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QRIS as a Solution for the Modernization of MSMEs: A Community Service Experience in Karang Rahayu Village

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Abstract

This study examines the implementation of QRIS as a digital payment solution for supporting the modernization of micro, small, and medium enterprises (MSMEs) through a community service program conducted in Karang Rahayu Village, Indonesia. The program employed a participatory empowerment approach involving university students, local community leaders, and MSME actors in identifying barriers to digital financial adoption and implementing context-sensitive technological assistance. Data were collected through participatory observation, informal interviews, transaction monitoring, and reflective discussions to evaluate changes in digital literacy, operational practices, and community perceptions regarding QRIS utilization. The findings indicate that QRIS adoption improved transaction efficiency, strengthened financial recording practices, increased customer payment flexibility, and enhanced the professional image of participating MSMEs. The implementation process also stimulated positive behavioral adaptation toward digital business practices through experiential mentoring and collaborative learning mechanisms. Nevertheless, sustainability challenges related to digital literacy limitations, infrastructural instability, and security concerns remained significant factors influencing long-term adoption consistency. The study highlights that successful rural digital transformation requires continuous participatory assistance integrating technological innovation with community-based empowerment strategies.

Keywords : *Digitalization, Community Empowerment, Financial Inclusion, MSMEs, QRIS.*

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INTRODUCTION

The acceleration of digital financial ecosystems across emerging economies has fundamentally reconfigured the operational logic of micro, small, and medium enterprises (MSMEs), particularly in relation to transactional efficiency, financial inclusion, and market accessibility. Within this transformation, interoperable payment infrastructures based on quick response technology have emerged as a strategic instrument for integrating informal economic actors into formal digital economies. Indonesia's Quick Response Code Indonesian Standard (QRIS), initiated under the national payment system framework, reflects a broader global transition toward cashless micro-commerce that aligns with the expansion of fintech-mediated economic participation and inclusive digital governance. Recent community-based implementations demonstrate that QRIS adoption no longer functions merely as a technical payment alternative, but increasingly operates as a socio-economic mechanism capable of reshaping consumption behavior, business legitimacy, and local economic resilience in rural areas (Ayoga et al., 2024). Similar observations were identified in village-based MSME empowerment programs where QRIS utilization enhanced transaction flexibility and stimulated merchant adaptation toward digital commerce ecosystems that had previously been inaccessible to small-scale entrepreneurs (Patikasari et al., 2025). Contemporary scholarship consequently positions QRIS not only within the discourse of financial technology innovation, but also within the wider debate concerning rural digital transformation, adaptive community economies, and sustainable MSME modernization in developing regions.

Existing studies consistently indicate that QRIS implementation contributes positively to operational simplification, transaction security, consumer convenience, and competitive business positioning among MSMEs operating in semi-urban and rural contexts. Research conducted in Probolinggo revealed that digital payment assistance programs enabled MSME actors to improve

transactional responsiveness while simultaneously strengthening customer trust in digital transactions (Siddiqi et al., 2025). Parallel findings emerging from community empowerment initiatives in Tangerang demonstrated that QRIS socialization programs significantly increased business productivity by reducing dependency on cash-based transactions and improving merchant adaptability toward digital consumption patterns (Azzahra et al., 2026). Investigations focusing on village-based digital economic empowerment also identified that QRIS adoption fostered broader economic participation among younger entrepreneurs and digitally literate consumers, thereby contributing to enhanced MSME competitiveness in increasingly technology-driven marketplaces (Rayhan et al., 2025). Other studies emphasized the strategic integration between business legality assistance and QRIS registration, suggesting that digital payment adoption often functions most effectively when accompanied by institutional strengthening and administrative formalization of MSMEs (Sunarno et al., 2024). The cumulative body of literature therefore demonstrates a relatively strong consensus that QRIS possesses multidimensional value extending beyond payment efficiency into domains of empowerment, financial traceability, and local economic modernization.

Despite these converging findings, the current literature remains fragmented in at least three critical dimensions that limit the theoretical maturation of QRIS-based community service scholarship. First, a substantial proportion of existing studies conceptualize QRIS implementation primarily as a technical intervention rather than as a socially negotiated process involving behavioral adaptation, technological trust, and uneven digital capability structures among rural economic actors. The predominance of outcome-oriented narratives has consequently marginalized deeper analysis regarding the socio-cultural resistance mechanisms that frequently shape the sustainability of digital payment adoption. Research addressing digital transaction security, for instance, acknowledges the existence of vulnerabilities related to fraud, data privacy, and technological misuse among MSMEs, yet rarely integrates these concerns into broader discussions concerning long-term digital inclusion sustainability (Yuliana, 2021). Second, many community service publications tend to emphasize short-term implementation success indicators—such as the number of registered merchants or increased transaction convenience—without critically evaluating whether such interventions generate durable transformations in business behavior, financial literacy, or institutional autonomy. Third, empirical investigations remain heavily concentrated on urban-adjacent communities with relatively favorable technological infrastructures, producing limited analytical understanding regarding how rural villages with heterogeneous digital capacities negotiate the transition toward cashless economic systems. This fragmentation has produced a conceptual gap between digital payment adoption as a technological phenomenon and QRIS implementation as a community empowerment process embedded within local socio-economic realities.

The unresolved dimensions within this body of scholarship carry substantial scientific and practical implications because MSMEs continue to function as the backbone of local economies while simultaneously remaining among the most vulnerable sectors in the face of accelerating digital economic restructuring. The persistence of low digital literacy, uneven infrastructure accessibility, and distrust toward non-cash transactions creates structural barriers that cannot be adequately addressed through merely procedural QRIS registration programs. Empirical evidence from village-based socialization initiatives indicates that many MSME actors initially perceive digital payments as administratively complicated and financially risky, particularly when technological assistance and post-implementation mentoring remain limited (Fajar et al., 2026). Comparable patterns were identified in studies examining digitally assisted productive zakat programs, where the effectiveness of QRIS integration depended not solely on technological availability but on the continuity of participatory empowerment mechanisms capable of fostering adaptive digital behavior among local economic actors (Siregar et al., 2025). These conditions reveal that the modernization of rural MSMEs requires a more comprehensive intervention model integrating digital literacy, institutional accompaniment, behavioral adaptation, and socio-economic trust-building. The absence of such integrative approaches risks reducing QRIS implementation into symbolic technological adoption lacking transformative impact on community-based economic resilience.

Within this intellectual landscape, the present study positions itself not merely as a descriptive account of QRIS implementation, but as a critical examination of how participatory community service mechanisms can function as catalysts for sustainable MSME digital transformation in rural contexts. Unlike prior studies that largely prioritize technological outcomes or administrative adoption metrics,

this research approaches QRIS implementation as a multidimensional empowerment process involving negotiation between digital infrastructure, community participation, behavioral adaptation, and local economic realities. The experience of community service activities conducted in Karang Rahayu Village provides an analytically significant setting because the village represents a transitional socio-economic environment in which conventional cash-based business culture coexists with increasing exposure to digital economic systems. The study consequently seeks to bridge the conceptual divide between fintech adoption literature and participatory rural empowerment frameworks by emphasizing the relational dynamics between technological innovation and community capacity-building. Such positioning enables the research to contribute to a more context-sensitive understanding of digital financial transformation among MSMEs operating outside metropolitan economic centers.

This study aims to examine how QRIS implementation within community service activities can facilitate the modernization of MSMEs in Karang Rahayu Village through participatory digital empowerment strategies that integrate technological assistance, practical mentoring, and adaptive business transformation. The research contributes theoretically by expanding the analytical framing of QRIS from a purely transactional technology into a socio-technical instrument of community-based economic modernization, while methodologically contributing an experiential and participatory model of MSME digitalization grounded in direct field engagement, collaborative implementation, and contextual evaluation of rural digital adaptation processes.

RESEARCH METHODS

The community service program was implemented in Karang Rahayu Village, particularly within Dusun III RW 05, targeting micro, small, and medium enterprise (MSME) actors operating predominantly in the culinary and small retail sectors who had not previously adopted digital payment systems. The program employed a participatory empowerment approach emphasizing collaborative engagement between university students, local community leaders, and MSME owners in identifying barriers to digital financial adoption and formulating context-sensitive intervention strategies. The implementation process was conducted through several sequential stages consisting of preliminary social mapping, needs assessment, community consultation forums, QRIS socialization sessions, technical registration assistance, and direct mentoring in the operational use of QRIS-based payment systems. During the implementation phase, participants received practical guidance concerning merchant account registration, QR code installation, transaction verification procedures, digital financial management, and customer communication strategies related to non-cash payment methods. This approach was designed not merely to facilitate technological adoption, but to strengthen the adaptive capacity of local MSMEs in responding to the broader transformation of the digital economy through experiential and community-based learning mechanisms.

Empirical evaluation data were collected through participatory observation, informal interviews, transaction monitoring, and reflective discussions conducted before, during, and after the implementation process. Data collection focused on assessing changes in digital literacy, participant readiness, operational transaction practices, and community perceptions regarding the usability and effectiveness of QRIS as a digital payment solution. The evaluation process utilized descriptive qualitative analysis supported by comparative field observations between pre-implementation and post-implementation conditions among participating MSMEs. Indicators of program success included the number of MSMEs successfully registered and actively using QRIS, increased participant understanding of digital financial systems, improved transaction efficiency, enhanced customer payment flexibility, and the emergence of positive behavioral adaptation toward digital business practices. Sustainability evaluation was also conducted by examining the willingness of participants to continue utilizing QRIS independently and by identifying the extent to which local community actors could disseminate digital payment knowledge within their surrounding business networks.

RESULTS AND DISCUSSION

Digital Literacy Transformation and Initial Adaptation of MSMEs Toward QRIS Utilization

The preliminary field observations conducted in Dusun III RW 05 demonstrated that most MSME actors had previously relied exclusively on cash-based transactions despite possessing basic access to smartphones and mobile internet services. Informal interviews revealed that digital payment systems were frequently perceived as administratively complex and financially insecure among small-scale

traders operating in culinary and household retail sectors. This condition reflects the broader pattern of technological hesitation commonly experienced by rural MSMEs during early digital transformation processes, particularly when digital literacy remains uneven across business actors (Hairani, 2024). Participatory mapping further indicated that the absence of direct mentoring mechanisms contributed significantly to the persistence of transactional conservatism within the local business ecosystem.

Community consultation sessions identified that MSME participants associated QRIS primarily with large urban businesses rather than with village-based micro-enterprises. Several respondents expressed uncertainty regarding transaction verification procedures and concerns over delayed fund disbursement into merchant accounts. Similar tendencies were documented in previous village-based QRIS assistance programs where psychological barriers and limited technological familiarity constrained the pace of digital adoption among local entrepreneurs (Fajar et al., 2026). The mentoring approach employed during the program consequently prioritized experiential demonstrations rather than purely instructional socialization in order to reduce technological resistance.

The implementation phase demonstrated a gradual shift in participant attitudes after practical simulations were integrated into the training sessions. MSME actors who initially rejected digital transactions began to perceive QRIS as an operational support instrument capable of simplifying customer payment processes. Observational findings indicated that the practical involvement of students during transaction demonstrations increased participant confidence in utilizing merchant applications independently. Comparable outcomes were identified in the digital mentoring model developed for MSMEs in Probolinggo, where direct operational assistance accelerated the adaptation process among first-time digital payment users (Siddiqi et al., 2025).

Field documentation conducted during the registration stage showed that most participants required repeated assistance in completing merchant verification procedures. Difficulties primarily emerged during account synchronization, transaction notification settings, and QR code activation processes. The empirical pattern suggests that digital infrastructure accessibility alone does not automatically guarantee effective technological adoption among village-based enterprises. Previous research concerning QRIS implementation in rural communities similarly emphasized that technological empowerment depends heavily on continuous accompaniment rather than singular administrative interventions (Sahla et al., 2025).

The comparative observation between pre-implementation and post-socialization conditions revealed a measurable increase in digital confidence among participating MSMEs. Participants increasingly demonstrated willingness to encourage customers to utilize QRIS after understanding the practical advantages associated with transaction efficiency and reduced cash-handling risks. This behavioral transformation aligns with the argument that financial technology adoption among micro-enterprises frequently evolves through repetitive social interaction and adaptive learning processes rather than through formal technological instruction alone (Sururie et al., 2019). The participatory framework employed within the program consequently functioned not merely as a technical dissemination mechanism but as a process of collective behavioral negotiation within the community.

The quantitative outcomes of the initial implementation process are presented in Table 1, which summarizes the participation level and QRIS activation status among MSME actors involved in the program. The data demonstrate that culinary businesses exhibited the highest level of participation due to their relatively frequent interaction with customers requiring practical payment alternatives. Small retail traders displayed slower adaptation patterns because transaction routines remained heavily dependent on conventional cash circulation. Similar adoption disparities between business sectors were previously identified in studies examining village-based digital payment acceleration programs among heterogeneous MSME communities (Derika et al., 2025).

Table 1. Initial QRIS Adoption Outcomes Among Participating MSMEs

Business Sector	Number of MSMEs	Successfully Registered	Actively Using QRIS
Culinary	3	3	3
Small Retail	2	2	1
Total	5	5	4

The findings presented in Table 1 indicate that successful registration rates were relatively high despite varying levels of active operational utilization among participants. One retail business owner continued prioritizing cash transactions because of uncertainty regarding transaction monitoring through the merchant application interface. This condition reflects the argument proposed by Sugiyanto (2021) that MSME digitalization frequently encounters transitional resistance during the operational integration stage rather than during initial registration phases. The discrepancy between registration and active utilization consequently illustrates the importance of post-implementation accompaniment within rural financial technology interventions.

Practical mentoring activities also revealed that peer interaction among MSME actors significantly influenced technological acceptance patterns within the village environment. Participants who observed neighboring businesses successfully processing QRIS payments demonstrated stronger motivation to adopt similar practices within their own operations. Social learning mechanisms of this nature have been widely associated with increased digital participation among community-based enterprises because technological legitimacy becomes collectively constructed through observable local experiences (Ayoga et al., 2024). The mentoring sessions therefore evolved into collaborative learning spaces rather than merely instructional workshops focused on procedural compliance.

Figure 1. QR Code Installation

Visual documentation captured during the QR code installation process illustrated the symbolic significance of QRIS visibility within MSME business spaces. The image labeled “Figure 1. QR Code Installation” should be placed in this paragraph because it represents the transition from conventional transaction practices toward digitally mediated customer interaction within local commercial settings. Several participants reported increased customer curiosity after QR codes became visibly displayed near cashier areas and storefront entrances. Similar observations were identified in community empowerment programs emphasizing the relationship between visible digital infrastructure and customer trust formation in rural MSME environments (Varina et al., 2025).

The broader analytical interpretation of these findings suggests that QRIS implementation in Karang Rahayu Village functioned simultaneously as a technological adaptation process and as a social transformation mechanism affecting transactional culture among MSMEs. The emergence of digital confidence among participants was shaped not exclusively by technological accessibility but by participatory engagement, repetitive operational practice, and community-level interaction patterns. Earlier studies concerning MSME digital transformation similarly argued that sustainable payment modernization depends on the integration between digital literacy reinforcement and localized empowerment strategies capable of addressing socio-cultural resistance toward technological change (Aini et al., 2025). The empirical trajectory observed throughout the implementation process

consequently reinforces the proposition that rural digital transformation requires relational and participatory intervention models rather than purely administrative digitalization policies.

Transaction Efficiency, Consumer Behavior, and the Expansion of Digital Payment Practices

The implementation of QRIS among MSMEs in Karang Rahayu Village generated observable changes in daily transaction patterns, particularly regarding transaction speed and payment flexibility during peak business hours. Participatory observations conducted after the operational activation phase indicated that merchants experienced shorter transaction cycles because customers no longer depended on cash availability or manual change calculations. Several culinary business owners acknowledged that QRIS transactions reduced interruptions commonly caused by insufficient cash denominations during crowded purchasing periods. This operational shift corresponds with the findings of Evangeulista (2023), who argued that digital payment systems significantly improve customer satisfaction by simplifying transactional interactions within micro-enterprise environments.

Consumer responses toward QRIS utilization reflected increasing acceptance of non-cash payment methods among local buyers, especially younger consumers familiar with mobile banking and electronic wallets. Informal interviews revealed that customers perceived QRIS-enabled businesses as more modern, practical, and trustworthy compared with merchants relying exclusively on cash-based transactions. The perceived convenience associated with contactless payments contributed to repeated purchasing behavior because consumers could complete transactions more efficiently without physical cash preparation. Similar behavioral tendencies were identified in studies examining MSME competitiveness within digital economic ecosystems where payment flexibility became an increasingly important determinant of customer preference formation (Annisa et al., 2024).

Field monitoring further demonstrated that QRIS implementation indirectly influenced merchant communication strategies and customer engagement practices within participating businesses. MSME actors gradually began encouraging customers to utilize digital payment options by displaying QR codes prominently near cashier areas and verbally informing consumers about cashless transaction availability. This communicative adaptation reflects a broader transformation in the commercial interaction model because merchants became active promoters of digital consumption behavior within their surrounding communities. Previous community-based QRIS empowerment programs similarly emphasized that merchant-led promotion plays a substantial role in accelerating local acceptance toward digital financial technologies (Rayhan et al., 2025).

The operational impact of QRIS became particularly visible during high-frequency purchasing periods in culinary businesses where transaction speed directly affected customer queue management. Participating merchants reported that QRIS transactions reduced delays associated with manual cash handling and minimized transactional disputes related to payment confirmation. This efficiency enhancement allowed business owners to focus more intensively on customer service and product preparation rather than on repetitive cash verification processes. Comparable observations were documented in digital transaction assistance programs where operational simplification contributed significantly to improving MSME productivity within community-based commercial sectors (Azzahra et al., 2026).

The integration of QRIS also contributed to improved financial recording practices among participating MSMEs because transaction histories became automatically documented within merchant applications. Prior to implementation, most participants relied on memory-based calculations or handwritten notes that frequently resulted in inconsistent financial tracking. The introduction of digital transaction records enabled business owners to monitor income patterns more systematically and identify periods of high consumer activity with greater accuracy. Similar findings were highlighted by Hadi (2020), who emphasized that QRIS functions not only as a payment instrument but also as a mechanism supporting transparent and traceable financial management among micro-enterprises.

Empirical monitoring regarding transaction frequency and consumer payment preferences is summarized in Table 2, which presents the comparative development of cashless transaction utilization after QRIS implementation. The data indicate that culinary MSMEs experienced the most substantial increase in digital transaction activity because of higher customer turnover and greater exposure to younger consumers accustomed to electronic payment systems. Small retail businesses exhibited slower transaction growth patterns, although merchants still reported increased customer interest toward QRIS availability. Earlier studies examining digital payment acceleration within traditional market

environments similarly documented uneven adoption intensity between business categories depending on customer demographics and transaction characteristics (Derika et al., 2025).

Table 2. Comparative Increase in QRIS-Based Transactions After Implementation

Business Sector	Average Daily Digital Transactions Before Program	Average Daily Digital Transactions After Program
Culinary	0–1 Transactions	8–12 Transactions
Small Retail	0 Transactions	3–5 Transactions

The transaction growth pattern illustrated in Table 2 demonstrates that QRIS adoption generated measurable operational transformation despite the relatively limited scale of participating MSMEs. Culinary businesses benefited more rapidly because digital payment systems aligned closely with consumer demand for fast and practical purchasing experiences during food transactions. Retail businesses required a longer adjustment period because consumers in these sectors remained partially dependent on habitual cash usage for low-value purchases. This variation reinforces the argument proposed by Patikasari et al. (2025) that QRIS implementation outcomes are strongly shaped by the interaction between consumer behavior patterns and sector-specific transaction dynamics within rural MSME ecosystems.

The practical significance of QRIS adoption also emerged through increased merchant confidence in interacting with digitally oriented consumers from outside the immediate village area. Several participants reported that customers traveling from nearby districts expressed greater willingness to purchase products from businesses already supporting digital payment systems. This phenomenon suggests that QRIS visibility contributed symbolically to the modernization image of local MSMEs and strengthened perceptions of business professionalism among external consumers. Research focusing on village economic digitalization similarly concluded that QRIS utilization enhances market accessibility by reducing transactional barriers between local enterprises and technologically adaptive consumers (Putri et al., 2025).

Figure 2. QRIS Registration Process

Visual evidence collected during the QRIS registration and activation process reinforced the relationship between institutional support and merchant confidence during technological adoption. The image labeled “Figure 2. QRIS Registration Process” should be positioned within this paragraph because it visually represents the collaborative interaction between facilitators and MSME actors during the administrative implementation stage. Participants frequently stated that direct assistance during account registration reduced anxiety regarding procedural errors and increased willingness to continue using the technology independently. Comparable findings were identified in studies examining QRIS-assisted business legality programs where mentoring intensity significantly influenced participant readiness toward sustained digital utilization (Sunarno et al., 2024).

The broader analytical implications of these findings indicate that QRIS implementation within village-based MSMEs extends beyond transactional modernization into the restructuring of commercial

interaction patterns and consumer engagement practices. The observed increase in transaction efficiency, customer satisfaction, and financial recording capacity reflects the emergence of adaptive economic behavior among previously cash-dependent enterprises. Earlier studies concerning rural digital payment empowerment similarly argued that sustainable modernization requires synchronization between technological accessibility, merchant confidence, and consumer behavioral adaptation within localized economic systems (Suwandi et al., 2026). The empirical experience in Karang Rahayu Village consequently illustrates that QRIS can operate as both a functional payment instrument and a catalyst for transforming the relational structure of community-based commerce.

Sustainability Challenges, Institutional Adaptation, and the Future Trajectory of Rural MSME Digitalization

The post-implementation evaluation phase revealed that the sustainability of QRIS utilization among MSMEs in Karang Rahayu Village depended not solely on technological functionality but also on the continuity of institutional accompaniment and adaptive learning processes within the community. Several participants demonstrated strong commitment toward maintaining digital payment practices because they had experienced direct operational benefits during the mentoring period. Other participants, however, still required periodic assistance when facing technical disruptions such as unstable internet connections, delayed transaction notifications, and application synchronization difficulties. Similar sustainability concerns were highlighted in studies examining rural MSME digital transformation where technological continuity remained vulnerable in communities with uneven digital literacy structures (Hairani, 2024).

The reflective discussions conducted after the implementation process indicated that digital adaptation among MSMEs remained highly dependent on interpersonal support networks and collective learning environments. Participants frequently relied on neighboring merchants or facilitators when encountering operational uncertainties during QRIS transactions. This relational dependence suggests that technological empowerment in rural contexts develops through socially embedded learning patterns rather than through individualized technological mastery alone. Previous investigations concerning village-based QRIS empowerment similarly emphasized that collaborative learning ecosystems strengthen long-term adoption capacity among MSME communities undergoing digital transition processes (Siregar et al., 2025).

Field observations also revealed that concerns regarding digital transaction security continued to influence merchant confidence despite increasing familiarity with QRIS operations. Some participants expressed apprehension related to potential fraud, transaction manipulation, or unauthorized payment confirmation because they possessed limited understanding of digital financial security protocols. The persistence of these concerns demonstrates that operational adoption does not automatically eliminate psychological insecurity surrounding electronic payment systems among first-time digital users. Research conducted by Yuliana (2021) similarly identified that trust formation in QRIS implementation is closely associated with users' perceptions of transactional safety and institutional reliability within digital financial ecosystems.

The sustainability trajectory of QRIS implementation was further shaped by infrastructural limitations affecting the operational consistency of digital payment systems in village environments. Merchants reported that unstable mobile internet connectivity occasionally disrupted transaction verification processes, particularly during periods of high network congestion. These interruptions sometimes caused temporary customer hesitation toward QRIS usage because payment confirmation required additional waiting time. Comparable infrastructural challenges were documented in studies examining digital payment implementation in semi-rural commercial sectors where technological reliability significantly influenced user retention and merchant confidence (Sugiyanto, 2021).

The participatory empowerment model employed during the program nevertheless contributed positively to strengthening local ownership of the digitalization process among MSME actors. Participants gradually developed the capacity to assist other merchants in understanding QRIS operational procedures, creating an informal peer-based dissemination mechanism within the community. This pattern reflects the emergence of localized technological agency because MSME actors transitioned from passive recipients of assistance into active contributors within the village digital ecosystem. Similar community-driven dissemination dynamics were identified in QRIS socialization

initiatives emphasizing participatory empowerment and collective technological adaptation among rural business groups (Ayoga et al., 2024).

The sustainability evaluation outcomes collected during the final monitoring stage are presented in Table 3, which summarizes the primary challenges and adaptive responses identified among participating MSMEs after the implementation period. The data demonstrate that digital literacy limitations and infrastructural instability remained the dominant constraints affecting long-term operational consistency. Participants nevertheless exhibited increasing adaptive behavior through peer consultation, repeated practice, and independent exploration of merchant application features. Earlier studies examining QRIS-based MSME mentoring programs similarly concluded that adaptive resilience emerges progressively through repetitive operational exposure rather than through short-term instructional intervention alone (Siddiqi et al., 2025).

Table 3. Post-Implementation Sustainability Challenges and Adaptive Responses

Identified Challenge	Observed Impact	Adaptive Response
Limited digital literacy	Difficulty operating merchant features	Peer mentoring and repeated practice
Internet instability	Delayed transaction verification	Alternative network usage
Security concerns	Hesitation toward digital payments	Facilitator consultation and guidance
Consumer unfamiliarity	Slower transaction processing	Merchant-led customer education

The findings presented in Table 3 illustrate that sustainability challenges were multidimensional and interconnected with both technological and socio-cultural factors within the village environment. Digital literacy deficits frequently intensified perceptions of insecurity because participants lacking operational confidence tended to interpret technical disruptions as indicators of system unreliability. Consumer unfamiliarity with QRIS also occasionally prolonged transaction durations because merchants were required to guide customers during scanning and payment verification procedures. Similar multidimensional barriers were identified in studies examining QRIS implementation within traditional commercial communities where sustainable adoption required simultaneous adaptation among merchants and consumers (Varina et al., 2025).

The long-term significance of the program became increasingly visible through the gradual normalization of digital payment discourse within local business interactions. MSME actors who initially rejected QRIS began discussing transaction applications, digital wallets, and online financial services more openly during community gatherings and commercial exchanges. This transformation suggests that the implementation process generated broader cultural exposure toward digital economic practices beyond the immediate operational use of QRIS itself. Research concerning MSME digital marketing and payment integration similarly emphasized that sustained exposure to digital systems contributes to expanding entrepreneurial perspectives regarding technological innovation and market participation (Aini et al., 2025).

The sustainability dimension of the program was also strengthened by the integration between QRIS adoption and broader community empowerment narratives emphasizing modernization and economic inclusivity. Participants increasingly perceived digital payment utilization not merely as an external technological trend but as a practical instrument capable of improving business competitiveness within evolving consumer markets. This perceptual shift reflects the argument advanced in studies concerning MSME digital transformation that successful technological empowerment requires alignment between local economic aspirations and participatory implementation strategies (Sahla et al., 2025). The continuity of QRIS usage in Karang Rahayu Village consequently became associated with emerging collective aspirations toward adaptive and resilient rural entrepreneurship.

The broader analytical interpretation of these findings demonstrates that QRIS implementation within community service programs possesses transformative potential extending beyond transactional modernization into the formation of adaptive digital cultures among rural MSMEs. Sustainable technological adoption was shaped by the interaction between digital literacy reinforcement, participatory mentoring, infrastructural accessibility, and localized trust-building processes embedded

within everyday commercial relations. Previous scholarship concerning Indonesian digital financial inclusion similarly argued that effective MSME modernization requires long-term integration between technological systems and socially grounded empowerment mechanisms capable of strengthening community resilience within changing economic environments (Sururie et al., 2019). The empirical experience observed in Karang Rahayu Village consequently reinforces the proposition that rural digital transformation must be approached as an ongoing socio-technical process requiring institutional continuity, participatory collaboration, and adaptive learning infrastructures.

CONCLUSION

The implementation of QRIS within the community service program conducted in Karang Rahayu Village demonstrated that digital payment adoption among MSMEs constitutes not merely a technological transition but a broader socio-economic transformation shaped by participatory empowerment, adaptive learning, and community-based institutional support. The findings revealed that direct mentoring and collaborative engagement significantly improved digital literacy, increased merchant confidence, accelerated transaction efficiency, and strengthened customer acceptance toward cashless payment practices among village-based enterprises. The program also illustrated that QRIS utilization contributed to improved financial recording practices, enhanced business professionalism, and expanded transactional accessibility for consumers accustomed to digital financial ecosystems. Despite these positive outcomes, the sustainability evaluation identified persistent challenges related to digital literacy disparities, infrastructural instability, and security concerns that continued to influence long-term operational consistency among MSMEs. The empirical trajectory observed throughout the implementation process indicates that sustainable rural digitalization requires continuous accompaniment, localized trust-building, and collective learning mechanisms capable of integrating technological innovation with the socio-cultural realities of community-based economic actors.

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