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AN ISS-GROUNDED STRUCTURAL MODEL OF QRIS USAGE: QUALITY, TRUST, AND INTENTION-BEHAVIOR TRANSLATION: EVIDENCE FROM INDONESIA

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Abstract. *Purpose* – This study examines how Indonesia's QRIS translates willingness into actual use via the Information Systems Success (ISS) model, focusing on quality dimensions, trust, regulatory support, and the intention-behavior link.

Research methodology – A survey of 493 QRIS users (March–August 2025) was analyzed using PLS-SEM with 5,000 bootstrap resamples to test hypothesized relationships and the moderating role of perceived regulatory support.

Findings – Information quality was the strongest driver of trust (β = 0.539, t = 13.793), followed by system quality (β = 0.305, t = 8.449) and service quality (β = 0.086, t = 2.784). Trust significantly increased intention to use (β = 0.393, t = 7.908), while perceived regulatory support did not moderate the trust–intention link (β = 0.033, t = 0.655). Intention strongly predicted actual use (β = 0.762, t = 32.762), with substantial explained variance (R^2trust = 0.678; R^2intention = 0.595; R^2use = 0.581) and acceptable model fit (SRMR = 0.078).

Research limitations – The information-quality measure emphasizes presentation/usability over content veracity, which may inflate its effect on trust; future studies should disaggregate these facets (e.g., hierarchical/bifactor models). The model omits factors such as habit, social influence, incentives, merchant density, and perceived risk-multi-level data are advised.

Practical implications – To convert intention into real payment behavior, providers should prioritize interface clarity and transaction-confirmation cues (readable amounts, fast receipts, clear failure explanations), system responsiveness and task completion reliability, and service recovery mechanisms (guided dispute/refund flows with predictable resolution).

Originality/Value – This study offers early empirical evidence applying ISS to a national interoperable QR ecosystem and quantifies the trust-based mechanism linking quality perceptions to actual fintech usage, providing actionable guidance for QRIS providers and policymakers in developing-country contexts.

Keywords: information quality, service quality, system quality, trust, intention to use, actual usage.

JEL Classification: G41, G28, O33.

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1. Introduction

Indonesia's unified QR standard – QRIS (Quick Response Code Indonesian Standard) now underpins retail digital payments by letting banks, e-money issuers, and fintech wallets transact through a single, interoperable code. Evidence of diffusion is strong: the user base has exceeded 57 million and merchant acceptance continues to widen nationwide (Fanther, 2025). Transactional activity has also accelerated: QRIS volume expanded by 175.2% in 2024,

indicating deeper use in day-to-day purchases (IDN Financials, 2025). Beyond the domestic market, QRIS has been woven into regional payment corridors linkages with Thailand and announced arrangements spanning Singapore–Indonesia Malaysia (Medina, 2022; Tham, 2023). Yet the presence of infrastructure and scale does not guarantee routine checkout behavior, pointing to a persistent "last-mile" gap.

This gap motivates the present inquiry. When scanning to pay is both available and promoted, why do some consumers who intend to use QR still reach for cash or cards at the counter? The sticking points may be informational (unclear fees or confirmations), technical (speed, reliability, or security), or service-related (support and dispute handling). Understanding which frictions dominate is essential for translating capability into consistent point-of-sale usage. The authors posit that trust is the pivotal mechanism for conversion from willingness to action. Trusting beliefs reduce perceived transaction risk and lighten cognitive load under uncertainty – key conditions in financial exchanges – thereby shaping adoption and continuance (Talwar et al., 2020). Following the Information Systems Success (ISS) tradition, we treat three upstream quality cues as the signals from which users infer trust: information quality (clarity, accuracy, timeliness), system quality (reliability, usability, security), and service quality (responsiveness, assurance, recovery) (DeLone & McLean, 2003; Petter et al., 2008). In a QR setting, transparent disclosures (fees, authentication, and confirmations), dependable app performance, and credible support should jointly strengthen trust and, through it, intention to pay by QR. However, the extant fintech literature typically examines these levers separately or concludes at intention, offering limited evidence on whether intentions become observed QR payments in real checkout episodes (Oliveira et al., 2016; Gao & Waechter, 2017; Khalilzadeh et al., 2017). In addition, perceived regulatory support – users' belief that rules, oversight, and redress protect them – has been theorized as a structural assurance but is seldom tested as a conditioner of the trust-to-intention link in nationwide QR programs such as QRIS.

Main research question: How do ISS-related quality cues and perceived regulatory support shape trust and intention, and how do these mechanisms translate into actual QRIS use at the point-of-sale? Accordingly, this study asks four Research Questions (RQs): (1) To what extent do perceived information, service, and system quality shape trust in QRIS? (2) Does trust translate into a stronger intention to use QRIS? (3) Does perceived regulatory support intensify the conversion from trust to intention? (4) Do stated intentions materialize as actual QRIS use at the point-of-sale? By connecting ecosystem advances to individual behavior, the study explains how quality signals and institutional assurances convert willingness to scan into sustained, everyday usage.

Accordingly, this study asks four questions: (1) To what extent do perceived information, service, and system quality shape trust in QRIS? (2) Does trust translate into stronger intention to use QRIS? (3) Does perceived regulatory support intensify the conversion from trust to intention? (4) Do stated intentions materialize as actual QRIS use at the point of sale? By connecting ecosystem advances to individual behavior, the study explains how quality signals and institutional assurances convert willingness to scan into sustained, everyday usage.

The study is structured as follows. Section 1 introduces the research background, problem motivation, and research questions. Section 2 reviews the relevant literature and

develops the theoretical framework and hypotheses. Section 3 describes the methodology, including sampling, measurement development, and the PLS-SEM analysis procedure. Section 4 presents the empirical results. Section 5 discusses the findings. Section 6 presents the implications, including theoretical and practical contributions. Section 7 concludes the study by summarizing key findings, key contributions, limitations, and directions for future research.

2. Literature review

2.1. Previous studies and gaps identification

Table 1 depicts authors' thorough review in all prior studies related to the present work. Prior fintech work established key links but left QR-payment specifics underexplored. Chang et al. (2025) showed that information, system, and service quality shaped satisfaction and that trust predicted loyalty; however, they did not trace intention into actual payment use or test trust as the conduit from quality to intention in a QR setting. Elsotouhy et al. (2023) reported positive effects of perceived quality on satisfaction, engagement, and continuance – moderated by Islamic religiosity – yet they did not examine perceived regulatory support, did not include actual usage, and did not model a unified quality → trust → intention chain. In banking chatbots, Nguyen et al. (2021) linked quality to satisfaction, trust, and continuance intention but omitted observed transactions and any moderation by institutional safeguards. Rahman et al. (2024) documented gamification effects on ease of use, attitude, and continuance, yet did not consider how formal protections might condition the trust-intention link, nor did they capture real usage. Finally, Chand et al. (2026) tied interface design and value to intention (sometimes to use) but typically treated quality levers in isolation and did not study interoperable national QR rails such as QRIS.

Taken together, prior fintech studies point to a fragmented understanding of how perceived information, system, and service quality co-produce trust and how that trust translates into behavior in QR payment contexts. Much of the work treated quality cues in isolation, stopped at intention rather than actual use, and rarely considered institution-based assurances (e.g., regulatory protections) as contextual forces shaping decisions at the point of sale. Consequently, we still lack an integrated account of the quality→trust mechanism and its intention-behavior translation for national, interoperable QR rails such as QRIS.

This study addresses those gaps in three ways. First, grounded in the Information Systems Success (ISS) model (DeLone & McLean, 2003; Petter et al., 2008), it models the ISS quality triad – information, system, and service quality – as joint antecedents of trust in QRIS. Second, it tests trust as a predictor of intention and, crucially, examines whether intentions materialize as actual QRIS use at checkout. Third, it introduces perceived regulatory support as a contextual moderator of the trust→intention linkage, capturing the role of formal rules, oversight, and redress in payment decisions. Together, these elements deliver a more complete explanation of how quality signals and institutional assurances convert willingness to pay by QR into sustained, everyday QRIS usage.

Table 1. Previous studies and gap identification

Author (s)	Context	Variables used	Moderating	Main findings	Contributions
Chand et al. (2026)	Financial technology	Performance expectancy, effort expectancy, trust, price value, interface design quality, intention to use, information quality, service quality, system quality, and actual usage	Yes, perceived fintech quality	Performance expectancy, effort expectancy, perceived trust, price value and interface design quality positively influence intention to use Fintech. Effort expectancy and price value impact actual use behavioral intentions mediate the relationship between fintech variables and actual use. The moderating effects of information quality, service quality and system quality are significant.	Does not analyze perceived regulatory supports
Chang et al. (2025)	Financial Technology	System quality, information quality, service quality, perceived security and privacy, trust, intention to use, user satisfaction, and loyalty	Yes, trust is the moderating variable	Information, system and service quality influence satisfaction; trust affects satisfaction but not to moderating the relationship between satisfaction and loyalty. The digital banking experience influences security, privacy and satisfaction.	Does not analyze actual usage and perceived regulatory supports
Elsotouhy et al. (2023)	Financial technology	System quality, information quality, service quality, satisfaction, customer engagement, delight, continuance intention, and Islamic religiosity	Yes, Islamic religiosity is the moderating variable	All perceived quality constructs affect satisfaction. Satisfaction, positively affects customer engagement and delight. Customer engagement, delight and Islamic religiosity positively affect continuance intention. Islamic religiosity moderates the influence of customer engagement and customer delight on continuance intention.	Does not explore trust, perceived regulatory supports and actual usage
Nguyen et al. (2021)	Banking industry	Information quality, system quality, service quality, trust, satisfaction, confirmation of expectation, perceived usefulness, and continuance intention	No	Continuance intentions towards the banks' chatbot services were influenced by satisfaction, trust, and perceived usefulness. information quality, system quality, service quality, and confirmation of expectations had significant effects on three drivers of continuance intention.	Does not analyze perceived regulatory supports, intention to use, and actual usage

End of Table 1

Author (s)	Context	Variables used	Moderating	Main findings	Contributions
Rahman et al. (2024)	Financial Technology (m-wallet)	Confirmation, perceived usefulness, perceived ease of use, perceived effectiveness of gamification, attitude, satisfaction, trust, and continuance intention	No	TCT constructs affect consumer satisfaction and attitudes towards m-wallets. Perceived effectiveness of gamification affects perceived ease of use and attitude, as well as its indirect effect on consumers' continued use intentions of mobile wallets via attitude. Trust negatively influenced continuance intention to use.	Does not analyze perceived quality, perceived regulatory supports, intention to use, and actual usage
This study	Financial technology	Information quality, service quality, system quality, trust, perceived regulatory supports, intention to use, and actual usage revisit, and revisit intention	Yes, perceived regulatory supports	Information quality, system quality, and service quality affect trust. Trust increases intention, and intention translates into actual use. Perceived regulatory support does not moderate the trust–intention relationship.	It analyzes information quality, service quality, system quality, trust, intention to use, and actual usage, with perceived regulatory supports as the moderating variable

2.2. Theoretical framework: the information system success model

The Information Systems Success (ISS) model originated as a parsimonious framework linking information quality and system quality to use, user satisfaction, and impacts (DeLone & McLean, 1992). Its ten-year update incorporated service quality and reconceptualised outcomes as net benefits, while distinguishing use from intention to use, which made the model better suited to consumer-facing, platformized settings (DeLone & McLean, 2003). Subsequent re-specifications for e-commerce confirmed that the three quality dimensions work through user evaluations to shape reuse intentions (Wang, 2008). Validation studies in applied domains likewise show that system, information, and service quality significantly influence use and satisfaction, reinforcing ISS as a stable explanatory core that can be extended with context-specific mediators such as trust (Ojo, 2017).

Applied to digital payments, ISS provides the quality to trust/attitude to intention/use pathway needed to explain adoption and continuance. In mobile banking, models built on DeLone-McLean show that system and information quality raise trust and satisfaction, and that trust enhances favorable user responses (Damabi et al., 2018). For mobile payments, trust transfer research demonstrates that trust (cultivated by prior payment experiences and quality cues) heightens satisfaction, which then drives continuance intention (Cao et al., 2018). In line with this study's model, more recent payment studies extend ISS with TAM/TPB components to show that perceived ease/usefulness and trust/security translate quality into intention to

use and actual use in consumer settings (Linh & Nguyen, 2025). Together, this evidence indicates that high information, system, and service quality foster trust, and trust in turn propels intention and actual usage – the precise chain your QRIS model tests.

2.3. Hypothesis development

2.3.1. Information, service, and system quality on trust

In digital payment settings, information quality denotes the extent to which presented content – such as fees, authentication procedures, transaction updates, and dispute guidance – is accurate, complete, up-to-date, relevant, and easy to interpret (DeLone & McLean, 2003; Nelson et al., 2005; Wixom & Todd, 2005). When these attributes are satisfied, uncertainty and perceived risk decline, signaling the provider's competence and integrity and, in turn, fostering trust. Recent work on mobile payments consistently links transparent and dependable informational cues to trust development and subsequent adoption (Oliveira et al., 2016; Gao & Waechter, 2017; Talwar et al., 2020). Thus, IS-success based frameworks indicate that information quality is a primary antecedent of initial trust, which later translates into stronger intention and continued usage.

H1: *Information quality significantly affects users' trust in a digital-payment service.*

Service quality captures users' evaluations of support and problem-handling (responsiveness, reliability/assurance, empathy, and recovery effectiveness) across online service encounters (Parasuraman et al., 1991, 2005; Pitt et al., 1995). In fintech contexts, consistent, responsive assistance and credible resolution of failures (e.g., chargebacks, transfer errors) signal benevolence and accountability, strengthening trust in the provider. Prior studies show that superior e-service processes (including security/privacy assurance and fulfilment) increase trust and downstream loyalty or usage (Blut et al., 2015; Sharma, et al., 2024). Evidence from digital/fintech services similarly indicates that perceived service excellence affects trust.

H2: *Service quality significantly affects users' trust in a digital-payment service.*

System quality refers to the technical performance of the payment application – reliability/availability, ease of use, response time, and perceived security (DeLone & McLean, 2003; Seddon, 1997; Petter et al., 2008; Nelson et al., 2005). Robust system performance and visible security controls (e.g., strong authentication, error transparency) create predictability and control, which foster trusting beliefs in technology-mediated exchange. Empirical studies in mobile payments demonstrate that system reliability/usability and security features meaningfully raise users' initial trust and continued use intentions (Khalilzadeh et al., 2017; Gao & Waechter, 2017; Talwar et al., 2020).

H3: *System quality significantly affects users' trust in a digital-payment service.*

2.3.2. Trust on intention to use

Trust is users' confident expectation that a digital-payment provider is competent, reliable, and will act in their interest under conditions of vulnerability and risk (Talwar et al., 2020). In fintech exchanges, such credence lowers perceived transaction risk and decision complexity, thereby converting evaluations into conative choice (Lian & Li, 2021). Empirical studies in mobile and NFC payments consistently show that trusting beliefs – rooted in perceived

security, reliability, and benevolence – exert a direct, positive effect on intentions to adopt and continue using payment applications, over and above alternative drivers (Alrawad et al., 2023; Ariffin et al., 2021). Trust thus functions as a gate-keeping appraisal that enables users to move from favourable beliefs to planned usage within high-stakes, technology-mediated financial contexts.

H4: *Trust significantly affects intention to use a digital-payment service.*

2.3.3. Perceived regulatory supports moderates the relationship between trust and intention to use

Perceived regulatory support denotes individuals' beliefs about the degree of encouragement, support, and regulatory environment the government provides (Amnas et al., 2024). In IS research, such institution-based assurances – laws, supervision, consumer-protection rules, and legal recourse – create a structural context that reduces vulnerability and legitimizes exchange (McKnight et al., 2002; Pavlou, 2003; Gefen et al., 2003). When users perceive a strong regulatory umbrella, trust in the digital-payment service converts more efficiently into intention because institutional safeguards bound the down-side of acting on trust; when perceived support is weak, residual risk tempers the trust-intention link. In fintech's high-stakes, relatively opaque settings, these assurances complement firm-level trust by stabilizing expectations about security, recourse, and fairness, thereby strengthening the translation of trust into planned usage.

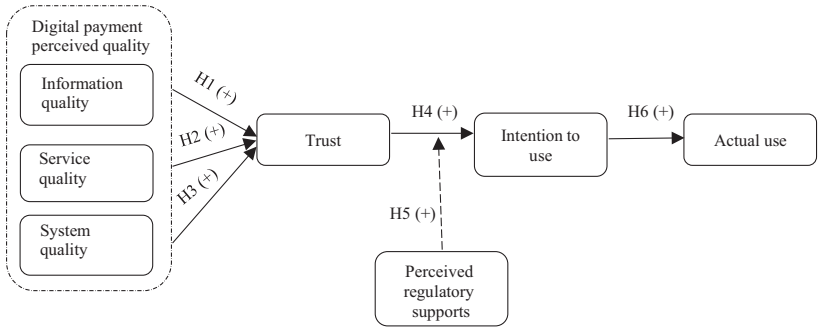
H5: *Perceived regulatory support positively moderates the relationship between trust and intention to use.*

2.3.4. Intention to use on actual usage

Intention to use is the individual's motivational readiness to perform a behavior within a specified context. In canonical behavioral theories, intention is the proximal antecedent of enacted behavior: it captures the effort and planning a person is willing to invest, and is therefore the strongest predictor of actual use (Ajzen, 1991; Venkatesh et al., 2012). Information-systems continuance models likewise treat intention as the immediate driver of subsequent usage (Bhattacherjee, 2001). Empirically, digital-payment studies report that higher usage intention translates into greater self-reported and observed payment use (Liébana-Cabanillas et al., 2014).

H6: *Intention to use a digital-payment service positively affects their actual usage of the service.*

All hypotheses are depicted in Figure 1. Figure 1 depicts an ISS-based mechanism in which perceived digital-payment quality operates through trust to explain both adoption readiness and actual use. Specifically, information quality (H1), service quality (H2), and system quality (H3) are proposed as complementary quality cues that reduce uncertainty and signal competence, thereby strengthening trust; trust then serves as the proximal psychological conduit translating these quality evaluations into intention to use (H4). Finally, intention to use is modeled as the immediate antecedent of actual use (H6), while perceived regulatory support is theorized to condition the strength of the trust → intention linkage by providing institution-based assurance and perceived recourse (H5).



Note: The (+) symbols denote the hypothesized positive direction of each relationship (i.e., higher X is expected to increase Y); they do not indicate that hypotheses are added or combined mathematically.

Figure 1. Research model

3. Methodology

3.1. Measurement development

To ensure conceptual clarity and psychometric soundness, each latent construct in the study – information quality, service quality, system quality, trust, perceived regulatory supports, intention to use, and actual usage – was precisely specified, operationalized, and validated. All indicators employed a seven-point Likert response format from "strongly disagree" to "strongly agree." As detailed in Table 2, the construct definitions and vetted items together constitute a cohesive measurement scaffold that supports sub-sequent modeling and preserves internal consistency across the instrument.

Table 2. Summary of measurement items

Constructs	Measurement items	Authors
Perceived regulatory supports	1. My decision to utilize QRIS is positively impacted by governmental initiatives and policies. 2. Government promotions highlighting the advantages of QRIS make me more predisposed to using them. 3. The backing of the government instills a greater sense of security and confidence in my utilization of QRIS. 4. Government support plays a role in enhancing the accessibility and affordability of QRIS.	Amnas et al. (2024)
Service quality	1. The responsible service personnel are always highly willing to help whenever I need support with QRIS. 2. The responsible service personnel provide personal attention when I experience problems with QRIS. 3. The responsible service personnel provide services related to QRIS at the promised time. 4. The responsible service personnel have sufficient knowledge to answer my questions with respect to QRIS.	Chand et al. (2026)
Actual use	1. I used digital payment services frequently in my daily life. 2. I depend on digital payment services in my financial transaction. 3. I will recommend digital payment services to others.	Ong et al. (2023)

End of Table 2

Constructs	Measurement items	Authors
Intention to use	1. I intend to use digital payment services in the future. 2. I will always try to use digital payment services in my daily life. 3. I plan to use digital payment services in future. 4. I predict I would use digital payment services in the future.	Ong et al. (2023)
Information quality	1. QRIS provides convenient access. 2. QRIS is easy to use. 3. QRIS is easy to navigate. 4. QRIS is visually attractive.	Roh et al. (2024)
Trust	1. QRIS keeps its promises. 2. QRIS services meet my needs. 3. QRIS is trustworthy. 4. I think QRIS is concerned with the present and future interests of users. 5. Overall, I trust QRIS.	Roh et al. (2024)
System quality	1. QRIS are easy to use. 2. QRIS can be accessed immediately. 3. QRIS enable me to accomplish my financial transactions. 4. QRIS provide helpful functions for my financial transactions.	Ryu and Ko (2020)

3.2. Sampling technique, data collection, and sample characteristics

A questionnaire-based quantitative design was adopted to investigate how information, service, and system quality – as well as perceived regulatory support – shape trust, intention to use, and actual QRIS usage. To ensure respondent relevance, we implemented purposive sampling: only individuals who (i) identified as male or female, (ii) were 20 years or older, (iii) had at least high school education (or equivalent), and (iv) had prior QRIS experience were eligible. These screens guaranteed sufficient familiarity with the focal constructs. The survey was self-administered via Google Forms and distributed through LinkedIn, WhatsApp, Facebook, and Line to reach active users of digital payments. The questionnaire consisted of an eligibility screener, demographic and usage items, and the focal construct measures adapted from validated scales, using a 7-point Likert scale with 1 = strongly disagree to 7 = strongly agree to maximize interpretability and variance. Data collection took place from March-August 2025. Following rigorous data cleansing and quality checks, 493 respondents met the inclusion criteria, yielding a sample of QRIS users that is sufficiently robust and contextually aligned for the ensuing analyses.

Table 3 reports the sample characteristics. Majority of respondents were women accounted for 59.03% and men 40.97%, indicating no strong gender skew. In term of age, most respondents were 31–39 (41.58%) and 20–30 (29.82%) – who are prone to adopt and routinize cashless payments. Educational attainment was high (bachelor's 34.69%, master's 31.64%, doctoral 10.95%, senior-high/equivalent 22.72%), suggesting ample literacy to judge information, system, and service features. Regarding occupations, majority were civil servants 24.14% and private-sector employees 21.50% led, with substantial shares of students 21.30% and entrepreneurs 17.85%, capturing both salaried and self-employed use contexts. Lastly, most respondents received monthly income of IDR 5–10 million (40.37%) and IDR 10–15 million (25.35%) – implying steady purchasing power and frequent point-of-sale exposure suited to observing intention-behavior translation in QRIS usage.

Table 3. Sample demographics

Measure	Category	Frequency	Percentage
Gender	Female	291	59.03%
	Male	202	40.97%
Age group	20–30 years old	147	29.82%
	31–39 years old	205	41.58%
	40–49 years old	91	18.46%
	=>50 years old	50	10.14%
Educational background	High school and equivalent	112	22.72%
	Bachelor's degree	171	34.69%
	Master's degree	156	31.64%
	Doctoral degree	54	10.95%
Occupation	Student	105	21.30%
	Entrepreneur	88	17.85%
	Private Sector	106	21.50%
	Civil servant	119	24.14%
	Others	75	15.21%
	<= Rp. 5,000,000	94	19.07%
	Rp. 5,000,001–Rp 10,000,000	199	40.37%
Monthly income	Rp. 10,000,001–Rp 15,000,000	125	25.35%
	Rp. 15,000,001–Rp 20,000,000	53	10.75%
	> Rp. 20,000000	22	4.46%

3.3. Analysis technique

Model estimation proceeded via Partial Least Squares Structural Equation Modeling (PLS-SEM) in SmartPLS 4.1.1.2 (Sarstedt et al., 2023). PLS-SEM was selected given the study's predictive emphasis and the presence of multiple latent constructs with mediating links (Hair et al., 2017). Before estimating paths, potential Common Method Variance (CMV) was assessed using Harman's single-factor test alongside collinearity diagnostics. Convergent validity was supported when Average Variance Extracted (AVE) exceeded 0.50 and when item loadings were ≥ 0.70 (Baumgartner & Weijters, 2021). Reliability was indicated by Cronbach's alpha and Composite Reliability values ≥ 0.70, and discriminant validity was evaluated using the Fornell-Larcker criterion (Henseler et al., 2015). Model adequacy was further gauged using the Goodness-of-Fit (GoF) index together with R^2 statistics before proceeding to hypothesis testing, thereby ensuring a rigorous and credible assessment of the proposed research framework.

4. Results

4.1. Validity and reliability assessment

Before estimating the structural paths, the measurement model was scrutinized in SmartPLS 4.1.1.2. Indicator quality was evaluated via standardized loadings; every item met the 0.70-or-higher criterion, indicating solid item reliability and accurate representation of the

intended latent constructs (Hair et al., 2017). A compact overview is presented in Table 4. Afterward, convergent validity was examined using Average Variance Extracted (AVE). All constructs recorded AVE values above 0.50, showing that each latent variable captured more than half of the variance of its indicators (Hair et al., 2017). Internal consistency was also verified: Cronbach's alpha and Composite Reliability (CR) both exceeded 0.70, evidencing stable and precise measurement (Hair et al., 2017). Taken together, the results in Table 4 confirm that trust, intention to use, and actual usage are measured with sufficient coherence and rigor.

Discriminant validity was established through three complementary tests. First, the Fornell-Larcker check showed that the square root of each construct's AVE surpassed its correlations with other constructs (Table 5). Second, the cross-loading matrix indicated that each item loaded highest on its theorized construct relative to all others (Table 6). Third, heterotrait-monotrait (HTMT) ratios fell below the 0.85 guideline, further demonstrating construct

Table 4. Convergent validity and reliability

Constructs	Items	FL	CA	CR	AVE
Information Quality (IQ)	IQ1	0.703			
	IQ2	0.877			
	IQ3	0.863	0.828	0.841	0.663
	IQ4	0.803			
Service Quality (SQ)	SQ2	0.894	0.811	0.848	0.839
System Quality (SYQ)	SQ3	0.937			
	SYQ1	0.716			
	SYQ2	0.862	0.839	0.859	0.674
	SYQ3	0.880			
	SYQ4	0.815			
	T1	0.811			
Trust (T)	T3	0.772	0.809	0.819	0.638
	T4	0.877			
	T5	0.726			
Perceived Regulatory (PRS) Support	PRS1	0.812			
	PRS2	0.812	0.797	0.804	0.622
	PRS3	0.811			
	PRS4	0.717			
	IU1	0.708			
Intention to Use (IU)	IU2	0.762	0.770	0.778	0.592
	IU3	0.823			
	IU4	0.779			
	AU1	0.826			
Actual Usage (AU)	AU2	0.777	0.736	0.744	0.653
	AU3	0.819			

Note: FL: Factor Loading ≥ 0.7; CA: Cronbach Alpha ≥ 0:7; CR: Composite Reliability ≥ 0:7; AVE: Average Variance Extracted ≥0.5.

distinctiveness (Henseler et al., 2015). Collectively, these diagnostics at-test to a robust measurement model and provide a sound basis for the subsequent structural analysis. Fourth, the cross-loading matrix (Table 7) showed each item exhibited its strongest loading on its hypothesized latent variable rather than on any alternative factor, indicating clear separation among the constructs.

Table 5. Fornell-Larcker criterion

	IQ	SQ	SYQ	T	PRS	IU	AU
Information quality	0.814						
Service quality	0.514	0.916					
System quality	0.638	0.543	0.821				
Trust	0.778	0.529	0.696	0.799			
Perceived regulatory support	0.694	0.482	0.620	0.788	0.789		
Intention to use	0.669	0.482	0.541	0.723	0.733	0.769	
Actual usage	0.568	0.470	0.550	0.623	0.608	0.762	0.808

Table 6. Heterotrait-Monotrait Ratio (HTMT) – Matrix

	IQ	SQ	SYQ	T	PRS	IU	AU
Information quality	—						
Service quality	0.615	—					
System quality	0.758	0.640	—				
Trust	0.846	0.637	0.823	—			
Perceived regulatory support	0.850	0.578	0.748	0.777	—		
Intention to use	0.833	0.590	0.663	0.808	0.826	—	
Actual usage	0.721	0.585	0.693	0.793	0.779	0.798	—

Notes: The values in the parenthesis represents HTMT value with < 0.85 is strong, < 0.90 moderate and < 0.95 weak.

Table 7. Cross-loadings matrix

Indicators	IQ	SQ	SYQ	T	PRS	IU	AU
IQ1	0.703	0.308	0.486	0.534	0.523	0.460	0.395
IQ2	0.877	0.521	0.621	0.708	0.647	0.624	0.552
IQ3	0.863	0.448	0.517	0.650	0.561	0.559	0.476
IQ4	0.803	0.374	0.447	0.629	0.522	0.524	0.414
SQ2	0.428	0.894	0.439	0.419	0.381	0.384	0.384
SQ3	0.507	0.937	0.546	0.538	0.490	0.489	0.469
SYQ1	0.419	0.313	0.716	0.402	0.421	0.354	0.368
SYQ2	0.556	0.514	0.862	0.564	0.507	0.469	0.474
SYQ3	0.586	0.499	0.880	0.618	0.542	0.487	0.495
SYQ4	0.516	0.431	0.815	0.653	0.546	0.449	0.454
T1	0.609	0.512	0.655	0.811	0.607	0.595	0.536
T3	0.685	0.320	0.506	0.772	0.603	0.542	0.444
T4	0.681	0.502	0.591	0.877	0.674	0.638	0.552

End of Table 7

Indicators	IQ	SQ	SYQ	T	PRS	IU	AU
T5	0.499	0.335	0.456	0.726	0.639	0.530	0.450
PRS1	0.516	0.347	0.499	0.628	0.812	0.565	0.447
PRS2	0.539	0.319	0.492	0.586	0.812	0.524	0.430
PRS3	0.610	0.518	0.531	0.718	0.811	0.666	0.576
PRS4	0.512	0.303	0.423	0.530	0.717	0.538	0.445
IU1	0.572	0.321	0.453	0.562	0.642	0.708	0.484
IU2	0.490	0.273	0.366	0.463	0.480	0.762	0.566
IU3	0.582	0.501	0.484	0.666	0.600	0.823	0.694
IU4	0.406	0.359	0.350	0.514	0.528	0.779	0.583
AU1	0.452	0.394	0.459	0.483	0.507	0.623	0.826
AU2	0.414	0.229	0.411	0.396	0.415	0.530	0.777
AU3	0.504	0.487	0.460	0.608	0.540	0.679	0.819

4.2. Model robustness testing validity and reliability assessment

The authors began by judging explanatory strength through the coefficient of determination (R^2) for each endogenous construct. Using the Falk and Miller's (1992) rule-of-thumb that R^2 should exceed 0.10 to be considered meaningful, the model performs well: trust (R^2 = 0.678), intention to use (R^2 = 0.595), and actual usage (R^2 = 0.581) are all substantially accounted for by the three quality antecedents, indicating solid predictive adequacy across the system. Global fit was then inspected following Hu and Bentler (1999). The bootstrapped Standardized Root Mean Square Residual (SRMR) registered 0.078, satisfying the < 0.08 guideline and supporting acceptable absolute fit. Additional PLS-based fit diagnostics further corroborated adequacy, with d_ULS = 1.976, d_G = 0.759, and NFI = 0.712, jointly suggesting the proposed specification is empirically tenable.

To summarize performance in a single index, we computed the Goodness-of-Fit (GoF), which synthesizes convergent validity (via average AVE) and explanatory power (via average R^2). Following Tenenhaus et al. (2005), GoF is obtained as:

$$\text{GoF} = \sqrt{\overline{AVE}} \times \sqrt{\overline{R^2}} = \sqrt{0.669 \times 0.618} = 0.505.$$

Using the Wetzels et al.'s (2009) – weak (< 0.10), small (0.10–0.25), moderate (0.25–0.36), and high (> 0.36) – the observed GoF = 0.505 indicates a high overall fit. Taken together, the R^2 magnitudes, fit diagnostics, and composite GoF imply that the model not only explains a considerable share of variance in the principal outcomes but also reflects the intended causal structure with satisfactory fidelity.

4.3. Hypothesis results

Table 8 reports the structural estimates for this study's model. As summarized in Figure 2, the three perceived-quality antecedents significantly strengthened users' trust in QRIS. Information quality exerted the strongest effect on trust (H1: β = 0.539, t = 13.793), indicating that

Table 8. Summary of hypothesis testing

Hypothesis	β	T-Value	Bootstrapping CI 97.5% (N = 5000)		Decision
			Min	Max	
H1 Information quality → trust	0.539***	13.793	0.459	0.614	Supported
H2 Service quality → trust	0.086**	2.784	0.024	0.144	Supported
H3 System quality → trust	0.305***	8.449	0.234	0.376	Supported
H4 Trust → intention to use	0.393***	7.908	0.289	0.487	Supported
H5 Perceived regulatory support X trust → intention to use	0.033ns	0.655	–0.058	0.137	Not supported
H6 Intention to use → actual usage	0.762***	32.762	0.716	0.807	Supported

Notes: Significance level with ***P < 0.001; **P < 0.01; *P < 0.05.

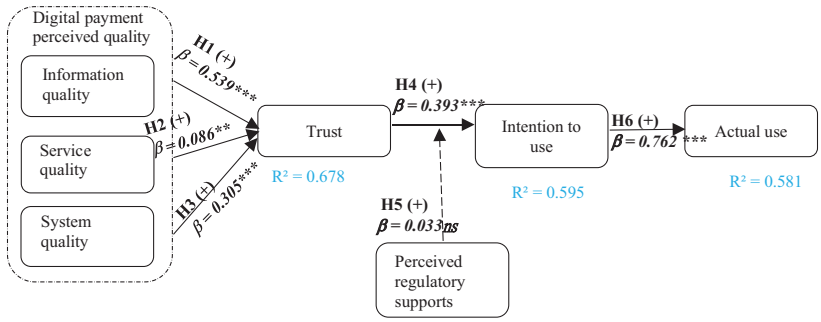


Figure 2. Hypothesis summary

when QRIS appears accessible and its interface cues are easy to follow (e.g., convenience, ease of use, navigability, and visual appeal), users develop stronger confidence in the payment system. System quality also significantly enhanced trust (H3: β = 0.305, t = 8.449); given that its indicators emphasize immediate accessibility, the ability to complete financial transactions, and helpful system functions, this finding suggests that a responsive, transaction-ready platform materially consolidates trusting beliefs. Service quality contributed a smaller yet significant increment (H2: β = 0.086, t = 2.784), implying that competent frontline support (willingness to help, timeliness, and staff knowledge) complements – rather than substitutes for – informational and technical cues in trust formation.

Trust subsequently translated into a higher intention to use QRIS (H4: β = 0.393, t = 7.908), demonstrating that confidence in the platform meaningfully elevates planned future usage. However, the hypothesized moderating role of perceived regulatory support on the trust-intention link was not supported (H5: β = 0.033, t = 0.655). Although perceived regulatory support reflects governmental initiatives, promotional campaigns, security assurances, and perceived affordability/accessibility support, these institutional signals did not significantly strengthen the extent to which trust converts into intention once trust is established.

Finally, intention to use strongly predicted actual QRIS usage (H6: $\beta = 0.762$, $t = 32.762$), confirming a decisive intention-behavior translation. The model also demonstrates substantial explanatory power, accounting for 67.8% of the variance in trust ($R^2 = 0.678$), 59.5% in intention to use ($R^2 = 0.595$), and 58.1% in actual usage ($R^2 = 0.581$), as shown in Figure 2. Overall, the hypothesized mechanism is supported for H1–H4 and H6, indicating that quality perceptions – particularly information and system quality – build trust, trust increases intention, and intention robustly materializes as actual QRIS payment behavior, while perceived regulatory support provides little incremental leverage as a moderator.

5. Discussion

The present study examined, in the digital-payment context, how information, service, and system quality shape users' trust in a digital-payment service, how trust translates into intention to use, whether perceived regulatory support conditions that translation, and whether intention culminates in actual usage. The hypothesis testing yields several insights. First, information quality emerges as the most consequential antecedent of trust, while system quality and service quality also contribute positively. Users appear to build trusting beliefs foremost when the QRIS interface and on-screen information are easy to access, navigate, and process, while dependable technical performance and responsive support reinforce that confidence. This profile accords with fintech evidence showing that credible information and security-salient system performance are primary drivers of initial trust and continuance in digital payments (Oliveira et al., 2016; Gao & Waechter, 2017; Khalilzadeh et al., 2017; De Luna et al., 2019). The comparatively smaller role of service quality mirrors meta-analytic and sectoral findings that, in high-risk financial contexts, e-service processes matter but typically less than informational and technological cues (Blut et al., 2015; Sharma et al., 2024). Taken together, the results suggest that clarity and transparency in communications, coupled with visible reliability and security, are the key levers for trust formation. Because the research questions operationalize the same causal structure tested in H1–H6, we discuss the findings below primarily through the hypothesized paths (Figure 2), while referencing the corresponding RQs only as an organizing frame.

Second, trust in the digital payment service strengthens users' intention to use. This aligns with prior studies showing trust as a robust, direct predictor of adoption and continuance across diverse user groups and platforms (Talwar et al., 2020; Ariffin et al., 2021; Lian & Li, 2021; Alrawad et al., 2023). Conceptually, confidence in the digital-payment provider converts cognitive evaluations into conative choice under perceived risk – an especially relevant mechanism for financial transactions. Third, perceived regulatory support does not significantly moderate the trust-intention link. A plausible interpretation is that institution-based assurances (laws, oversight, redress) operate as a background legitimacy scaffold rather than an amplifier of the slope between trust and intention in this setting. Prior work is mixed: reviews note that formal safeguards often facilitate adoption by legitimizing exchange, yet their influence may flow through trust or perceived risk rather than through interaction effects (Dahlberg et al., 2015; Amnas et al., 2024). In a market where baseline protections around digital payments are already salient, additional perceived support may yield limited incremental

leverage. Finally, intention meaningfully predicts actual usage, consistent with behavioral and IS-continuance views that treat intention as the proximal antecedent of enacted behavior and with digital-payment studies linking stated intentions to subsequent usage patterns (Liébana-Cabanillas et al., 2014).

Responding to the research questions, the study yields four key insights. (RQ1) The three quality perceptions, information, service, and system quality, play a significant role in developing trust in QRIS, which affirms the notion that the three quality cues are primary sources of confidence in the system among the users. (RQ2) Trust in QRIS the payment system, which serves as a significant indication that trust is paramount in transforming the intention to use the payment system, strongly influencing users' intention to use the payment system, indicating that trust is paramount in turning that intention into reality. (RQ3) There is no significant effect of perceived regulatory support in enhancing the relationship between trust and the intention to use QRIS, meaning that institutional assurances influence user adoption in this direction in a very limited way. (RQ4) Trust and intention go hand in hand with actual QRIS implementation at the point of sale, whereby the intention of the user to use QRIS has a likely impact on their actual payment behavior. The insights provide useful suggestions to enhance the use of QRIS by emphasizing the quality of the services provided and developing trust in the system.

To clarify the relationship between the research questions and the tested hypotheses, each RQ corresponds directly to a specific set of structural paths in the model (Figure 2). RQ1 is addressed by the trust-formation paths from information, service, and system quality to trust (H1–H3); RQ2 corresponds to the effect of trust on intention to use (H4); RQ3 corresponds to the proposed moderating role of perceived regulatory support on the trust → intention relationship (H5); and RQ4 corresponds to the intention → actual use relationship (H6). Accordingly, the discussion above integrates the evidence primarily at the hypothesis/path level – highlighting which links are supported, their relative magnitudes, and what the supported/non-supported paths imply for QRIS adoption – rather than treating the RQs as separate findings.The present study examined, in the digital-payment context, how information, service, and system quality shape users' trust in a digital-payment service, how trust translates into intention to use, whether perceived regulatory support conditions that translation, and whether intention culminates in actual usage. Hypothesis testing yields several insights and clarifies the relative strengths of the mechanisms summarized in Figure 2.

Consistent with H1–H6, information quality emerged as the most consequential antecedent of trust, while system quality and service quality also contributed positively but to a lesser extent. This ranking indicates that users build trusting beliefs foremost when the QRIS interface and on-screen information and interface cues are easy to access, navigate, and process, and when the transaction experience feels straightforward and legible at the moment of payment. System performance then provides an additional layer of assurance by signaling that QRIS is transaction-ready (accessible, responsive, and functionally reliable), whereas service support plays a more complementary role by reinforcing confidence when users encounter questions or problems. In practical terms, these results imply that trust formation in QRIS is driven primarily by the clarity and usability of the payment experience, supported by reliable technical performance and competent assistance.

Second, trust significantly strengthened intention to use, indicating that once users perceive QRIS as dependable and credible, they become more willing to rely on it in future transactions. This finding is consistent with the view that trust functions as a key mechanism through which users translate evaluations of a technology-mediated financial service into adoption/continuance intentions under perceived vulnerability (McKnight et al., 2002; Pavlou, 2003).

However, perceived regulatory support did not significantly moderate the trust-intention relationship. One plausible interpretation is that institution-based assurances may function more as a baseline legitimacy condition in this context, rather than as an incremental amplifier of how strongly trust translates into intention; once trust is formed through direct experience and platform cues, incremental perceived government support may yield limited additional leverage in strengthening the trust → intention conversion (McKnight et al., 2002; Pavlou, 2003; Dahlberg et al., 2015).

Finally, intention strongly predicted actual usage, providing evidence of a robust intention-behavior translation in QRIS payments. This result is aligned with dominant behavioral and IS-adoption perspectives that treat intention as the proximal antecedent of enacted behavior (Ajzen, 1991; Venkatesh et al., 2012; Bhattacherjee, 2001). Accordingly, the overall pattern in Figure 2 suggests a coherent pathway in which interface-level clarity and system readiness build trust, trust increases intention, and intention reliably materializes as actual QRIS use.

To clarify the relationship between the research questions and the tested hypotheses, each RQ corresponds directly to a specific set of structural paths in the model (Figure 2). RQ1 is addressed by the trust-formation paths from information, service, and system quality to trust (H1–H3); RQ2 corresponds to the effect of trust on intention to use (H4); RQ3 corresponds to the proposed moderating role of perceived regulatory support on the trust → intention relationship (H5); and RQ4 corresponds to the intention → actual use relationship (H6). Accordingly, the discussion integrates the evidence at the hypothesis/path level – highlighting which links are supported, their relative magnitudes, and what the supported and unsupported paths imply for QRIS adoption – rather than treating the RQs as separate findings.

6. Implications

6.1. Theoretical implications

First, the results refine a core proposition of ISS model by showing that information quality is the dominant antecedent of trust, with system quality and service quality exerting supporting roles. In high-risk financial exchanges, users appear to rely foremost on how clearly and seamlessly information is presented and accessed, while technical assurances and service processes operate as reinforcing signals. Thus, our evidence both endorses and re-weights the DeLone-McLean quality triad for payments: presentation-centric informational cues are the primary trust trigger, with technological and service cues acting as credibility multipliers rather than substitutes (DeLone & McLean, 2003; Petter et al., 2008; Nelson et al., 2005).

Second, the asymmetry between system and service quality advances theorizing on which "quality layer" matters most when monetary loss and security are salient. Consistent with fintech work, users put greater stock in technology-centred assurances – stable access and task

efficacy – than in generic e-service attributes when forming trusting beliefs (Gao & Waechter, 2017; Khalilzadeh et al., 2017). Meta-analytic evidence similarly shows that, in high-stakes contexts, service processes matter but their marginal impact on trust is typically smaller than informational/presentation and technological cues (Blut et al., 2015; Sharma et al., 2024). Theoretically, ISS models the antecedents of trust.

Third, the findings reinforce trust as the proximal conduit from quality perceptions to behavioural intention. Trust reliably translated quality appraisals into intention to use, corroborating prior research that positions trust as a central mechanism through which users commit to technology-mediated financial actions (Talwar et al., 2020; Ariffin et al., 2021; Lian & Li, 2021; Alrawad et al., 2023). By linking that intention to actual usage, the model also supports the ISS claim that intention is the immediate antecedent of behaviour, thereby closing the quality on trust on intention and use chain within one framework.

Fourth, the non-significant moderation of the trust-intention relationship by perceived regulatory support nuances how ISS should incorporate institution-based assurances. Rather than amplifying the slope from trust to intention, formal safeguards (laws and supervision) may act as background legitimacy conditions whose influence is largely absorbed into the main effects of trust and risk (Pavlou, 2003; McKnight et al., 2002). This helps reconcile mixed findings in payments: reviews note that regulation facilitates adoption, but often via trust or perceived risk rather than through interaction effects (Dahlberg et al., 2015). ISS models in regulated finance should therefore model institutional assurances primarily as antecedents or contextual controls, not necessarily as consistent moderators of trust's behavioural potency.

6.2. Practical implications

The present work offers actionable guidance for banks and fintech, merchants, and regulators seeking to convert intention into real, day-to-day QR-code payments. First, prioritize clarity of information and experience at checkout, because information quality (interface clarity/usability cues) is the most powerful driver of trust in this study. Providers should strengthen on-screen guidance, make the amount and any fees fully transparent before payment, and deliver immediate, readable confirmations that match on both customer and merchant screens (merchant name, amount, time, reference ID) to reduce ambiguity and hesitation at the point of sale. To accelerate routinization, the first transaction should be designed to be frictionless – simplify onboarding and decision steps, guide users toward an immediate "try it now" payment, and issue a clear receipt – because early successful enactment supports repetition and habit formation (Ouellette & Wood, 1998; Wood & Neal, 2009; Lally et al., 2010). These measures also reduce cognitive load and execution friction during checkout (Thaler & Sunstein, 2008; Venkatesh et al., 2012).

Second, ensure transaction-ready system performance to reinforce trust and prevent abandonment under time pressure. Stakeholders should prioritize fast access, stable execution, and reliable functions so that QRIS feels responsive and dependable when users attempt payment (Venkatesh et al., 2012). In busy point-of-sale settings, practical design choices – such as using static QR codes that customers can scan while waitingcan further reduce time pressure and improve completion rates (Venkatesh et al., 2012).

Third, strengthen service recovery and dispute-handling processes to maintain confidence when failures occur, consistent with the finding that service quality provides meaningful support to trust formation. When a payment fails, apps should provide plain-language explanations, a one-tap retry option, and guided refund/void flows with predictable resolution times; effective service recovery and clear redress processes are critical for sustaining trust after service failures (Tax et al., 1998; Smith et al., 1999; Maxham, 2001). Service personnel should also be trained to use.

Fourth, make consumer protections visible and standardized to provide practical reassurance, even though perceived regulatory support did not amplify the intention trust-intention link in this sample. Every app should present a clear "Your rights" page outlining dispute steps, expected timelines, and liability policies, with one-tap case submission and real-time status tracking; these visible safeguards reduce perceived vulnerability in high-stakes digital exchanges (McKnight et al., 2002; Pavlou, 2003). Regulators can reinforce trust by standardizing disclosures and publishing complaint-handling performance dashboards, and observable signals for users (Dahlberg et al., 2015).

Finally, to make QR payments routine, stakeholders should increase acceptance salience and ease of discovery – e.g., prominent "QR accepted" signage and clear placement of codes at the point-of-sale, plus in-app maps or partner directories because lowering search effort and increasing cues supports behavior enactment in everyday settings (Wood & Neal, 2009; Thaler & Sunstein, 2008). Timely prompts (bill reminders, low-balance alerts) and simple, predictable incentives (e.g., small credits after a number of successful payments) can further support repetition and stabilise continued use (Lally et al., 2010; Thaler & Sunstein, 2008; Venkatesh et al., 2012).

7. Conclusions

This study applies the ISS lens to digital payments and evidences a clear quality on trust on intention and use pathway. Information quality is the strongest driver of trust, with system and service quality reinforcing it; trust increases intention, and intention translates into actual use. Perceived regulatory support does not that regulation operates more as background assurance than as a behavioral amplifier.

This study applied the Information Systems Success (ISS) lens to explain how quality cues and perceived regulatory support shape trust and intention, and how these mechanisms translate into actual QRIS use at the point of sale. Overall, the main research aim is accomplished: the results support a coherent quality → trust → intention → actual use pathway and clarify which quality cues matter most in building trust and enabling real payment behavior.

Regarding the RQs, the findings provide clear answers. RQ1 asked to what extent information, service, and system quality shape trust in QRIS; the results show that all three quality cues significantly strengthen trust, with information quality (interface clarity/usability cues) exerting the strongest effect, followed by system quality, while service quality plays a smaller yet meaningful supporting role. RQ2 examined whether trust translates into stronger intention to use; the results confirm that trust significantly increases intention, indicating that confidence in QRIS is a key psychological conduit converting quality evaluations into adoption readiness. RQ3 asked whether perceived regulatory support intensifies the trust →

intention conversion; the moderation effect was not supported, suggesting that perceived government backing does not materially strengthen the translation of trust into intention once trust is established. RQ4 examined whether stated intentions materialize into actual QRIS use; the findings show that intentions strongly predict actual QRIS use, demonstrating a robust intention-behavior link at the point of sale.

Based on the overall findings, several recommendations follow. First, providers should prioritize clarity in information and experience at checkout by improving on-screen guidance, transparent fee/amount displays, and immediate, readable confirmations, since these cues are the most powerful drivers of trust formation. Second, stakeholders should ensure transaction-ready system performance (fast access, stable execution, reliable functions) to reinforce trust and reduce abandonment under time pressure. Third, banks/fintech and merchants should strengthen service recovery and dispute-handling processes (clear error explanations, one-tap retry, predictable refund/void workflows, and visible complaint tracking) to maintain confidence when failures occur. Finally, regulators can increase practical reassurance by making consumer protections visible and standardized (e.g., clear recourse procedures and service-performance transparency), even though perceived regulatory support did not strengthen the trust-intention slope in this sample.

8. Limitations and future studies

This study has limitations that open avenues for future research. First, the measurement of information quality emphasizes presentation/usability (clarity, navigability, visual appeal) more than content veracity (accuracy, completeness, timeliness), which may overstate the influence of "information quality" on trust; future work should separate these facets explicitly (e.g., distinct dimensions or hierarchical/bifactor specifications). Second, the model's construct scope is intentionally focused and omits potentially important determinants such as habit strength, social influence, incentive exposure, merchant acceptance density, and perceived risk. Subsequent research should incorporate these drivers – ideally with multi-level or multi-source data linking user perceptions with merchant and provider environments – to identify when and for whom the ISS pathway is strongest and most actionable.

Author contributions

APT and WK were responsible for conceptualization, APT was responsible for methodology, WK was responsible for software, WK contributed to validation, APT and WK contributed to formal analysis, APT was in charge for investigation, APT and WK both responsible for data curation, APT was responsible for writing – original draft preparation, writing – APT and WK both contributed to review and editing, APT was responsible for supervision and project administration.

Disclosure statement

The authors declare have no competing financial, professional, or personal interests from other parties.

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While preparing this manuscript, OpenAI (Version GPT-5.2.) and Grammarly Premium (Version 1.2.98) were used primarily as writing assistants for grammar checking, language editing, sentence restructuring, formatting, or improving citations, and minor text editing to refine wording and improve the clarity and structure of the manuscript. All intellectual contributions, interpretations, and final decisions were made by the authors.

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