation. The article discusses these findings in the context of Indonesia's 2025 national agenda for digital economic transformation and provides policy implications for expanding inclusive digital finance in underserved regions.

Keywords*: Digital Economy, Digital Payment, Financial Efficiency, Microenterprise, QRIS, Rural Areas.*

INTRODUCTION

The rapid expansion of digital payment systems embodied by platforms such as Quick Response Code Indonesian Standard (QRIS), e-wallets, and mobile banking has reshaped transactional practices across Indonesia, including in rural microenterprises (Prawitasari et al., 2024). This shift is increasingly salient in 2025 as national policies explicitly support digital economic transformation, yet empirical understanding of how these payment technologies affect financial efficiency at the Micro, Small, and Medium Enterprises (MSMEs) level in rural contexts remains incomplete (Chen & Tran, 2025). Existing macro- and sectoral data indicate a steep rise in QRIS and e-wallet usage since 2021, suggesting potential gains for transaction speed, cost structure, and record-keeping; however, adoption remains uneven because of infrastructure and literacy gaps.

Scholarly responses to these shifts have been productive but fragmented. Cross-country and regional investigations identify technology acceptance factors, security and trust considerations, and organizational drivers of continuance use, while Indonesia-specific case studies document mixed impacts of QRIS and mobile wallets on sales, customer reach, and operational practices. Some micro-level studies report positive correlations between QRIS adoption and revenue/traceability, yet other localized surveys find no significant performance gains absent complementary capacities (training, connectivity,

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record systems). This mixed evidence highlights both the promise and conditionality of digital payment benefits for microenterprises (Hendrawan et al., 2023; Deng & Qian, 2024).

This topic matters for three interlinked reasons. First, microenterprises in rural areas are central to local livelihoods and resilience, and improvements in their financial efficiency can support inclusive growth. Second, digital payments influence key firm-level practices such as cash handling, billing, bookkeeping, and access to formal financial services, which in turn affect operational costs and managerial decision-making. Third, policy ambitions for a cash-lite economy require evidence of the actual effects of digital payment adoption in underserved areas. Recent systematic reviews and field studies indicate that fintech and cashless tools can enhance SMEs' financial management and inclusion while also revealing new challenges, including limited digital literacy, connectivity issues, and perceived costs, highlighting the need for focused research on rural microenterprises (Räisänen & Tuovinen, 2020; Sharma et al., 2023; Jha & Dangwal, 2025).

This article responds by examining how the adoption of QRIS, e-wallets, and similar digital payment tools affects the financial efficiency of microenterprises in rural areas, with attention to intermediary mechanisms (transaction cost reductions, improved record accuracy, speed of settlement) and contextual moderators (digital literacy, internet reliability, and firm routines). The study positions itself amid national policy momentum in 2025 and contributes empirically by focusing on rural microenterprise actors less frequently represented in existing fintech literature and analytically by unpacking pathways from payment adoption to measurable elements of financial efficiency. Methodologically, the paper employs a mixed-methods design: a structured survey to quantify associations between digital payment usage and indicators of financial efficiency (transaction costs, cash handling time, accuracy of records), complemented by semi-structured interviews that explore owner practices, perceived benefits, and barriers. The mixed approach allows triangulation testing statistical relationships while capturing explanatory detail about why and how effects emerge or fail to materialize in everyday business routines (Richards, 2025).

The research aims to narrow the empirical gap between broad digital finance promises and on-the-ground outcomes for rural MSMEs. The problem statement driving this inquiry is whether and under what conditions digital payment adoption translates into tangible financial efficiency gains for rural microenterprises, and what policy or practice interventions can strengthen positive outcomes. The article discusses empirical results with reference to recent literature and national policy goals, highlights managerial and infrastructural constraints observed in the field, and advances practical recommendations for policymakers, local financial institutions, and development practitioners aiming to scale inclusive digital finance. By connecting micro-level evidence with the 2025 digital transformation agenda, the study expects to provide actionable insights that inform training programs, connectivity investments, and incentive structures designed to make digital payments a tool for rural microenterprise resilience and efficiency.

LITERATURE REVIEW & HYPOTHESIS DEVELOPMENT

Digital Payment Systems and Financial Efficiency in Microenterprises

Digital payment systems are a transformative innovation in financial transactions, especially for micro and small enterprises. These systems include QRIS, e-wallets, internet banking, and mobile payment applications, which allow transactions to be faster, traceable, and more secure than traditional cash-based systems (Ward, 2012). The use of digital payment technology not only makes transactions easier but also supports financial transparency, which contributes to better financial efficiency (Alias et al., 2016; Calderon, 2025; Minarni, 2025). Financial efficiency refers to the ability of enterprises to reduce transaction costs, minimize manual errors, and improve cash flow management (Tirdasari & Dhewanto, 2012; Nasimiyu, 2023; Lovita et al., 2024; Kumar, 2025). In addition, digital payment systems help strengthen financial records, support better

budgeting, and provide useful data for managerial decision-making, which supports business sustainability.

Previous studies show that the adoption of cashless payments among microenterprises is mainly driven by perceived benefits, such as lower operational costs, better financial records, and improved customer satisfaction (Khotimah & Wibowo, 2021). However, the level of adoption depends on access to digital infrastructure, digital literacy, and trust in financial technology (Santoso & Putri, 2023; Islam & Khan, 2024; Adel, 2024; AbdulKareem & Oladimeji, 2024). Rural microenterprises face additional challenges, including limited connectivity, low awareness of digital financial tools, and resistance to changing long-standing cash-based practices (Aini et al., 2022). Several studies also report a positive relationship between digital payment adoption and business performance, such as higher sales, faster operations, and better cash management (Santoso & Rachmawati, 2020; Rahmawati & Putri, 2021). Alias et al. (2016) found that digital payment systems can reduce transaction costs by 15–30% while improving data accuracy and customer satisfaction. However, these benefits strongly depend on supporting conditions such as internet access, user skills, and system reliability (Common, 2017; Hussain et al., 2025).

H1: Digital payment adoption has a positive effect on financial efficiency.

Digitalization and Microenterprise Performance

The main theoretical frameworks used in digital payment research are the Technology Acceptance Model (TAM) and the diffusion of innovation theory. According to Davis (1989), technology adoption is influenced by perceived usefulness and ease of use. In microenterprises, digital payment adoption is affected by factors such as simple interfaces, transaction reliability, and compatibility with existing business processes (Alias et al., 2016; Chopra & Ranjani, 2020; Timur et al., 2025). Diffusion of Innovation Theory explains that technology spreads through social networks, where the observed benefits experienced by early adopters influence later users (Rogers, 2003; Cheng, 2022; Yang et al., 2023). This highlights the importance of social influence, peer learning, and community examples in encouraging digital payment adoption, especially in rural areas. Studies in developing countries also show that trust, government incentives, training, and peer influence play important roles in accelerating adoption (Ward, 2012; Islam & Khan, 2024). In Indonesia, the QRIS initiative has been a key driver of standardized digital payment adoption among MSMEs and has helped strengthen financial inclusion (IDN Financials, 2024).

However, rural microenterprises remain an underserved group in digital transformation. Kusumawardani et al. (2023) found that rural entrepreneurs often see digital payments as complex and risky due to low digital literacy and limited access to formal financial services. These problems are worsened by poor infrastructure and limited access to digital devices. Institutional studies by the World Bank (2024) and IDN Financials (2024) emphasize the need for inclusive digital ecosystems that provide not only technology but also education, training, and infrastructure support. Evidence from Malaysia, India, and Indonesia shows that digital payments can improve financial efficiency in rural areas by reducing transaction time and improving financial records (Ward, 2012; Gurendrawati et al., 2024). However, these benefits are not evenly distributed and still require coordinated policy interventions (Younus & Zaenuri, 2024).

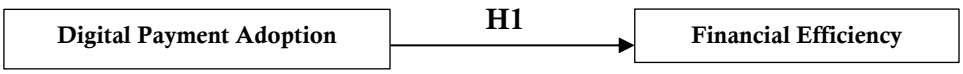

Figure 1. Research Framework

Figure 1 shows that digital payment adoption has a direct impact on financial efficiency, which means that the higher the adoption of digital payments, the better the financial efficiency of micro-enterprises.

RESEARCH METHODS

This study adopts a mixed-method approach that combines quantitative and qualitative techniques to obtain a comprehensive understanding of how digital payment adoption, particularly QRIS, e-wallets, and mobile banking, affects the financial efficiency of microenterprises in rural areas (Östlund et al., 2011). The integration of both methods aims to ensure validity through data triangulation and to strengthen the explanatory power of the findings (Sugiyono, 2019). The target population of this research consists of microenterprise owners operating in rural districts of Hulu Sungai Utara, South Kalimantan, Indonesia, who have implemented or are in the process of adopting digital payment systems. The study focuses on microenterprises in the culinary, retail, and service sectors, which represent the most active users of cash and small-scale digital transactions in the region.

A purposive sampling technique was used to select respondents with experience using at least one digital payment method (QRIS, GoPay, OVO, DANA, or ShopeePay). The survey included 100 microenterprise owners, while 10 key informants were interviewed in-depth to capture behavioral changes, challenges, and perceptions of digital payment adoption. The unit of analysis was the individual microenterprise, defined in Indonesia as a business with total assets below IDR 50 million or annual turnover under IDR 300 million. Respondents were mostly 25–45 years old, with 3–10 years of business experience, and approximately 60% were female, reflecting the growing role of women in rural microeconomic activities.

Data were collected in two complementary stages: surveys and semi-structured interviews. The survey employed a structured questionnaire to capture quantitative indicators such as frequency and intensity of digital payment use, cost and time efficiency, financial record management, and perceived business improvements, and was distributed both offline and online to ensure accessibility. Semi-structured interviews were conducted face-to-face with selected microenterprise owners and local digital payment agents to explore attitudes, adoption barriers, and operational impacts, with sessions lasting 30–45 minutes and recorded with participants' consent. Prior to full deployment, a pilot test with 10 respondents was conducted to refine question wording and enhance data clarity and reliability.

To operationalize the study variables, both objective and perceptual measures were employed. Digital payment adoption was measured by indicators such as the type of digital payment used, duration of use, transaction frequency, and the proportion of total business transactions conducted digitally. Financial efficiency was assessed across three dimensions: cost efficiency, reflected in reductions in cash handling and administrative expenses; time efficiency, indicated by faster transaction processing and settlement; and record accuracy, measured through improvements in bookkeeping and financial flow tracking. Respondents rated each indicator on a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree), and reliability was confirmed with Cronbach's Alpha coefficients above 0.70 for all constructs. Interview data were analyzed thematically to identify recurring themes such as perceived benefits, usability, and adoption barriers, with triangulation between surveys and interviews enhancing validity.

RESULTS

This section presents the statistical and descriptive findings derived from both the quantitative survey and qualitative interviews, offering a comprehensive understanding of digital payment adoption among rural microenterprises. The results provide an empirical overview of how the use of digital payment systems influences financial efficiency, including cost management, transaction speed, and accuracy of financial records. The analysis is structured into three main parts: (1) descriptive statistics outlining respondents' demographic profiles, business characteristics, and digital payment usage patterns; (2) inferential analysis examining the strength and significance of the relationship between digital payment adoption and financial efficiency; and (3) qualitative findings from interviews, which contextualize the statistical results by exploring behavioral changes,

adoption barriers, and perceived benefits from the perspective of microenterprise owners. Together, these sections offer a holistic view of both the measurable and experiential impacts of digital payments on rural microenterprise operations.

Table 1. Respondents' Characteristics

Category	Description	Frequency	Percentage (%)
Gender	Male	40	40
	Female	60	60
Age	18–25 years	10	10
	26–35 years	45	45
	36–45 years	30	30
	>45 years	15	15
Business Sector	Culinary	45	45
	Retail	35	35
	Services	20	20
Type of Digital Payment Used	QRIS	75	75
	E-Wallets	65	65
	Mobile Banking	40	40

Table 1 shows the demographic profile of respondents, which shows that the majority of microenterprise owners are female (60%), aged between 25 and 45 years, and predominantly engaged in the culinary (45%) and retail (35%) sectors. Most respondents have operated their businesses for more than five years, and 80% have adopted at least one form of digital payment system, mainly QRIS and e-wallets (GoPay, DANA, or ShopeePay). The majority of respondents (68%) reported using digital payments for more than one year, and 72% indicated that digital payment transactions now account for more than 50% of their total business sales. This finding suggests a significant behavioral shift toward digital financial management among rural microenterprises.

Table 2. Descriptive Statistics

Variable	Indicator	Mean	Std. Dev
Digital Payment Adoption	DPA1	4.02	0.68
	DPA2	3.95	0.71
	DPA3	4.10	0.64
	DPA4	3.88	0.75
Financial Efficiency	FE1	3.92	0.70
	FE2	4.05	0.66
	FE3	3.98	0.69

Table 2 shows that all indicators in digital payment adoption and financial efficiency variables have average values above 3.8, indicating that respondents tend to agree with the implementation of digital payments and their impact on business financial efficiency. The relatively small standard deviation (<1) indicates that respondents' answers are quite homogeneous, thus, perceptions of both variables are relatively consistent across respondents.

Table 3. Outer Loading

Construct	Number of Indicators	Outer Loading Range
Digital Payment Adoption	4	0.769 – 0.834
Financial Efficiency	3	0.798 – 0.846

Table 3 shows that all indicators in the digital payment adoption and financial efficiency variables have outer loading values above 0.70, ranging from 0.769 to 0.834 and 0.798 to 0.846, respectively. This indicates that all indicators adequately reflect their constructs and meet convergent validity criteria.

Table 4. Validity and Reliability

Construct	Cronbach's Alpha	Composite Reliability	AVE
Digital Payment Adoption	0.82	0.88	0.64
Financial Efficiency	0.79	0.86	0.68

Based on Table 4, all constructs have Cronbach's Alpha and Composite Reliability values above 0.70, and AVE values above 0.50. This indicates that the digital payment adoption and financial efficiency variables have a good level of reliability and meet convergent validity criteria, making them suitable for use in structural model analysis.

Table 5. Digital Payment Adoption and Financial Efficiency

Statistic	Value	Interpretation
Correlation coefficient (r)	0.684	Strong positive relationship between digital payment adoption and financial efficiency ($p < 0.001$)
Coefficient of determination (R^2)	0.468	46.8% of the variance in financial efficiency is explained by digital payment adoption
Regression coefficient (β)	0.612	Each unit increase in digital payment adoption significantly improves financial efficiency ($t = 9.871$, $p < 0.001$)

Pearson correlation and simple linear regression were used to examine the data in order to evaluate the hypothesis regarding the relationship between the adoption of digital payments and financial efficiency. Three dimensions were used to measure the dependent variable, financial efficiency: record accuracy, time efficiency, and cost efficiency. The hypothesis that microenterprises adopting digital payments achieve higher financial efficiency than those relying solely on cash-based transactions is supported by Table 2's correlation coefficient ($r = 0.684$, $p < 0.001$), which shows a strong and significant positive relationship between digital payment adoption and financial efficiency. Additionally, adoption of digital payments accounts for 46.8% of the variance ($R^2 = 0.468$) in financial efficiency outcomes, according to simple linear regression, with a regression value of $\beta = 0.612$ ($t = 9.871$, $p < 0.001$). This suggests that cheaper transaction costs, quicker payment processing, and more precise financial records are linked to increased use of digital payments.

Qualitative interviews provided rich insights that complement the quantitative findings, revealing how digital payment adoption affects operational and financial practices among rural microenterprises. Respondents generally expressed positive attitudes toward digital payment tools, emphasizing their contributions to business transparency, simplified bookkeeping, and improved financial control. Many participants noted that QRIS and other e-wallet platforms enable immediate payment confirmation, which not only reduces cash discrepancies but also strengthens trust between sellers and customers. Several respondents highlighted that the availability of digital transaction records facilitates more accurate budgeting, forecasting, and internal reporting, allowing business owners to make more informed managerial decisions.

Despite these benefits, respondents also reported several challenges. Unstable internet connectivity in rural areas often caused delays in processing transactions, and some participants admitted limited familiarity with advanced features of digital payment systems, such as automated transaction reports, analytics dashboards, and integration with inventory management. These practical obstacles reinforce the notion that digital literacy and infrastructural readiness remain critical determinants of successful adoption, a finding consistent with previous studies on rural financial transformation (Aini et al., 2022; Kusumawardani et al., 2023; Gallego-Losada et al., 2024; Mookerjee et al., 2025). Several interviewees also highlighted concerns about system trustworthiness, particularly regarding transaction errors and potential security risks, suggesting that building confidence in fintech platforms is essential to sustain long-term adoption.

From a theoretical perspective, these qualitative insights reinforce the TAM, which posits that perceived usefulness and perceived ease of use are key drivers of adoption behavior (Davis, 1989). Respondents' experiences illustrate that when digital payment

systems are perceived as practical and user-friendly, adoption rates increase, and users are more likely to integrate them into routine business operations. Furthermore, the findings support the Diffusion of Innovation Theory Rogers, (2003), as early adopters' success stories often influence peers and encourage wider uptake within rural communities. Social influence, demonstration effects, and word-of-mouth were repeatedly cited as factors motivating hesitant microentrepreneurs to experiment with cashless payment methods.

The qualitative findings also indicate a broader behavioral shift among rural microenterprises. Adoption of digital payments appears to foster a transition from informal, cash-dependent practices toward more systematic, traceable, and accountable financial management. Entrepreneurs reported increased confidence in reconciling daily transactions, reduced errors in bookkeeping, and improved transparency that supports both internal management and external reporting to financial institutions. These operational improvements align with Indonesia's national agenda for digital economic inclusion and corroborate prior empirical evidence that cashless systems enhance SMEs' efficiency, financial literacy, and overall competitiveness (Santoso & Rachmawati, 2020; Rahmawati & Putri, 2021).

The qualitative data suggest that while digital payment adoption provides tangible improvements in financial management and operational transparency, its success depends on supportive infrastructure, digital literacy, and social diffusion mechanisms. These findings highlight the need for targeted interventions, such as training programs, awareness campaigns, and improvements in connectivity, to ensure that the benefits of digital payments are fully realized among rural microenterprises. Moreover, the study underscores the interplay between individual perceptions, community influence, and institutional support in shaping the adoption and effective use of financial technology tools in rural settings.

DISCUSSION

The findings of this study indicate that rural microenterprise owners are predominantly female, aged between 25 and 45 years, and mostly engaged in the culinary and retail sectors. This demographic pattern reflects the growing role of women in rural entrepreneurship, as highlighted by Kusumawardani et al. (2023), and suggests that targeted interventions to support female-led microenterprises could further enhance digital financial inclusion. The high adoption rate of digital payment systems, particularly QRIS and e-wallets, indicates a significant behavioral shift towards digital financial management, consistent with trends observed in previous studies by Santoso and Rachmawati (2020) and Prawitasari et al. (2024). Quantitative analysis confirms a strong positive relationship between digital payment adoption and financial efficiency, with a correlation coefficient of 0.684 and regression results showing that adoption explains 46.8% of the variance in financial efficiency outcomes ($\beta = 0.612$, $p < 0.001$). These results support prior findings by Alias et al. (2016), Rahmawati and Putri (2021), and Calderon (2025), demonstrating that digital payment integration reduces transaction costs, accelerates payment processing, and improves financial record accuracy, thereby enhancing overall operational efficiency.

Complementary qualitative insights further illustrate the mechanisms underlying these improvements. Respondents generally perceive digital payment tools as contributing to greater business transparency, simplified bookkeeping, and enhanced customer trust, particularly due to features such as immediate payment confirmation provided by QRIS and e-wallets. These experiences are in line with the Technology Acceptance Model by Davis (1989), where perceived usefulness and ease of use drive adoption behavior, and with the Diffusion of Innovation Theory by Rogers (2003), which emphasizes the influence of early adopters in encouraging wider uptake within communities. However, several challenges persist, including unstable internet connectivity, limited familiarity with advanced features such as automated reports and analytics, and concerns over system trustworthiness, echoing observations by Aini et al. (2022), Kusumawardani et al.

(2023) and Gallego-Losada et al. (2024), and these constraints underscore the critical importance of digital literacy, infrastructure, and trust in sustaining adoption and maximizing financial efficiency gains among rural microenterprises.

The integration of quantitative and qualitative results highlights important implications for policy and practice. Efforts to expand rural digital finance must go beyond technology provision to include training programs, awareness campaigns, and connectivity improvements, aligning with recommendations from the World Bank (2024), IDN Financials (2024), and Younus and Zaenuri (2024). Adoption of digital payments not only improves measurable financial outcomes but also encourages a broader behavioral transformation from informal, cash-dependent operations toward more systematic, traceable, and accountable financial management. These findings emphasize that digital payment adoption can be a strategic tool to enhance resilience, managerial decision-making, and overall competitiveness among rural microenterprises, contributing directly to Indonesia's 2025 agenda for inclusive digital economic transformation while bridging the gap between national-level digital initiatives and the operational realities faced by rural business owners.

The findings confirm that digital payment adoption significantly enhances financial efficiency through reduced cash handling costs, faster transaction times, and improved financial transparency. Nevertheless, digital inequality in terms of infrastructure and literacy may reduce these potential benefits in more remote villages. The implication for policymakers is that digital transformation programs must be accompanied by capacity-building initiatives, such as digital literacy training and improved rural connectivity. For practitioners and financial institutions, the findings suggest opportunities to design customized financial solutions that align with rural business conditions, such as simplified QRIS onboarding and offline payment features. The study underscores that while digital payment adoption positively affects financial efficiency, its sustainability depends on continued technological support, inclusive education, and long-term institutional collaboration between government, banks, and local communities.

CONCLUSION

This study examined the impact of digital payment adoption, specifically QRIS, e-wallets, and mobile banking, on the financial efficiency of microenterprises operating in rural Indonesia. The findings reveal that the integration of digital payment systems significantly improves cost efficiency, transaction speed, and financial record accuracy, indicating a strong positive relationship between digitalization and business performance in rural contexts. The regression analysis confirmed that digital payment adoption explains nearly half of the variance in financial efficiency, while qualitative insights emphasized practical benefits such as reduced cash dependency and improved transparency in daily business operations.

The research contributes to the broader discourse on digital financial inclusion by demonstrating that rural MSMEs can experience measurable economic benefits from adopting digital payment systems when supported by adequate digital literacy and infrastructure. However, the study also recognizes its limitations. The research was conducted in a single rural region, and its findings may not be fully generalizable to other geographic or economic contexts. Additionally, the cross-sectional nature of the survey limits causal inference, and future research should employ longitudinal or experimental designs to capture dynamic changes in efficiency over time.

Potential biases might arise from self-reported data, which could overstate perceived efficiency improvements. Nonetheless, the use of mixed methods mitigated these risks by triangulating quantitative results with qualitative evidence. Future research is encouraged to explore additional variables such as financial literacy, trust in technology, and institutional support to deepen the understanding of how digital transformation affects the long-term sustainability of microenterprises. This study highlights that the successful adoption of digital payment systems depends not only on technology availability but also on human and institutional readiness. Continued collaboration among policymakers,

financial institutions, and community organizations will be crucial to ensure that digital finance contributes effectively to rural economic empowerment and national digital transformation goals by 2025.

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