

Perceived Security and Trust as Determinants of QRIS Usage Among Informal Traders: Evidence from Car Free Day Merchants in Padangsidempuan

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ABSTRACT

This study examined the effects of perceived security and trust on QRIS usage among Car Free Day traders in Padangsidempuan City. An associative quantitative design was employed. The study population consisted of 67 active traders who accepted QRIS, and all were included through saturated sampling. Primary data were collected using a five-point Likert questionnaire and analyzed with multiple linear regression after validity, reliability, and classical-assumption testing. The results showed that perceived security had a positive and significant effect on QRIS usage ($\beta = 0.710$; $p < 0.001$), whereas trust did not have a significant partial effect ($\beta = 0.149$; $p = 0.090$). Jointly, perceived security and trust significantly explained QRIS usage ($F = 53.914$; $p < 0.001$), with an adjusted R^2 of 0.616. The findings indicated that transaction security was the more salient determinant for informal merchants who had already adopted QRIS. The study contributes evidence from a temporary, informal trading setting and suggests that merchant assistance should prioritize transaction verification, data protection, fraud awareness, and reliable settlement procedures.



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INTRODUCTION

Digital payment systems have become a central component of Indonesia's economic digitalization because they reduce transaction friction, expand payment options, and create interoperable channels between consumers and merchants. The Quick Response Code Indonesian Standard (QRIS), introduced as a national standard for QR-code payments, has accelerated this transition by allowing a single merchant code to receive payments from different licensed applications. The scale of adoption has continued to expand. Bank Indonesia reported that, by June 2026, QRIS had reached 65.77 million users and 44.86 million merchants, 96.68% of whom were micro, small, and medium enterprises (MSMEs), while transactions in the first half of 2026 reached 12.55 billion with a nominal value of approximately IDR 1.12 quadrillion (Bank Indonesia, 2026). These figures indicate that QRIS is no longer a peripheral payment option but an increasingly embedded infrastructure for retail and small-business transactions.

The national expansion of QRIS, however, does not automatically imply uniform adoption or uniform intensity of use at the local level. Informal traders operate under conditions that differ from those of formal retail businesses. Their sales are often small-value, high-frequency, mobile, weather-dependent, and concentrated in limited operating periods. Car Free Day (CFD) markets represent this type of setting. Merchants typically serve crowds for a few hours, use temporary stalls, depend on mobile internet connections, and must process payments quickly while simultaneously managing products and customers. These characteristics make convenience important, but they also make transaction certainty, verification, settlement reliability, and protection from fraud especially salient.

Field mapping in the Padangsidempuan CFD area identified 147 registered traders. Of these, 128 were active and 19 were inactive. Among the active traders, 67 accepted QRIS while 61 had not used QRIS as a payment method. Thus, QRIS had reached more than half of active traders but had not become universal in this local informal market. Preliminary observation also indicated concerns about data leakage, network disruption, delayed receipt of funds, incorrect payment confirmation, and fraud. These concerns are consistent with the broader security discussion surrounding QR-based payments.

Ajhari (2024), for example, highlights threats such as QR manipulation and quishing, showing that perceived security is not merely a technical feature but also a behavioral consideration for users who must decide whether a transaction process is sufficiently safe and verifiable.

Perceived security refers to the user's judgment that a digital payment system protects transactions and personal or financial information from misuse, manipulation, unauthorized access, or other harmful outcomes. In merchant settings, this perception is reinforced when payment status is clear, transaction notifications are reliable, funds are settled as expected, and the merchant can distinguish legitimate from suspicious transactions. Studies of Indonesian QRIS users generally indicate that security is an important antecedent of adoption or usage intention. Buluati et al. (2023) found that transaction security significantly increased QRIS usage interest among MSMEs in Boalemo. Sebayang and Rahmayati (2023) similarly reported a positive security effect among halal MSMEs in Medan, while Nasution et al. (2025) found that security significantly influenced QRIS use among halal MSMEs. Evidence from Kebumen also suggests that perceived risk and perceived usefulness jointly shape payment decisions, although the direction and significance of risk-related variables can vary across contexts (Rejeki & Astuti, 2024).

Trust is conceptually related to security but is not identical to it. Security is primarily an evaluation of protection and transaction safeguards, whereas trust reflects confidence that the system and its providers are reliable, credible, and will perform as expected. In digital payments, trust can emerge from repeated successful transactions, institutional reputation, transparent settlement, recommendations from other users, and the absence of negative experiences. Puspitasari and Salehudin (2022) showed that trust plays a role in long-term QRIS adoption, including as a mechanism through which government support and perceived usefulness influence behavioral intention. Indriyani et al. (2024) also found that trust positively affected digital-payment usage among QRIS merchants in the Jabodetabek area. More recent continuance research indicates that trust remains important after adoption, although habit can become an even stronger predictor of continued usage once the technology is routinely integrated into everyday payment behavior (Wicaksono, 2025).

The empirical relationship between trust and QRIS behavior is nevertheless inconsistent. Buluati et al. (2023), Sebayang and Rahmayati (2023), Hidayatullah et al. (2023), and Anggraini et al. (2024) reported significant positive effects of trust in different MSME or business-user contexts. Conversely, Pontoh et al. (2022) found that consumer trust did not significantly affect merchant intention to use QRIS. This inconsistency suggests that trust may function differently across stages of technology adoption. For prospective users, trust may be a threshold belief required before initial adoption. For existing users, however, day-to-day use may be more strongly shaped by concrete transaction experiences such as security, reliability, network availability, and habit. The distinction is particularly relevant for this study because all respondents were already active QRIS merchants.

The Technology Acceptance Model (TAM) provides the theoretical foundation for understanding this process. TAM explains technology acceptance through user beliefs that shape attitudes and behavioral responses. Contemporary applications often extend the model by incorporating context-specific external variables, including risk, trust, security, social influence, and facilitating conditions. Indonesian QRIS studies support such extensions. Nurhapsari and Sholihah (2022) showed that perceived usefulness, perceived ease of use, product knowledge, and perceived risk explained intention among traditional-market MSMEs in Semarang. Paramita and Cahyadi (2024), using an extended UTAUT model, demonstrated that performance expectancy, effort expectancy, social influence, perceived risk, behavioral intention, and facilitating conditions were relevant to QRIS behavior. Suyanto et al. (2024) likewise emphasized performance and effort expectations in shaping usage behavior among MSMEs. These findings indicate that QRIS acceptance cannot be reduced to one universal determinant; the relative importance of each factor depends on user characteristics and transactional context. The belief-based interpretation of technology acceptance is consistent with the consolidated TAM literature (Davis & Granić, 2020). Additional Indonesian evidence likewise indicates that the relative roles of usefulness, ease, risk, and related adoption determinants vary across QRIS user groups and settings (Adrianto & Rahmidani, 2024; Nathasya & Maysha, 2024; Saputra & Bahari, 2024).

This study extends the local QRIS literature in three ways. First, it focuses on CFD traders, a temporary and informal merchant segment that is rarely isolated as a distinct empirical setting in QRIS research. Second, it examines perceived security and trust simultaneously among existing users rather

than combining users and non-users, allowing the analysis to address differences in the intensity or quality of QRIS usage after adoption. Third, it provides evidence from Padangsidempuan, where the local composition of informal trade and digital-payment penetration may differ from larger metropolitan areas frequently examined in previous studies. The novelty therefore lies not in proposing entirely new constructs, but in testing the relative explanatory power of two established determinants within a specific post-adoption informal-trading context.

Based on the theoretical reasoning and prior empirical evidence, the study proposed three hypotheses. H1 stated that perceived security would have a positive and significant effect on QRIS usage among CFD traders in Padangsidempuan City. H2 stated that trust would have a positive and significant effect on QRIS usage. H3 stated that perceived security and trust would jointly have a significant effect on QRIS usage. The study accordingly aimed to test the partial and simultaneous effects of perceived security and trust, explain the pattern of significant and non-significant relationships, and formulate practical implications for improving secure and sustainable QRIS usage among informal merchants.

RESEARCH METHOD

This study used an associative quantitative design because the objective was to test the statistical relationship between perceived security and trust as independent variables and QRIS usage as the dependent variable. The research was conducted in the Car Free Day trading area of Padangsidempuan City beginning in October 2025. The unit of analysis was the individual trader. The design was cross-sectional: respondent perceptions and reported QRIS usage were measured during the same research period and analyzed to estimate the direction and significance of the relationships among variables.

The sampling frame was constructed from field mapping of CFD traders. A total of 147 traders were registered, of whom 128 were active and 19 inactive. Among the 128 active traders, 67 accepted QRIS and 61 did not. Because the analytical objective concerned QRIS usage among merchants who had already adopted the payment method, the study population was defined as the 67 active QRIS-using traders. All members of this population were included through saturated sampling. The inclusion criteria were: actively trading in the CFD area, accepting QRIS as a payment method, and being willing to participate. The final analytical sample therefore consisted of 67 respondents, representing the entire defined population of active QRIS merchants at the study site.

Primary data were collected using a structured questionnaire with a five-point Likert response scale, where higher values represented stronger agreement with each statement. The questionnaire operationalized perceived security through system security, data protection, system reliability, and perceived risk of misuse; trust through QRIS reliability, provider credibility, information or experience from other users, and transaction transparency; and QRIS usage through perceived suitability for transaction needs, ease in practical use, intention to continue using the service, and satisfaction with its role in payment activities. The operationalization retained the item structure of the source manuscript: nine items for perceived security, eight items for trust, and eight items for QRIS usage. The constructs were aligned with themes commonly employed in Indonesian QRIS and digital-payment studies, particularly security, risk, trust, usefulness, effort, and continued use (Buluati et al., 2023; Indriyani et al., 2024; Nurhapsari & Sholihah, 2022; Puspitasari & Salehudin, 2022).

Instrument quality was evaluated before hypothesis testing. Item validity was assessed using item-total correlation by comparing the observed correlation coefficient with the critical r value at the 5% significance level. With $n = 67$ and $df = 65$, the critical r value used in the source analysis was 0.2404. Reliability was assessed with Cronbach's alpha. Although the source protocol used a minimum criterion of 0.60, the observed alpha coefficients were all above 0.85 and therefore also exceeded the more conservative 0.70 threshold commonly used in behavioral research. This provided stronger evidence that the item sets were internally consistent.

Data analysis was conducted with SPSS and proceeded in four stages. First, descriptive information was used to summarize the study population and QRIS penetration among active CFD traders. Second, validity and reliability testing evaluated measurement quality. Third, the assumptions for ordinary least squares regression were examined through residual normality, multicollinearity, and heteroscedasticity tests. Normality was assessed with the Kolmogorov-Smirnov test, multicollinearity with tolerance and variance inflation factor (VIF), and heteroscedasticity with significance-based

testing of the residual pattern. Fourth, multiple linear regression was estimated in the form $Y = a + b_1X_1 + b_2X_2 + e$, where Y represented QRIS usage, X1 perceived security, X2 trust, a the constant, b1 and b2 regression coefficients, and e the error term.

The partial effect of each independent variable was tested with the t test at $\alpha = 0.05$, while the simultaneous explanatory effect of perceived security and trust was tested with the F test. Model explanatory power was assessed with R square and adjusted R square. Because the sample consisted exclusively of current QRIS users, the dependent variable should be interpreted as variation in reported usage/acceptance among adopters rather than a binary adoption decision. This distinction is important when comparing the findings with studies that model intention among prospective users or mixed user populations.

Table 1 Operationalization of Research Variables

Variable	Indicators	Empirical grounding	Items	Scale
Perceived security (X1)	System security; data protection; system reliability; risk of misuse	Buluati et al. (2023); Ajhari (2024); Nasution et al. (2025)	9	Likert 1–5
Trust (X2)	QRIS reliability; provider credibility; other-user experience; transaction transparency	Puspitasari & Salehudin (2022); Sebayang & Rahmayati (2023); Wicaksono (2025)	8	Likert 1–5
QRIS usage (Y)	Practical ease; suitability to needs; continuance intention; satisfaction	Nurhapsari & Sholihah (2022); Paramita & Cahyadi (2024); Suyanto et al. (2024)	8	Likert 1–5

RESULTS AND DISCUSSION

Sample coverage and QRIS penetration

The field mapping provides an important descriptive context for interpreting the regression results. Of 147 registered CFD traders, 128 were active at the time of mapping. Among these active traders, 67 used QRIS and 61 did not. Thus, 52.3% of active traders had adopted QRIS, while 47.7% had not. The analytical sample included all 67 active QRIS merchants. The relatively balanced distribution between users and non-users indicates that local QRIS diffusion was substantial but incomplete. It also reinforces the relevance of examining what sustains usage among existing adopters, because continued positive experience among current merchants can influence peer learning and future adoption within the same trading community.

The informal CFD environment creates a distinctive form of technology use. Merchants operate during a narrow time window and typically manage sales directly without dedicated cashier staff. A payment method that creates ambiguity about payment confirmation, settlement, or security can therefore impose a disproportionate operational burden. In such a setting, perceived security may function as a concrete performance condition rather than an abstract attitude. Trust, by contrast, may already be embedded in the decision to become a QRIS merchant and therefore show less variation once adoption has occurred. This post-adoption interpretation becomes relevant when the partial regression coefficients are examined.

Table 2 Coverage of CFD Traders and Analytical Sample

Category	Number of traders	Share / description
Registered CFD traders	147	100% of registered traders
Active traders	128	87.1% of registered traders
Inactive traders	19	12.9% of registered traders
Active QRIS users	67	52.3% of active traders; analytical population
Active non-QRIS traders	61	47.7% of active traders

Measurement quality

The validity test showed that all questionnaire items exceeded the critical r value of 0.2404. The correlation range was 0.883–0.964 for QRIS usage, 0.507–0.855 for perceived security, and 0.828–0.982 for trust. These values indicate that each item was sufficiently associated with its respective construct score. The very high item correlations for the trust and QRIS-usage scales also suggest strong item homogeneity; while this supports internal consistency, future scale development could examine

whether some items are conceptually redundant and whether a shorter instrument could capture the same constructs more efficiently.

Reliability results were similarly strong. Cronbach's alpha was 0.970 for QRIS usage, 0.859 for perceived security, and 0.975 for trust. All values were well above the source criterion of 0.60 and the commonly applied 0.70 benchmark. The instrument therefore demonstrated adequate internal consistency for regression analysis.

Table 3 Validity and Reliability Results

Variable	Item correlation range	Critical r	Cronbach's α	Interpretation
QRIS usage (Y)	0.883–0.964	0.2404	0.970	Valid and reliable
Perceived security (X1)	0.507–0.855	0.2404	0.859	Valid and reliable
Trust (X2)	0.828–0.982	0.2404	0.975	Valid and reliable

Classical-assumption tests

The residual normality test produced a Kolmogorov-Smirnov test statistic of 0.084 with an Asymp. Sig. of 0.200, indicating no evidence against residual normality at the 5% level. Multicollinearity was also not problematic: both independent variables had a tolerance value of 0.774 and a VIF of 1.292. These values indicate that perceived security and trust shared some conceptual association but did not exhibit a level of collinearity that would destabilize the regression estimates.

The heteroscedasticity test produced significance values of 0.124 for perceived security and 0.906 for trust, both above 0.05. The available diagnostics therefore supported the use of multiple linear regression. Taken together, the assumption tests suggest that the inferential conclusions are unlikely to be driven by obvious violations of normality, multicollinearity, or non-constant residual variance.

Table 4 Summary of Classical-Assumption Tests

Test	Statistic / variable	Result	Decision
Normality	Kolmogorov-Smirnov	Statistic = 0.084; $p = 0.200$	Residuals approximately normal
Multicollinearity	Perceived security	Tolerance = 0.774; VIF = 1.292	No multicollinearity
Multicollinearity	Trust	Tolerance = 0.774; VIF = 1.292	No multicollinearity
Heteroscedasticity	Perceived security	$p = 0.124$	No evidence of heteroscedasticity
Heteroscedasticity	Trust	$p = 0.906$	No evidence of heteroscedasticity

Multiple regression and hypothesis testing

The estimated regression equation was $Y = -28.267 + 0.410X_1 + 0.136X_2 + e$. The positive unstandardized coefficients indicate that higher perceived security and higher trust were associated with higher QRIS usage scores when the other predictor was held constant. However, statistical significance differed markedly between the two predictors. Perceived security had a standardized coefficient of $\beta = 0.710$ and was statistically significant ($t = 8.192$; $p < 0.001$), whereas trust had a substantially smaller standardized coefficient of $\beta = 0.149$ and was not statistically significant at the 5% level ($t = 1.721$; $p = 0.090$). H1 was therefore supported and H2 was not supported.

The simultaneous F test yielded $F = 53.914$ with $p < 0.001$, supporting H3. The model correlation coefficient was $R = 0.792$ and $R^2 = 0.628$. After adjustment for the number of predictors and sample size, adjusted R^2 was 0.616. Thus, perceived security and trust jointly explained 61.6% of the observed variance in QRIS usage scores, while 38.4% was associated with other factors not included in the model. The remaining variance is theoretically plausible because QRIS usage can also be influenced by perceived usefulness, ease of use, customer demand, network quality, settlement speed, habit, transaction volume, social influence, and facilitating conditions (Nurhapsari & Sholihah, 2022; Paramita & Cahyadi, 2024; Suyanto et al., 2024; Wicaksono, 2025).

Table 5 Multiple Regression and Partial Hypothesis Tests

Variable	B	Std. Error	β	t	p	Decision
Constant	-28.267	5.883	–	-4.805	<0.001	–
Perceived security (X1)	0.410	0.050	0.710	8.192	<0.001	H1 supported
Trust (X2)	0.136	0.079	0.149	1.721	0.090	H2 not supported

Table 6 Simultaneous Test and Model Explanatory Power

F	p	R	R ²	Adjusted R ²	Std. error of estimate
53.914	<0.001	0.792	0.628	0.616	4.600

Perceived security as the dominant determinant of QRIS usage

The strong positive effect of perceived security is the central empirical finding of this study. A standardized coefficient of 0.710 indicates that security had considerably greater explanatory weight than trust within the two-predictor model. For CFD merchants, the result is substantively reasonable. They operate in a high-tempo environment in which payment verification must occur quickly, often with queues, noise, and limited time to resolve errors. A merchant who believes that QRIS protects transaction data, produces reliable confirmation, and minimizes misuse can integrate the system into daily selling activity with lower perceived operational risk. Conversely, uncertainty about whether a payment is genuine or whether funds have been received can disrupt service and may discourage active use even after initial adoption.

This finding is consistent with Buluati et al. (2023), who reported that transaction security positively affected QRIS usage interest among MSMEs in Boalemo. It also aligns with Sebayang and Rahmayati (2023), who found a significant security effect on QRIS usage interest among halal MSMEs in Medan, and with Nasution et al. (2025), who identified security as an important determinant among halal MSME users. Salja et al. (2025) similarly found that security significantly influenced QRIS interest among MSMEs in Sawang, South Aceh. The consistency across geographically diverse MSME settings indicates that security is not limited to one locality; it is a recurring adoption and usage concern for small businesses that directly bear the consequences of payment problems.

The result also extends these prior findings by showing that security remains important after adoption. Many studies model intention to use, whereas the present sample consisted entirely of active QRIS merchants. This distinction suggests that perceived security is not merely a pre-adoption belief. It can remain relevant during continued usage because merchants repeatedly encounter transaction confirmation, settlement, customer claims, device security, and network-related uncertainty. In other words, security operates as a continuing service-quality condition. The post-adoption role is particularly important for informal merchants whose payment systems are embedded in personal smartphones and who may not have separate administrative staff to reconcile digital transactions.

Security should also be understood as both technical and perceptual. QRIS may comply with formal payment standards, but users evaluate security through visible and experiential cues: whether the merchant name displayed on the payer's screen is correct, whether transaction notifications arrive promptly, whether the merchant understands how to verify a successful payment, whether suspicious QR replacement can be detected, and whether settlement discrepancies can be resolved. Ajhari (2024) emphasizes that QR-code payment systems remain exposed to social-engineering and QR-manipulation risks, including quishing. Therefore, security education is not redundant even when the infrastructure itself is regulated. The quality of merchant verification practices can shape the perceived safety of the entire transaction process.

From a TAM perspective, perceived security can be interpreted as an external belief that reduces perceived uncertainty and enables the expected benefits of technology to be realized. A system cannot be experienced as useful if users are unsure whether transactions are protected or correctly settled. This helps explain why extended acceptance models frequently incorporate risk or security variables. Nurhapsari and Sholihah (2022) found that perceived risk significantly influenced QRIS intention among traditional-market MSMEs, while Paramita and Cahyadi (2024) included perceived risk as a meaningful component of an extended UTAUT explanation of QRIS behavior. The present result is therefore theoretically compatible with the broader view that acceptance models need contextual variables when technology involves money, privacy, and irreversible transaction consequences.

The practical implication is that interventions aimed at increasing usage should go beyond encouraging merchants to display a QR code. Training should focus on secure transaction routines: verifying the merchant identity shown on the customer device, confirming receipt through the authorized application rather than relying solely on screenshots, safeguarding account credentials, recognizing QR replacement or phishing attempts, maintaining secure device access, and understanding settlement procedures. These practices convert abstract security assurances into observable merchant

competence. For local government, Bank Indonesia representatives, banks, and payment service providers, the priority should therefore be repeated practical assistance rather than one-time promotional socialization.

Why trust did not have a significant partial effect

Trust had a positive coefficient but did not reach the 5% significance threshold. This result should not be interpreted as evidence that trust is irrelevant to QRIS. Rather, it indicates that, after perceived security was included in the model, differences in trust did not explain enough additional variance in QRIS usage among these 67 existing users. The sampling context provides a plausible explanation. Every respondent had already adopted QRIS and used it as a payment method. A minimum level of trust may therefore have been established before respondents entered the analytical population. If most users already considered QRIS and its providers sufficiently credible to adopt the service, the remaining variation in trust would have less power to distinguish high from low usage.

This interpretation helps reconcile the present result with studies that found significant trust effects. Sebayang and Rahmayati (2023), Buluati et al. (2023), Hidayatullah et al. (2023), and Anggraini et al. (2024) reported positive and significant relationships between trust and QRIS interest or use in different populations. Indriyani et al. (2024) also found that trust positively influenced digital-payment usage among QRIS merchants. Those findings support the importance of trust, especially where the outcome captures intention, decision, or adoption. The present study differs because the sample is already selected on prior use; the analysis therefore addresses variation within adopters, not the initial decision to trust the system enough to start using it.

The non-significant finding is also consistent with Pontoh et al. (2022), who found that consumer trust did not significantly influence merchant intention to use QRIS. This cross-study inconsistency suggests that trust is sensitive to contextual and model conditions. Trust may overlap conceptually with other beliefs such as security, institutional credibility, risk, or accumulated experience. When security is modeled explicitly and is strongly associated with usage, the unique contribution of general trust can diminish. The VIF values in this study did not indicate problematic multicollinearity, but conceptual overlap can still exist without reaching statistical multicollinearity thresholds.

Post-adoption theory offers an additional explanation. Once a digital-payment method becomes routine, behavior may increasingly depend on habit, convenience, customer demand, and confirmation of prior expectations. Wicaksono (2025), in a large sample of active QRIS users, found that trust remained relevant but habit was a particularly strong predictor of continuance intention. For CFD merchants, repeated successful transactions can transform QRIS from a technology that requires active evaluation into a routine sales instrument. In that stage, general statements of trust may matter less than whether the system works securely and predictably during actual selling periods.

The p value of 0.090 also warrants careful interpretation. It is above the conventional 0.05 threshold, so H2 is not supported under the predefined criterion. However, the coefficient remained positive. With a small census population of 67 merchants, statistical power is limited by the finite local population. The appropriate conclusion is therefore not that trust has no relationship with usage in any context, but that the study did not obtain sufficient evidence for an independent partial effect at $\alpha = 0.05$ after security was controlled. Future research can test whether trust operates indirectly through perceived security, satisfaction, or continuance intention, or whether its effect differs between adopters and non-adopters.

For practice, the non-significant coefficient does not justify ignoring trust-building activities. Credibility remains necessary for maintaining a payment ecosystem. What the result suggests is a shift in emphasis: generic trust messages about QRIS may be less effective than concrete demonstrations of secure and reliable transaction processes for merchants who already use the system. Provider responsiveness, transparent complaint handling, accurate settlement, and clear transaction records are likely to strengthen trust through experience rather than through communication alone.

Joint explanatory power, theoretical contribution, and comparison with prior studies

Although trust was not significant on its own, the joint model was highly significant and explained 61.6% of adjusted variance in QRIS usage. This indicates that the combination of security-related and relational beliefs provides a meaningful account of how existing CFD merchants differ in their use of QRIS. The result also demonstrates why simultaneous testing is important. Digital-payment

behavior emerges from a system of beliefs rather than a single isolated perception. Security may have the dominant coefficient, but trust contributes to the conceptual environment in which merchants evaluate whether a payment method is dependable enough for continued commercial use.

The model's explanatory power compares favorably with several QRIS studies that use broader sets of predictors. Rejeki and Astuti (2024), for example, reported an adjusted R^2 of 0.516 for perceived usefulness, ease of use, and risk in explaining QRIS decisions in Kebumen. The present adjusted R^2 of 0.616 was achieved with only two predictors, suggesting that security and trust are highly relevant in the specific CFD context. This comparison should not be treated as evidence that the present model is universally superior because R^2 depends on sample composition, construct operationalization, and outcome definition. Nevertheless, it indicates that the two variables capture a substantial portion of variation among informal merchants at the study site.

The contribution to TAM-based research lies in contextual prioritization. Traditional TAM emphasizes usefulness and ease of use, while extended models add beliefs that are specific to the technology and setting. For digital payments, the consequences of error involve real money and customer disputes; thus, security can become a prerequisite for realizing usefulness. Nurhapsari and Sholihah (2022) demonstrated the relevance of perceived risk in traditional markets, and Indriyani et al. (2024) showed that trust can mediate relationships in modified TAM models. The present findings refine this literature by indicating that, among existing informal merchants, security may have stronger direct salience than generalized trust.

The findings are also consistent with extended UTAUT research emphasizing facilitating conditions and performance expectations. Paramita and Cahyadi (2024) found that actual QRIS use behavior was influenced by behavioral intention and facilitating conditions, while Suyanto et al. (2024) showed direct and indirect effects of performance and effort expectations on QRIS behavior. In the CFD setting, security can be interpreted as part of the facilitating quality of the payment environment: merchants need confidence that the system will protect and correctly process transactions under real operating conditions. This suggests that future models should not treat security only as a psychological fear variable; it can also be operationalized as a perceived capability of the payment infrastructure.

The study further contributes to the literature by highlighting the difference between adoption and continued usage. Puspitasari and Salehudin (2022) showed that government support, perceived usefulness, and trust can shape long-term adoption intention, while Wicaksono (2025) emphasized trust and habit in continued QRIS use. The present evidence fits between these perspectives. It suggests that, once adoption has occurred, the determinants of actual or continued usage can reorder in importance. A belief that was decisive before adoption may become a background condition, while repeated transaction-level experiences become more salient. Longitudinal research would be especially useful for testing this dynamic process directly.

Another implication concerns the informal-sector diffusion mechanism. CFD merchants work in close physical proximity and can observe one another's payment practices. Experiences with successful or problematic transactions can therefore spread through peer communication. Positive secure-use experiences among the 67 current users may reduce uncertainty for the 61 active traders who have not adopted QRIS, while visible fraud or settlement problems could have the opposite effect. Merchant education may consequently generate spillover benefits beyond the trained users. Local QRIS expansion strategies should use peer demonstrations and practical merchant champions, not only institutional campaigns.

Managerial and policy implications

For merchants, the first implication is to institutionalize a simple verification routine. The merchant should confirm the transaction through the authorized application or account notification, verify that the merchant identity and amount are correct, and avoid accepting screenshots as the sole evidence of payment. QR displays should be positioned where unauthorized replacement is difficult and should be checked before trading begins. Device access should be protected, and account credentials or one-time passwords should never be shared. These measures directly address the security dimension that demonstrated the strongest empirical effect.

For banks and payment service providers, assistance should be designed around merchant workflows. Training materials need to explain how to identify successful and failed transactions, delayed settlement, refund or complaint channels, phishing attempts, and QR manipulation. Providers

should also improve the visibility and speed of transaction notifications because delayed confirmation can create operational conflict at crowded stalls. Transparent service recovery is likely to strengthen both security perceptions and trust through lived experience.

For Bank Indonesia and local government stakeholders, the results support continued digital-payment literacy programs targeted to informal merchant communities. The emphasis should not be limited to increasing the number of QRIS codes distributed. Adoption metrics should be complemented by indicators of active use, merchant confidence, transaction-problem resolution, and security awareness. Because almost half of active CFD traders in the mapped population had not yet adopted QRIS, peer-assisted demonstrations could be used to connect prospective users with experienced merchants who can show secure transaction procedures in the actual CFD environment.

Finally, the local ecosystem should recognize that infrastructure reliability and security perception are mutually reinforcing. Even well-designed education will have limited effect if mobile connectivity, transaction notification, or settlement support is unreliable. Coordination among local authorities, telecommunications providers, banks, and payment service providers can therefore improve both the technical and perceptual conditions for sustained QRIS usage.

Limitations and directions for future research

The study has several limitations that define the boundaries of its conclusions. First, the population was small and geographically specific, consisting of 67 active QRIS merchants in one CFD location. The saturated sample provides complete coverage of that local population but does not guarantee generalizability to other cities, permanent markets, or larger MSMEs. Second, the cross-sectional design captures perceptions at one period and cannot establish how security and trust change as merchants accumulate experience. Third, all respondents were current QRIS users, so the study cannot directly explain why the 61 non-user traders had not adopted QRIS. Fourth, the dependent construct combined dimensions of practical use, suitability, continuance intention, and satisfaction; future studies should separate actual transaction frequency, continuance intention, and satisfaction to improve construct precision.

Future research should compare users and non-users in the same informal market, employ larger multi-city samples, and incorporate variables such as perceived usefulness, ease of use, customer demand, habit, digital literacy, network quality, settlement speed, perceived cost, and facilitating conditions. Structural equation modeling could test whether trust mediates the relationship between security and continued usage or whether habit moderates the effect of trust. Longitudinal designs would also help distinguish pre-adoption determinants from post-adoption determinants and identify how critical incidents such as failed transactions or fraud attempts affect subsequent usage.

CONCLUSION

This study demonstrated that perceived security was a positive and statistically significant determinant of QRIS usage among active Car Free Day merchants in Padangsidempuan City, whereas trust did not show a significant independent partial effect at the 5% level. Jointly, perceived security and trust significantly explained QRIS usage, with an adjusted R^2 of 0.616. The results indicate that, in a post-adoption informal-trading context, concrete confidence in transaction protection, data security, system reliability, and low misuse risk can be more salient than generalized trust. The non-significant trust coefficient should therefore be interpreted in the context of a sample composed entirely of existing users, for whom a basic threshold of trust may already have been established before adoption. The study contributes to QRIS acceptance literature by showing that the relative importance of established determinants can shift across adoption stages and merchant environments. For practice, merchants, banks, payment service providers, Bank Indonesia, and local government should prioritize secure-use routines, transaction-verification skills, fraud awareness, reliable notifications, transparent settlement, and accessible complaint resolution. Future research should compare adopters with non-adopters, separate actual usage from continuance intention and satisfaction, and test broader models incorporating usefulness, ease of use, digital literacy, customer demand, network quality, habit, and facilitating conditions across multiple informal-market locations.

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