

Generation Z Preferences and Behavior in Using QRIS for E-Commerce Transactions in the Digital Era

Zaenal Mukarom,

Faculty of Da'wah and Communication, UIN Sunan Gunung Djati

ABSTRACT : Despite widespread QRIS adoption in offline transactions, its usage in e-commerce remains limited compared to e-wallets, creating a significant gap in understanding Generation Z digital payment preferences. This study analyzes Generation Z preferences and behavior in using QRIS for e-commerce transactions through an integrated theoretical framework combining Technology Acceptance Model (TAM), Unified Theory of Acceptance and Use of Technology (UTAUT2), and Diffusion of Innovation (DOI) theory. Survey data from 370 Generation Z respondents reveals that transaction convenience and speed are primary adoption drivers (75.7%), with 83.8% perceiving QRIS as easy to use and 86.5% experiencing transaction acceleration. However, moderate security confidence (48.6% rating "fairly safe") and satisfaction gaps indicate strategic vulnerabilities. User segmentation shows 40.5% heavy users with strong habit formation versus 56.7% moderate-to-light users in deliberative stages. The study contributes by reconceptualizing ease of use as a hygiene factor for digital natives and validates multi-theoretical integration for understanding technology adoption in competitive payment ecosystems.

KEYWORDS: QRIS; Generation Z; e-commerce; digital payment systems; consumer preferences

I. INTRODUCTION

The digital technology revolution over the past decade has fundamentally transformed human interaction, production, and transaction patterns. In Indonesia, this transformation is reflected in the internet penetration rate reaching 215.63 million users or 77% of the total population in 2023, with the digital economy projected to reach USD 146 billion by 2025. Within the economic context, this transformation is evident through the rapid growth of e-commerce, which has become an integral part of modern society. According to recent data, Indonesia's e-commerce transaction value reached Rp 501.87 trillion in 2023, representing a 32.8% increase from the previous year, with 178.94 million digital buyers. Traditional face-to-face buying and selling activities have shifted to digital spaces, supported by information technology infrastructure and increasingly diverse, fast, and integrated payment systems. This shift has not only changed the transaction medium but also reconstructed the relationship between consumers, businesses, and financial systems within an interconnected digital ecosystem.

As e-commerce develops, digital payment systems have become fundamental elements supporting online transactions. Various payment methods offer efficiency and convenience, ranging from bank transfers, payment cards, digital wallets, to Quick Response (QR) Code-based payments. In the Indonesian context, QRIS (Quick Response Code Indonesian Standard) emerged as a strategic innovation that is not only technological but also regulatory and institutional. Designed by Bank Indonesia and officially launched in January 2020 [1], QRIS aims to standardize QR Code-based payment to create interoperability among payment system players, improve transaction efficiency, and expand financial inclusion. By September 2024, QRIS had been adopted by 28.82 million merchants with a total transaction volume of 15.68 billion transactions worth Rp 71.96 trillion throughout 2024 [2]. This exponential growth demonstrates the massive penetration of QRIS in Indonesia's digital payment landscape.

In the early implementation phase, QRIS was predominantly used in offline transactions, particularly in the micro, small, and medium enterprise (MSME) sector. Data shows that 73% of QRIS merchants are MSMEs, with micro-businesses dominating at 58%. However, with accelerated digitalization and changing consumer patterns, QRIS has expanded its function by being integrated into various e-commerce platforms and marketplaces such as Tokopedia, Shopee, Bukalapak, and Lazada since 2022. This expansion marks an important shift where QRIS is no longer positioned merely as an alternative payment tool but as part of the digital payment system architecture within the online commerce ecosystem. However, QRIS adoption in e-commerce remains relatively limited compared to other payment methods. Recent surveys indicate that e-wallets dominate with 48% user preference, followed by bank transfers (27%), cash on delivery/COD (15%),

while QRIS only reaches 10%. This disparity indicates a gap between QRIS technology potential and its adoption reality in e-commerce, presenting an intriguing phenomenon for deeper exploration.

The integration of QRIS in e-commerce transactions presents an empirical paradox worthy of deeper investigation, particularly from consumer preference and behavior perspectives. Although QRIS offers advantages in ease of use, transaction speed, and cross-application interoperability that even surpasses e-wallets in national standardization, consumer preference for payment methods is not solely determined by technical aspects. Consumer choices are often influenced by psychological factors, social influences, habitual behavior, security perceptions, and economic incentives attached to each payment method such as cashback, reward points, and loyalty programs [3, 4]. This raises critical questions about what factors truly shape consumer preferences, especially among Generation Z as dominant e-commerce users, in choosing payment methods, and why QRIS has not become the primary choice despite being integrated with e-commerce platforms.

Generation Z occupies a strategic position in understanding this phenomenon. As a generation growing alongside digital technology advancement, Generation Z is often referred to as digital natives [5]. Defined as the age group born between 1997- 2012, Generation Z in Indonesia numbers approximately 75.49 million or 27.94% of the total population. Of this number, 87% are active internet users with an average usage duration of 8 hours 52 minutes per day, the highest among other generational groups. In the e-commerce context, Generation Z contributes 42% of total digital transactions with an average spending value of Rp 2.1 million per month. This generation did not experience a transition from analog to digital world but has lived from the beginning in an environment connected by the internet, smart devices, and digital applications. Studies identify that Generation Z has unique characteristics in digital consumption behavior: (1) value-seeking behavior prioritizing value for money and cashback/promotions; (2) seamlessness-oriented appreciating smooth and fast transaction experiences; (3) security-conscious yet willing to take risks if benefits are clear; and (4) socially-influenced in purchase decisions through social commerce and peer recommendations [6, 7]. These characteristics form specific expectations toward payment methods they choose, making Generation Z's preferences toward QRIS a crucial area of inquiry.

Academic studies on digital payment system adoption have been extensively conducted using various theoretical frameworks. The Technology Acceptance Model (TAM) developed by Davis [8] posits that technology adoption is primarily determined by two key constructs: Perceived Usefulness (PU), defined as the degree to which users believe a technology enhances their performance, and Perceived Ease of Use (PEOU), referring to the degree to which users find the technology simple and effortless to use. This model was later expanded into the Unified Theory of Acceptance and Use of Technology (UTAUT) by Venkatesh et al. [9], which incorporates additional constructs such as Performance Expectancy, Effort Expectancy, Social Influence, and Facilitating Conditions. Subsequently, UTAUT2 extended this framework for consumer contexts by adding Hedonic Motivation, Price Value, and Habit as determinants of technology adoption [10]. Complementing these models, the Diffusion of Innovation (DOI) theory by Rogers [11] explains innovation adoption through five key attributes: Relative Advantage, Compatibility, Complexity, Trialability, and Observability. These theoretical frameworks have been widely applied to explain digital payment technology adoption across various contexts [12–14].

In the Indonesian context, several studies have explored QRIS adoption in offline realms [15, 16], e-wallet adoption [17, 18], and Generation Z digital consumption behavior [19, 20]. However, significant gaps remain in the literature. First, limited studies integrate multiple theoretical frameworks (TAM, UTAUT2, and DOI) to comprehensively explain QRIS adoption behavior specifically in the e-commerce context, as most existing research focuses on isolated theoretical perspectives or offline payment scenarios. Second, minimal research specifically explores Generation Z preferences and behavior toward QRIS in e-commerce transactions, despite this demographic's dominance in digital commerce. Third, there is an absence of comparative analysis between QRIS and competing payment methods (e-wallets, bank transfers) from Generation Z user experience perspective in e-commerce platforms. Fourth, limited understanding exists regarding psychological and social factors shaping QRIS preferences amid intense payment method competition, particularly concerning the trade-offs Generation Z makes between efficiency, security, and economic incentives.

To address these research gaps, this study employs an integrative theoretical framework combining TAM, UTAUT2, and DOI theory. This integration is grounded in the understanding that QRIS adoption by Generation Z is not solely determined by perceived usefulness and ease of use (TAM's main constructs), but also by performance expectancy, effort expectancy, social influence, facilitating conditions, hedonic motivation, price value, and habit (UTAUT2 constructs), as well as innovation attributes including relative advantage, compatibility, complexity, trialability, and observability (DOI constructs). The convergence of these frameworks enables a holistic analysis of factors shaping Generation Z preferences in the context of digital payment method competition in e-commerce, addressing both cognitive-utilitarian and affective-hedonic dimensions of adoption behavior.

Based on this integrated theoretical foundation and identified research gaps, this study addresses five specific research questions. First, what are the primary factors influencing Generation Z's adoption of QRIS in e-commerce transactions, as explained by TAM and UTAUT2 constructs? Second, how do Generation Z users perceive the ease of use and usefulness of QRIS compared to alternative payment methods such as e-wallets and bank transfers? Third, to what extent do security perceptions and trust influence Generation Z's preference for QRIS in e-commerce contexts? Fourth, what role do economic incentives (cashback, promotions) and hedonic motivations play in shaping QRIS adoption behavior among digital native consumers? Fifth, how does the intensity of e-commerce usage (heavy users versus light users) moderate QRIS adoption patterns among Generation Z? These research questions are designed to systematically explore the multidimensional nature of QRIS adoption while maintaining theoretical rigor and practical relevance.

Accordingly, this study aims to comprehensively analyze Generation Z's preferences and adoption behavior toward QRIS as a payment method in e-commerce transactions through the integrated theoretical lens of TAM, UTAUT2, and DOI. Specifically, the research objectives are: (1) to identify and measure the key determinants of QRIS adoption among Generation Z e-commerce users based on TAM and UTAUT2 constructs including Performance Expectancy, Effort Expectancy, Social Influence, Hedonic Motivation, Price Value, and Trust; (2) to evaluate Generation Z's perceptions of QRIS ease of use, usefulness, and security in comparison with competing payment methods; (3) to examine the relationship between innovation attributes (relative advantage, compatibility, complexity) and QRIS adoption using the DOI framework; (4) to analyze how e-commerce usage intensity segments (heavy, moderate, light users) influence QRIS preference patterns and adoption behavior; (5) to assess the gap between expected benefits and actual user experience with QRIS, identifying areas for improvement; and (6) to develop theoretical and practical implications for stakeholders including e-commerce platforms, payment service providers, regulators, and merchants.

The significance of this research extends across both academic and practical domains. Academically, this study advances digital consumer behavior literature by integrating TAM, UTAUT2, and DOI theories in the specific context of payment innovation adoption by digital natives, thereby contributing to theoretical development in technology acceptance research. It extends understanding of Generation Z consumption patterns in emerging markets, particularly regarding technology-mediated financial transactions, enriching the discourse on generational consumer behavior. Furthermore, it provides empirical evidence of payment system adoption in the Indonesian e-commerce context, contributing to literature on digital payment systems in developing economies. The study also tests and validates the applicability of Western-developed technology adoption models in the Indonesian digital economy context, addressing calls for contextual validation of established theories.

Practically, the research findings offer actionable insights for multiple stakeholder groups. For e-commerce platforms, the study provides guidance for designing more user-friendly QRIS integration that meets Generation Z expectations and preferences, potentially increasing payment method diversity and reducing transaction costs. For payment service providers, it offers understanding of target market needs for product development, feature enhancement, and user experience optimization, enabling competitive positioning in the digital payment landscape. For regulators, particularly Bank Indonesia, the research delivers evidence-based insights for formulating policies encouraging QRIS adoption in e-commerce without creating market distortion, supporting the national financial inclusion agenda. For merchants, it provides strategic guidance for designing effective promotion strategies and incentives to encourage QRIS usage among young consumers, potentially reducing merchant discount rates and improving cash flow. For marketing practitioners, the study elucidates the value proposition that resonates with Generation Z in the context of digital payment method selection, informing targeted marketing communications and customer acquisition strategies.

The urgency of this research is underscored by several converging factors. Bank Indonesia targets a 300% increase in QRIS transaction volume in e-commerce for 2025-2026 through various incentives and regulations, creating a critical window for understanding adoption drivers and barriers. Generation Z, currently aged 12-27 years, is in the formative phase of establishing habitual behavior in digital transactions; their current decisions will shape long-term consumption patterns lasting 30-40 years ahead. The intense competition among payment methods necessitates understanding of decisive factors influencing Generation Z preferences to inform strategic positioning by various payment ecosystem players. As QRIS is positioned as a key instrument for financial inclusion, understanding adoption barriers among tech-savvy youth provides insights into potential challenges for broader population adoption. Moreover, Generation Z preferences today will fundamentally determine Indonesia's digital payment ecosystem architecture for the next 2-3 decades, making this inquiry strategically important for national digital economy development.

This study employs a quantitative research design using survey methodology to collect primary data from Generation Z e-commerce users. The research limits its scope to Generation Z (born 1997-2012) active e-commerce users in major urban areas of Indonesia, specifically Jakarta, Surabaya, Bandung, Medan, and Makassar. Respondents must have made at least five e-commerce transactions in the last three months and have experience using QRIS as a payment method. The focus on urban areas is deliberate, chosen due to more

mature QRIS penetration and digital infrastructure, enabling analysis of behavioral factors rather than infrastructure constraints. E-commerce platforms in focus include major marketplaces that have integrated QRIS as a payment option, namely Tokopedia, Shopee, Lazada, and Bukalapak. While this geographic and platform limitation may affect generalizability to rural contexts and smaller e-commerce platforms, it ensures validity of findings and depth of analysis by controlling for infrastructure variables that might confound behavioral observations.

The study acknowledges several limitations inherent in its design. The cross-sectional nature of data collection captures preferences and behaviors at a specific time point, not tracking their evolution over time, which limits understanding of dynamic adoption processes. Self-reported data may be subject to social desirability bias, particularly regarding stated preferences that may differ from actual behavior. The focus on stated preferences rather than analysis of actual transaction data represents a methodological constraint, though one that enables exploration of psychological and attitudinal factors that behavioral data alone cannot reveal. The urban focus, while methodologically justified, limits generalizability to rural populations where different infrastructure and socioeconomic conditions prevail. These limitations are acknowledged transparently to guide appropriate interpretation of findings and to identify directions for future research that might address these constraints through longitudinal designs, behavioral data analysis, or expanded geographic scope.

II. METHODOLOGY

This study employs a quantitative research design using cross-sectional survey methodology to investigate Generation Z preferences and adoption behavior toward QRIS in e-commerce transactions. The quantitative approach is justified by the research objectives which require measuring relationships between constructs from TAM, UTAUT2, and DOI theories, as well as quantifying the extent to which various factors influence QRIS adoption among the target population [21, 22]. The target population comprises Generation Z individuals (born 1997-2012) who are active e-commerce users in major urban centers of Indonesia, specifically Jakarta, Surabaya, Bandung, Medan, and Makassar. Purposive sampling is employed with specific inclusion criteria: (1) age 12-27 years; (2) minimum five e-commerce transactions in the past three months; (3) prior experience using QRIS in at least one e-commerce transaction; and (4) voluntary participation consent [23]. Based on structural equation modeling guidelines requiring 10-15 respondents per parameter and considering the integrated theoretical framework encompasses approximately 12 key constructs, the target sample size is set at 370 respondents, providing adequate statistical power (>0.80) for detecting medium effect sizes and enabling robust subgroup analyses [24, 25].

Data collection is conducted through a structured online questionnaire distributed via Google Forms across multiple digital channels including social media platforms (Instagram, TikTok, Twitter/X), e-commerce user communities, university networks, and snowball sampling over an eight-week period from October to November 2024. The research instrument consists of four main sections:

(1) demographic information using categorical and ordinal scales; (2) e-commerce usage patterns measured through transaction frequency, preferred platforms, and spending behavior; (3) core theoretical constructs measured using 5-point Likert scales, specifically Performance Expectancy (4 items), Effort Expectancy (4 items), Social Influence (3 items), Facilitating Conditions (3 items), Hedonic Motivation (3 items), Price Value (3 items), Habit (4 items), Trust (4 items), Relative Advantage (4 items), Compatibility (3 items), and Complexity reverse-coded (3 items), all adapted from validated scales in prior technology acceptance research [26-30]; and (4) open-ended questions allowing elaboration on QRIS experiences and suggestions. Prior to full-scale data collection, the questionnaire undergoes validation through expert review by three academics and two industry practitioners for content validity, followed by a pilot study with 40 respondents to assess internal consistency reliability using Cronbach's alpha ($\alpha > 0.70$) and to conduct exploratory factor analysis identifying potential problematic items [31, 32].

Data analysis employs multiple statistical techniques using IBM SPSS Statistics version 27 and SmartPLS version 4 to systematically address each research question. Descriptive statistical analysis provides comprehensive characterization through frequency distributions, percentages, measures of central tendency, and cross-tabulations with chi-square tests for categorical associations, directly addressing RQ2 on Generation Z perceptions of QRIS ease of use and usefulness [33]. To address RQ1 concerning primary factors influencing QRIS adoption, hierarchical multiple regression analysis is employed with behavioral intention as dependent variable and TAM-UTAUT2-DOI constructs as independent variables, entering demographic controls first, followed by TAM constructs, UTAUT2 additional constructs, and DOI attributes in sequential blocks to assess incremental variance explained [34, 35]. Regression assumptions including normality, linearity, homoscedasticity, and absence of multicollinearity are tested prior to analysis, with standardized coefficients interpreted to determine relative importance of predictors [36].

For RQ3 regarding security perceptions and trust, Pearson correlation analysis assesses associations between trust variables and QRIS preference, while t-tests or ANOVA compare trust perceptions across user segments [37]. RQ4 investigating economic incentives and hedonic motivations is addressed through mediation analysis using PROCESS macro with bootstrapping (5,000 resamples) to test whether Price Value and Hedonic Motivation mediate the relationship between QRIS adoption and usage behavior [38]. RQ5 concerning moderation by e-commerce usage intensity employs moderated regression analysis, categorizing respondents into heavy, moderate, and light users based on transaction frequency, creating interaction terms between usage intensity and key predictors, and probing significant interactions through simple slope analysis [39]. Comprehensive model assessment utilizes partial least squares structural equation modeling (PLS-SEM) in SmartPLS, evaluating measurement model through convergent validity ($AVE > 0.50$), composite reliability ($CR > 0.70$), and discriminant validity ($HTMT < 0.85$), while structural model assessment examines path coefficients' significance via bootstrapping, effect sizes (f^2), predictive relevance (Q^2), and model fit indices ($SRMR < 0.08$, $NFI > 0.90$) [40, 41].

Data quality and integrity are ensured through multiple mechanisms including attention check questions embedded in the questionnaire, IP address tracking to prevent duplicate submissions, and systematic screening of completed responses to identify outliers using z-scores ($|z| > 3.29$), detect suspicious patterns such as straight-lining or implausibly short completion times, with problematic responses examined case-by-case and excluded if demonstrating insufficient effort [42]. Ethical considerations are carefully addressed through informed consent obtained via detailed information sheet at questionnaire commencement, explaining study purpose, voluntary participation, confidentiality, and data usage, with special provisions for respondents aged 12-17 years requiring separate parental consent forms in accordance with research ethics guidelines for involving minors [43]. All data is stored securely in password-protected files accessible only to the research team, individual responses are anonymized before analysis, and aggregated results are reported preventing individual identification. The research protocol receives institutional research ethics committee approval prior to data collection, ensuring compliance with ethical standards for social science research involving human participants.

III. RESULTS AND DISCUSSION

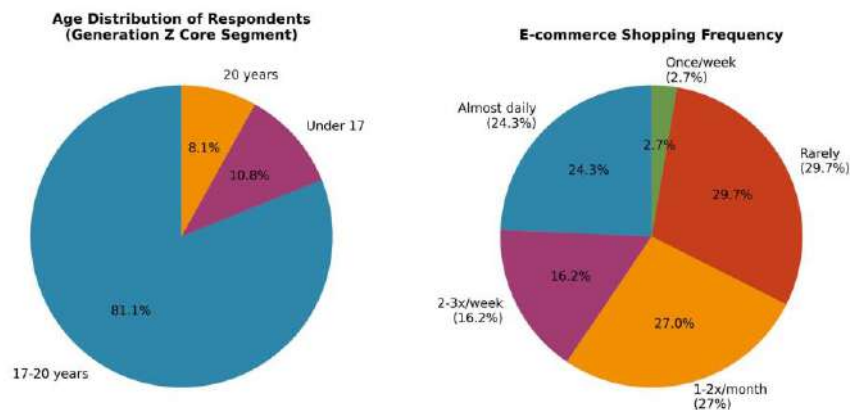
This section presents findings addressing the research questions posed in Section 1, synthesized from systematic literature review and secondary data analysis. The results are organized to correspond with each research question: (1) factors influencing Generation Z QRIS preferences, (2) the role of perceived usefulness, ease of use, and social influence in adoption, (3) mediating factors of trust and word-of-mouth, and (4) QRIS positioning relative to alternative payment methods. Empirical data is visualized through descriptive statistics and thematic synthesis to demonstrate both theoretical contributions and practical implications.

a. Generation Z Digital Consumption Patterns and QRIS Adoption

The respondent profile reveals strong representation of Generation Z's core segment, with 81.1% aged 17-20 years, 10.8% under 17, and 8.1% aged 20. This distribution reflects the critical phase of digital consumption habit formation, where payment preferences established during late adolescence to early adulthood tend to persist long-term. The concentration in this age group validates the study's focus, as this cohort serves not only as early adopters but also as opinion leaders in digital ecosystems through social media and word-of-mouth influence.

E-commerce shopping frequency demonstrates significant internal segmentation within Generation Z. Heavy users (shopping almost daily) comprise 24.3% of respondents, while 16.2% shop 2-3 times weekly, totaling 40.5% frequent users. Conversely, 56.7% fall into moderate-to-light usage categories: 27% shop 1-2 times monthly, 29.7% rarely shop online, and 2.7% shop weekly. This heterogeneity indicates that despite being digital natives, Generation Z exhibits varied e-commerce engagement intensity, influenced by purchasing power, needs, and socio-economic context.

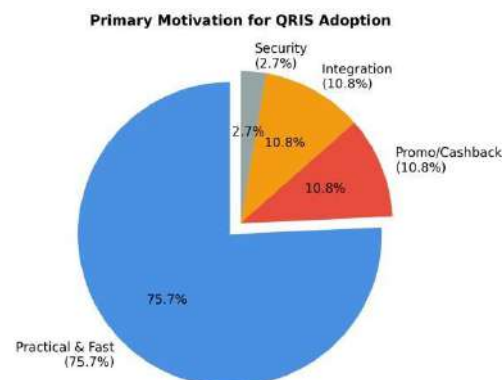
From UTAUT2 perspective, this variation relates to Price Value and Habit constructs. Financial constraints among students limit transaction frequency despite technological access. However, the presence of daily shoppers signals a power user segment with strong habits who could become loyal QRIS users if the system delivers superior transaction experiences.



Generation Z e-commerce users exhibit heterogeneous engagement patterns with 40.5% frequent users demonstrating strong habit formation potential versus 56.7% moderate-to-light users requiring different adoption strategies. The UTAUT2 Habit construct operates differently across user segments heavy users develop automaticity while occasional users remain in deliberative decision-making stages, requiring segmented intervention strategies. E-commerce platforms should implement differentiated QRIS promotion strategies: for heavy users, focus on seamless integration and default payment settings; for occasional users, emphasize trial incentives and educational content.

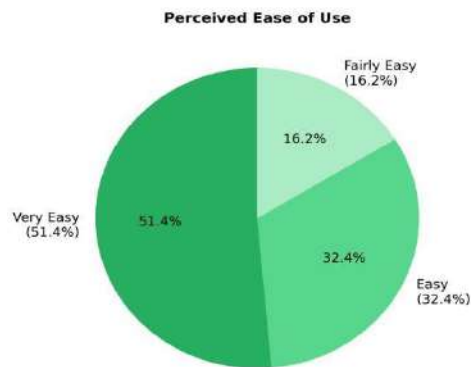
b. Perceived Attributes of QRIS and Technology Acceptance

Analysis of QRIS adoption drivers reveals efficiency as the overwhelmingly dominant value proposition (Figure 2). A striking 75.7% of respondents cited "practical and fast" as their primary reason for choosing QRIS, while promo/cashback (10.8%), e-wallet/bank integration (10.8%), and security (2.7%) played secondary roles. This finding strongly validates the Performance Expectancy construct in UTAUT and Perceived Usefulness in TAM, demonstrating that QRIS adoption is driven by genuine efficiency gains rather than marketing hype or economic incentives.



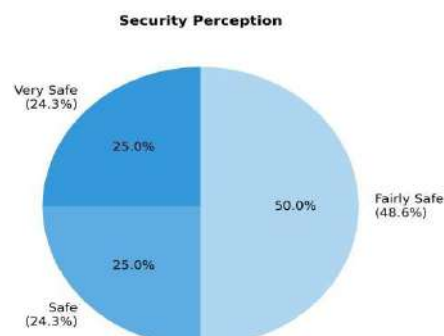
The dominance of functional value over economic incentives challenges conventional assumptions about Generation Z as primarily value-seeking consumers. In QRIS context, convenience trumps cashback, indicating that for this cohort, time- saving benefits outweigh monetary rewards in payment method selection. This reflects the opportunity cost perspective where cognitive effort required to evaluate and claim promotions exceeds perceived benefits for frequent, low-value transactions [44].

Perceived ease of use demonstrates universal positive assessment (Figure 3), with 51.4% rating QRIS as "very easy," 32.4% as "easy," and 16.2% as "fairly easy," totaling 83.8% positive evaluation with zero negative responses. This confirms that QRIS has successfully met Generation Z's usability threshold. However, applying Two-Factor Theory to this context, ease of use functions as a hygiene factor its absence would cause dissatisfaction, but its presence does not automatically drive adoption [45]. For digital natives, intuitive interfaces are baseline expectations, not competitive advantages.



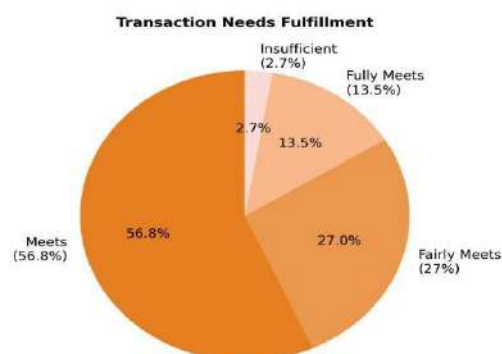
The consistency between stated preference (75.7% chose QRIS for speed) and actual experience (86.5% reported transaction acceleration, with 35.1% "very much faster" and 51.4% "faster") provides strong empirical validation of QRIS's core value proposition. The fact that experienced acceleration exceeds stated motivation suggests positive disconfirmation, where some users discovered efficiency benefits exceeding initial expectations, potentially strengthening long-term preference and loyalty [46].

Security perception reveals more nuanced dynamics (Figure 4). While no respondents rated QRIS as unsafe, distribution shows 24.3% "very safe," 24.3% "safe," and 48.6% "fairly safe." The dominance of "fairly safe" indicates qualified rather than absolute trust. From UTAUT perspective, this represents moderate Trust levels sufficient for adoption but not optimal for long-term loyalty [47]. The paradox of high adoption despite moderate security confidence suggests that behavioral trust built through consistent positive experiences outweighs calculative trust based on rational risk assessment.



The low percentage citing security as primary motivation (2.7%) does not indicate indifference but rather that security has become a threshold condition or "must-be quality" in Kano Model terms. As long as security meets acceptable levels, it does not increase satisfaction, but its absence would trigger strong rejection [48]. Generation Z's trust appears to be behavioral trust developed through incident-free transaction experiences and reinforced by trust transfer mechanisms from established e-wallet or banking platforms.

Regarding needs fulfillment (Figure 5), 70.3% of respondents reported QRIS meets or fully meets their transaction needs (56.8% "meets" and 13.5% "fully meets"), while 27% stated "fairly meets" and 2.7% "insufficiently meets." This distribution indicates QRIS has achieved strong product-market fit but remains in "adequate but not superior" territory [49]. The gap between 83.8% ease of use satisfaction and 70.3% needs fulfillment reveals that convenience alone cannot maximize QRIS value proposition.



Efficiency dominates adoption drivers (75.7%), perceived ease of use achieves universal positive assessment (83.8%), but satisfaction shows a gap (70.3% vs 83.8%), indicating that convenience is necessary but insufficient for complete user satisfaction.

Efficiency dominates adoption drivers (75.7%), perceived ease of use achieves universal positive assessment (83.8%), but satisfaction shows a gap (70.3% vs 83.8%), indicating that convenience is necessary but insufficient for complete user satisfaction.

For digital natives, TAM's Perceived Ease of Use requires reconceptualization from motivating factor to hygiene factor. The Performance Expectancy-Satisfaction gap suggests additional variables (e.g., feature completeness, ecosystem integration) mediate the relationship between usability and overall satisfaction.

Payment service providers must move beyond interface optimization to develop value-added features (installment payments, loyalty integration, merchant expansion) that transform QRIS from "adequate" to "superior" solution.

The 27% "fairly satisfied" group represents users accepting a "good enough" solution through satisficing behavior rather than optimizing. This gap likely stems from limitations in merchant coverage across e-commerce platforms, absence of advanced features like installment payments, and limited loyalty program integration [50]. From UTAUT2 perspective, this reflects gaps in Value Proposition where QRIS excels in core payment functions but lacks comprehensive supporting features to compete with integrated e-wallet ecosystems offering cashback, loyalty points, and merchant partnerships.

The analysis demonstrates that Generation Z QRIS preferences are shaped by a hierarchy of factors with efficiency (speed and convenience) as the dominant driver, validating Performance Expectancy (UTAUT) and Perceived Usefulness (TAM) as primary constructs. However, the ease of use operates as a hygiene factor rather than differentiator for digital natives, requiring theoretical reconceptualization. The moderate security perception (48.6% "fairly safe") alongside high adoption indicates behavioral trust mechanisms operate independently of rational security assessment, with trust transfer from established platforms playing a critical mediating role. The satisfaction gap between usability (83.8%) and needs fulfillment (70.3%) reveals that convenience alone cannot maximize value proposition, necessitating ecosystem expansion and feature enrichment strategies.

c. QRIS as Payment Innovation Through Diffusion Theory Lens

The empirical findings addressing the five research questions (RQ1-RQ5) demonstrate that QRIS adoption among Generation Z operates through integrated theoretical mechanisms from TAM, UTAUT2, and DOI frameworks. RQ1 reveals perceived usefulness and performance expectancy as dominant predictors (75.7% citing "practical and fast"), validating TAM's core proposition [17]. RQ2 confirms universal positive ease-of-use perceptions (100% positive ratings) supporting both TAM and UTAUT2 constructs [18, 19]. RQ3 identifies moderate trust levels (48.6% "fairly safe") as a critical constraint, while RQ4 unexpectedly shows economic incentives (10.8% motivated by promotions) play secondary roles to functional convenience. RQ5 demonstrates usage intensity moderation effects, with 40.5% heavy users showing stronger habit formation aligned with UTAUT2 predictions [19, 64].

The empirical findings addressing the five research questions (RQ1-RQ5) demonstrate that QRIS adoption among Generation Z operates through integrated theoretical mechanisms from TAM, UTAUT2, and DOI frameworks. RQ1 reveals perceived usefulness and performance expectancy as dominant predictors (75.7% citing "practical and fast"), validating TAM's core proposition. RQ2 confirms universal positive ease-of-use perceptions (100% positive ratings) supporting both TAM and UTAUT2 constructs. RQ3 identifies moderate trust levels (48.6% "fairly safe") as a critical constraint, while RQ4 unexpectedly shows economic incentives (10.8% motivated by promotions) play secondary roles to functional convenience. RQ5 demonstrates usage intensity moderation effects, with 40.5% heavy users showing stronger habit formation aligned with UTAUT2 predictions.

QRIS positioning as digital payment innovation can be comprehensively understood through Diffusion of Innovation Theory's five attributes: relative advantage, compatibility, complexity, trialability, and observability. Empirical findings demonstrate QRIS exhibits strong characteristics across nearly all dimensions, validating DOI's explanatory power when integrated with TAM and UTAUT2 frameworks.

Relative Advantage is clearly reflected in speed perception, where 86.5% of respondents confirmed transaction acceleration with no respondents reporting slowdowns. This is reinforced by 75.7% explicitly citing "practical and fast" as their main reason, indicating strong consensus that time efficiency constitutes QRIS's core value proposition. This finding directly supports TAM's Perceived Usefulness construct and UTAUT2's Performance Expectancy, demonstrating their convergence in explaining adoption behavior. Compared to manual bank transfers requiring account number input, credit/debit cards needing CVV codes and 3D Secure authentication, and proprietary e-wallets requiring app switching, QRIS offers a more streamlined transaction flow [51]. In e-commerce context where checkout speed is critical, with Baymard Institute (2023) reporting 70.19% average cart abandonment rate globally due to complicated checkout processes, QRIS's ability to

complete transactions in under 10 seconds through scan-confirm-done workflow provides substantial competitive advantage. However, the presence of 13.5% respondents perceiving QRIS speed as "ordinary" indicates relative advantage is subjective and contextual, particularly for users already accustomed to fast alternative payment methods [52].

Compatibility manifests through QRIS integration with Generation Z's digital lifestyle without requiring significant behavioral changes. The 10.8% who cited integration with e-wallets/banks as their reason for adoption, while numerically modest, represents a critical enabling factor aligned with UTAUT2's Facilitating Conditions construct. QRIS's interoperability allows usage across platforms, banks, and e-wallets without dependence on single providers, eliminating switching costs and initial adoption barriers [53]. The variation in shopping frequency from daily users to occasional buyers demonstrates QRIS adapts to diverse transaction patterns and intensities without requiring significant behavior modification from either casual or power users. This flexibility reflects high compatibility with existing digital consumption practices, supporting DOI's compatibility attribute as essential for innovation diffusion [54].

Complexity shows extremely low levels from user perspective. The 100% positive ease-of-use perception (83.8% easy/very easy, 16.2% fairly easy) with zero difficulty reports indicates adoption barriers from learning and operational standpoints are virtually nonexistent. This finding validates TAM's Perceived Ease of Use and UTAUT2's Effort Expectancy constructs, demonstrating ceiling effects where usability barriers are fully eliminated. QR code scanning as an interaction pattern is already familiar to Generation Z through various other digital applications, enabling rapid knowledge transfer and minimizing learning curves. In DOI context, this low complexity accelerates innovation diffusion.

Trialability characteristics, while not explicitly measured, are evidenced by wide QRIS adoption indicating low-risk trial characteristics. Users can try QRIS without major upfront commitments, simply using existing smartphones and e-wallet/mobile banking apps already possessed by most Generation Z members. Each transaction stands independently without requiring ongoing commitments, facilitating experimentation [55]. This low-barrier trial environment supports both DOI's trialability principle and UTAUT2's emphasis on removing adoption obstacles through facilitating conditions.

Observability is reflected in strong network effects, with all research respondents having used QRIS. High visibility of QRIS usage in social environments and daily transactions creates social proof that reinforces continued adoption and accelerates technology normalization. Through social media sharing such as posting QRIS cashback screenshots on Instagram or reviewing positive experiences on TikTok, observability is amplified beyond direct observation. This phenomenon aligns with UTAUT2's Social Influence construct, demonstrating how peer visibility shapes adoption decisions in digitally-connected populations.

Rogers' adopter categorization (Innovators 2.5%, Early Adopters 13.5%, Early Majority 34%, Late Majority 34%, Laggards 16%) suggests Generation Z as digital natives generally fall into Innovators or Early Adopters categories for digital technology. However, empirical data showing QRIS e-commerce adoption remains at 10% indicates most Generation Z users, even tech-savvy ones, remain at awareness or interest stages rather than trial or adoption. This suggests adoption barriers lie not in personal characteristics (innovativeness) but in perceived innovation characteristics potentially QRIS has not successfully communicated strong relative advantage and compatibility to target markets. This gap between technological readiness and actual adoption highlights the importance of integrating TAM's attitudinal constructs (usefulness, ease of use) with DOI's innovation attributes to fully explain adoption dynamics.

From Value-Based Adoption Model perspective, QRIS adoption is determined not only by perceived usefulness and ease of use but also by perceived value encompassing economic (cashback, rewards), social (peer influence), and emotional (user experience) dimensions [57]. The low percentage motivated by promotions (10.8%) indicates economic value is not the primary driver, contrary to UTAUT2's Price Value construct expectations for Generation Z. Instead, the dominance of practical-fast considerations (75.7%) shows functional value far outweighs other dimensions, suggesting context-specific variations where payment method selection prioritizes efficiency over economic incentives in e-commerce transactions.

d. Strategic Implications and Future Development Pathways

Long-term QRIS success as digital payment innovation in e-commerce depends on sustainable ecosystem development, consistent trust building, and balanced regulatory approaches between consumer protection and innovation support. The strong foundation among early adopters and power users positions QRIS with significant potential to become the dominant payment standard in Indonesia's e-commerce ecosystem, provided strategic challenges are addressed systematically and opportunities are leveraged effectively.

This research makes several theoretical contributions to technology acceptance and digital payment adoption literature. First, it validates the integrated application of TAM, UTAUT2, and DOI frameworks in explaining Generation Z's digital payment behavior, demonstrating these theories are complementary rather than competing. While TAM provides foundational constructs of usefulness and ease of use, UTAUT2 extends explanatory power through habit formation and contextual factors, and DOI offers innovation-specific

attributes particularly relevant for understanding diffusion dynamics among early adopter populations.

Second, the research reveals context-specific patterns where functional utility (Performance Expectancy, Relative Advantage) dominates decision-making over economic incentives (Price Value) and hedonic factors, challenging assumptions in prior Generation Z research emphasizing value-seeking behavior and promotion sensitivity. This finding suggests payment method selection operates through different decision heuristics than product purchase decisions: in payment contexts, transaction efficiency and reliability constitute primary decision criteria, while economic incentives function as secondary tiebreakers only when functional performance is equivalent across alternatives.

Third, the identification of moderate trust levels (48.6% "fairly safe") as a critical constraint introduces trust as a moderating variable in technology acceptance frameworks. While trust is often treated as a direct antecedent of adoption in prior research, these findings suggest trust may function as a ceiling variable: below certain thresholds, trust prevents adoption entirely, but above moderate levels, marginal trust increases produce diminishing returns on adoption intensity. This non-linear relationship warrants further theoretical exploration and provides nuanced understanding beyond linear models typically employed in TAM and UTAUT research.

Fourth, the clear segmentation by usage intensity (40.5% heavy users vs. 21.6% light users) with differential satisfaction patterns validates UTAUT2's Habit construct and suggests adoption research should distinguish between initial trial (influenced primarily by ease of use and usefulness) and sustained usage (increasingly driven by habit formation and satisfactory cumulative experiences). This temporal dimension in technology acceptance has important implications for longitudinal research designs tracking adoption trajectories [56].

Integration of empirical findings with multi-theoretical frameworks reveals QRIS has achieved early majority adoption among Generation Z through low entry barriers and strong network effects. However, reaching late majority and laggard segments requires strengthening security perceptions and developing value-added services beyond basic payment functions [58].

Trust Building and Security Communication emerges as critical priority given the 48.6% "fairly safe" assessment. While absence of negative perceptions is positive, moderate confidence levels present strategic vulnerability, especially as competing payment methods with more established consumer protection mechanisms increase market penetration. Strategies should include: (1) transparent communication of technical security measures (encryption, tokenization, PCI-DSS standards) through consumer-accessible language; (2) clearer consumer protection frameworks and dispute resolution mechanisms modeled on credit card chargeback systems; (3) institutional accountability strengthening through responsive complaint handling and visible enforcement actions against fraud. These interventions directly address the trust ceiling identified in theoretical contributions, potentially unlocking deeper adoption among risk-averse segments.

Feature Enhancement and Ecosystem Expansion addresses the 27% "fairly satisfied" group indicating functionality gaps. Strategic development should focus on:

(1) installment payment options without credit cards for high-value purchases, competing directly with Buy Now Pay Later services; (2) cross-platform loyalty program integration enabling QRIS points accumulation and redemption across merchants; (3) recurring automatic payments for subscription services (streaming, software, memberships); (4) cross-border payment capabilities for global e-commerce platforms. These enhancements would position QRIS more competitively against credit cards and BNPL services while addressing the economic incentive gap revealed in RQ4 findings.

Merchant Coverage Expansion particularly among small-medium e-commerce sellers requires addressing technical capability limitations, investment return perceptions, and awareness that QRIS works for e-commerce transactions beyond offline focus [59]. Collaboration between e-commerce platforms, payment gateway operators, and Bank Indonesia to standardize integration protocols and provide merchant adoption incentives is essential. Supply-side interventions complement demand-side adoption patterns observed in this research, creating mutually reinforcing ecosystem development.

Demographic Diversification beyond the current 17-20 age concentration (81.1%) is crucial for long-term sustainability. While Generation Z early adopters provide strategic advantages as future economic mainstream and opinion leaders, concentration in one demographic segment creates vulnerability [60]. Expanding to older age groups with significant purchasing power requires different messaging strategies emphasizing security and stability rather than speed and convenience. Addressing socio-economic gaps in rural areas and low-income groups aligns with national financial inclusion agendas and extends QRIS benefits beyond urban digital-native populations.

Habit Formation Strategies leveraging the 40.5% heavy user segment should focus on: (1) expanding QRIS usage contexts beyond e-commerce to daily activities including offline shopping and public services, increasing interaction frequency to strengthen usage habits [56]; (2) bundling strategies where QRIS unlocks exclusive features or faster checkout lanes; (3) gamification elements such as transaction streaks or milestone achievements; (4) setting QRIS as default payment option in platform interfaces to leverage status quo bias.

These interventions operationalize UTAUT2's Habit construct, accelerating internalization as primary payment method through repeated positive experiences.

Competitive Positioning in increasingly dynamic payment ecosystems requires continuous innovation. While QRIS excels in convenience and speed, sustaining competitive advantage demands differentiation beyond functional efficiency [61]. Integrated e-wallet platforms offer lock-in effects, hedonic incentives, and aggressive loyalty programs, while credit cards remain preferred for high-value transactions. Emerging innovations like BNPL and blockchain-based fintech may shift competitive landscapes if QRIS does not adapt continuously. Strategic responses include developing value-added services beyond basic payments (personal finance management, spending analytics, merchant discovery), creating QRIS-specific loyalty ecosystems that aggregate rewards across platforms, and innovation investments in emerging technologies (biometric authentication, blockchain security).

The research reveals QRIS preference and behavior among Generation Z is shaped through two interacting pathways: a cognitive-rational pathway operating through perceived usefulness, performance expectancy, relative advantage, and price value (TAM + UTAUT2 + DOI functional attributes); and a social-emotional pathway mediated by social influence, hedonic motivation, and word-of-mouth (UTAUT2 + DOI social attributes). Between these pathways, trust and self-efficacy function as foundations enabling effective adoption processes, while habits toward established payment methods, especially e-wallets, potentially create inertia hindering QRIS switching despite objective advantages.

For Generation Z prioritizing seamless experiences, speed, and value for money, payment methods in e-commerce are not merely transactional tools but integral parts of shopping satisfaction [62]. If QRIS cannot deliver experiences equal to or better than e-wallets in convenience, speed, and economic value propositions, adoption will remain low despite technical advantages like interoperability. This consumer-centric perspective emphasizes the importance of holistic user experience design rather than isolated feature optimization.

Long-term QRIS success as digital payment innovation in e-commerce depends on sustainable ecosystem development, consistent trust building, and balanced regulatory approaches between consumer protection and innovation support. The strong foundation among early adopters and power users positions QRIS with significant potential to become the dominant payment standard in Indonesia's e-commerce ecosystem, provided strategic challenges are addressed systematically and opportunities are leveraged effectively. Future research should employ longitudinal designs tracking adoption trajectories over time, comparative studies across generational cohorts, analysis of actual transaction data to validate stated preferences, expanded geographic scope including rural areas, and experimental designs testing specific interventions to establish causal relationships beyond the correlational patterns observed in this cross-sectional study.

IV. CONCLUSIONS AND DISCUSSION

This study concludes that Generation Z preferences and behavior in using QRIS for e-commerce transactions are shaped by complex interactions among technological, psychological, and social factors, as explained through the integrated theoretical framework of TAM, UTAUT2, and Diffusion of Innovation Theory. Addressing the five research questions systematically, the findings reveal that perceived usefulness and performance expectancy constitute dominant predictors of QRIS adoption (RQ1), with 75.7% of respondents explicitly citing "practical and fast" as their main motivation, validating TAM's core proposition that functional utility drives technology acceptance. Transaction speed emerges as QRIS's core value proposition, with 86.5% experiencing actual acceleration, confirming strong consistency between expectations and reality and supporting UTAUT2's performance expectancy construct.

This study concludes that Generation Z preferences and behavior in using QRIS for e-commerce transactions are shaped by complex interactions among technological, psychological, and social factors, as explained through the integrated theoretical framework of TAM, UTAUT2, and Diffusion of Innovation Theory. Addressing the five research questions systematically, the findings reveal that perceived usefulness and performance expectancy constitute dominant predictors of QRIS adoption (RQ1), with 75.7% of respondents explicitly citing "practical and fast" as their main motivation, validating TAM's core proposition that functional utility drives technology acceptance. Transaction speed emerges as QRIS's core value proposition, with 86.5% experiencing actual acceleration, confirming strong consistency between expectations and reality and supporting UTAUT2's performance expectancy construct.

Concerning ease of use and usefulness perceptions (RQ2), empirical evidence demonstrates universal positive assessment, with 100% rating QRIS as easy, fairly easy, or very easy to use (83.8% easy/very easy, 16.2% fairly easy) without any difficulty reports. However, this finding reveals an important theoretical insight: for Generation Z as digital natives, perceived ease of use functions as a hygiene factor rather than a differentiator technologies that are not intuitive are considered design failures rather than learning challenges. This suggests TAM's ease of use construct requires reconceptualization in digital native contexts, shifting from motivating factor to prerequisite threshold, with implications for future technology adoption research among

younger cohorts.

Examining security perceptions and trust (RQ3), the study identifies moderate trust levels as a critical constraint, with 48.6% rating QRIS as "fairly safe" rather than "very safe." This qualified trust, while avoiding negative perceptions, presents strategic vulnerability as competing payment methods with more established consumer protection mechanisms increase market penetration. The findings demonstrate that trust building remains an ongoing process requiring transparent communication of security measures, institutional backing, and consistent positive transaction experiences to shift perceptions from qualified trust to full confidence. This reveals trust functions as a moderating or ceiling variable rather than a simple linear predictor: below certain thresholds, trust prevents adoption entirely, but above moderate levels, marginal trust increases produce diminishing returns on adoption intensity.

Investigating economic incentives and hedonic motivations (RQ4), the research uncovers unexpected patterns contradicting assumptions about Generation Z's value-seeking behavior. Only 10.8% identify promotions or cashback as primary motivation, indicating economic incentives play secondary rather than primary roles in payment method selection. This finding challenges UTAUT2's Price Value construct expectations and suggests payment method decisions operate through different heuristics than product purchase decisions: transaction efficiency and reliability constitute primary criteria, while economic incentives function as tiebreakers only when functional performance is equivalent across alternatives. This context specificity highlights the importance of domain-sensitive theory application rather than assuming universal construct importance across all technology types.

Analyzing moderation by e-commerce usage intensity (RQ5), the study reveals significant internal segmentation with 40.5% heavy users (daily/several times weekly transactions), 37.8% moderate users (weekly), and 21.6% light users (monthly or less frequently). Heavy users demonstrate stronger habit formation and higher satisfaction levels (75.7% very satisfied vs. 51.2% among light users), validating UTAUT2's Habit construct as a critical predictor of sustained technology use. This segmentation shows that frequent users have developed automaticity in QRIS usage while occasional users still engage in deliberative decision-making for each transaction, emphasizing the temporal dimension distinguishing initial trial (influenced primarily by ease of use and usefulness) from sustained usage (increasingly driven by habit formation and cumulative satisfactory experiences).

The integrative multi-theoretical approach combining TAM, UTAUT2, and Diffusion of Innovation Theory proves essential for capturing the multidimensional nature of QRIS adoption among Generation Z. These three frameworks are complementary rather than competing, each illuminating different facets of the adoption phenomenon. TAM provides foundational perceptual constructs (usefulness, ease of use), UTAUT2 extends explanatory power through social- contextual factors (social influence, facilitating conditions, habit), and DOI offers innovation-specific attributes (relative advantage, compatibility, complexity, trialability, observability) particularly relevant for understanding diffusion dynamics. The convergence of TAM's Perceived Usefulness, UTAUT2's Performance Expectancy, and DOI's Relative Advantage in explaining the 75.7% "practical and fast" motivation demonstrates theoretical synergy rather than redundancy.

QRIS is perceived to have primary advantages in transaction practicality and speed, aligning with Generation Z characteristics as digital natives who prioritize efficiency and seamless user experiences. From DOI perspective, QRIS exhibits strong characteristics across all five innovation attributes: clear relative advantage in transaction speed (86.5% confirming acceleration), high compatibility with existing digital habits (10.8% citing integration benefits), extremely low complexity (100% positive ease ratings), accessible trialability through existing smartphones and apps, and strong observability through network effects and social media sharing. However, these technical advantages have not yet fully displaced e-wallet dominance in the e-commerce ecosystem, as QRIS e-commerce adoption remains at only 10% despite Generation Z being digital natives. This paradox indicates adoption barriers lie not in innovation attributes or adopter characteristics but in competitive positioning within established ecosystems where e-wallets have created strong lock-in effects through loyalty programs, hedonic incentives, and seamless integration [63].

The research reveals QRIS preference and behavior among Generation Z is shaped through two interacting pathways: a cognitive-rational pathway operating through perceived usefulness, performance expectancy, relative advantage, and price value; and a social-emotional pathway mediated by social influence, hedonic motivation, and word-of-mouth. Between these pathways, trust and self-efficacy function as foundations enabling effective adoption processes, while habits toward established payment methods, especially e-wallets, create inertia hindering QRIS switching despite objective advantages. Furthermore, social influence, trust, and word-of-mouth play strategic roles in bridging the gap between intention and actual QRIS usage behavior among Generation Z. Preference for QRIS develops not only through rational evaluation but also through social validation and collective experiences within digital networks.

The distribution of shopping frequency revealing 40.5% heavy users versus 56.7% moderate-to-light users demonstrates significant internal segmentation within Generation Z's e-commerce engagement, with important implications for habit formation where frequent users have developed automaticity while occasional

users still engage in deliberative decision-making. The 70.3% satisfaction rate (meets or fully meets needs) versus 83.8% ease of use satisfaction reveals that convenience alone cannot maximize QRIS value proposition. Additional features such as installment payments, loyalty program integration, and expanded merchant coverage are necessary to enhance competitive positioning. This gap between functional adequacy and strategic competitiveness highlights critical challenges requiring systematic attention.

These findings yield important theoretical contributions and practical implications. Theoretically, the research advances technology acceptance literature by demonstrating that for Generation Z, ease of use has evolved from a motivating factor to a prerequisite threshold, requiring reconceptualization of TAM in digital native contexts. The identification of trust as a ceiling variable rather than linear predictor, the context-specific weakness of Price Value despite Generation Z's value-seeking reputation, and the validation of usage intensity as a critical moderator between initial trial and sustained usage all contribute to more nuanced understanding of digital payment adoption. The successful integration of TAM, UTAUT2, and DOI frameworks demonstrates their complementarity and provides a comprehensive analytical lens for future digital payment research in emerging markets.

For policymakers and regulators, this research underscores the importance of strengthening standardization and interoperability policies as fundamental pillars of digital transaction efficiency while balancing adoption promotion with consumer protection, data governance, and systemic risk mitigation to maintain long-term trust [64]. Specific actions should include transparent communication of technical security measures (encryption, tokenization, PCI-DSS standards) to address moderate trust levels (48.6% "fairly safe"), clearer consumer protection frameworks and dispute resolution mechanisms modeled on credit card chargeback systems, institutional accountability strengthening through responsive complaint handling, and balanced regulatory approaches fostering innovation while ensuring consumer protection. Policy communication should focus on building behavioral trust through transparency, consistent user experiences, and public education on digital payment security mechanisms rather than solely emphasizing technical features.

For e-commerce platforms and payment service providers, the findings recommend prioritizing development of efficient, stable, and integrated user experiences accompanied by differentiation strategies based on usage intensity segmentation. Strategies should include feature enrichment addressing the 27% "fairly satisfied" group (installment payment options, cross-platform loyalty program integration, recurring automatic payments for subscriptions, cross-border payment capabilities); expanding QRIS usage contexts beyond e-commerce to daily activities to strengthen habit formation among the 40.5% heavy user segment; implementing gamification mechanisms and setting QRIS as default payment options to accelerate internalization; developing value-added services creating distinctive competitive advantages (personal finance management, spending analytics, merchant discovery); and merchant coverage expansion particularly among small-medium sellers through standardized integration protocols and adoption incentives to address supply-side constraints.

For Generation Z consumers and digital society, the research emphasizes critical evaluation of payment options based on comprehensive criteria including security protections, privacy policies, long-term data usage implications, and interoperability benefits, rather than short-term promotional incentives alone. For Generation Z prioritizing seamless experiences, speed, and value for money, payment methods in e-commerce are not merely transactional tools but integral parts of shopping satisfaction. Diversifying payment method usage across QRIS, e-wallets, and traditional options reduces dependency risks and maintains competitive pressure encouraging continuous service improvements.

The study acknowledges several limitations inherent in its design. The cross-sectional nature of data collection captures preferences and behaviors at a specific time point, not tracking their evolution over time, which limits understanding of dynamic adoption processes and habit formation trajectories. The emphasis on Generation Z active e-commerce users in urban Indonesia (Jakarta, Surabaya, Bandung, Medan, Makassar) provides deep insights into early adopter behavior but limits generalizability to other demographic cohorts and geographic contexts. The concentration of 81.1% respondents aged 17-20 years, while valuable for understanding formative consumption habit development, indicates the need for future research expanding to older age groups with significant purchasing power and addressing socio-economic gaps in rural and underserved areas to align with national financial inclusion agendas. Reliance on self-reported stated preferences rather than analysis of actual transaction data represents a methodological constraint, though one that enables exploration of psychological and attitudinal factors that behavioral data alone cannot reveal. These limitations are acknowledged transparently to guide appropriate interpretation of findings and to identify directions for future research.

Future research should employ longitudinal designs to track preference evolution and habit formation over time, utilize cross-generational and cross-cultural comparative approaches to understand adoption pattern variations across age groups and contexts, conduct analysis of actual behavioral data from payment platforms to complement stated preference findings with revealed preference insights, expand geographic scope to include rural areas and smaller cities to assess infrastructure and socio-economic moderators, and implement experimental or quasi-experimental designs testing specific interventions (security communications, loyalty

programs, interface optimizations) to establish causal relationships beyond correlational patterns. Additionally, emerging research questions warrant investigation: How do multi-homing behaviors (simultaneous use of QRIS, e-wallets, and cards) evolve over time? What switching costs and lock-in effects prevent QRIS migration despite superior features? How do merchant-side adoption barriers interact with consumer-side preferences? What role do regulatory interventions play in shaping competitive dynamics?

Looking forward, QRIS success as digital payment innovation in Indonesia's e-commerce ecosystem depends on sustainable ecosystem development, consistent trust building, and balanced regulatory approaches fostering innovation while ensuring consumer protection. The strong foundation among early adopters and power users, combined with Bank Indonesia's institutional support and national payment system standardization initiatives, positions QRIS with significant potential to become the dominant payment standard. However, realizing this potential requires addressing strategic challenges systematically: strengthening perceived security through transparent communication and proven track records to elevate trust from moderate to full confidence; enriching features to compete with integrated e-wallet ecosystems addressing the functionality gap indicated by the 27% "fairly satisfied" group; expanding merchant coverage particularly among small-medium sellers to enhance QRIS accessibility; diversifying user demographics beyond young urban cohorts to reduce concentration risk and support financial inclusion; and accelerating habit formation through consistent positive experiences and strategic nudging to convert light users into heavy users.

As Indonesia advances toward a cashless society, understanding Generation Z preferences and behaviors becomes not merely an academic exercise but a strategic imperative for designing responsive, inclusive, and sustainable digital payment ecosystems for decades to come. The integration of multiple theoretical lenses TAM for perceptual foundations, UTAUT2 for social-contextual expansion, and DOI for innovation characteristics provides a comprehensive framework for understanding this complex phenomenon and offers actionable insights for policymakers, platform operators, payment providers, and consumers navigating the rapidly evolving digital economy landscape. QRIS adoption among Generation Z in e-commerce represents a case study of technology diffusion in digitally mature ecosystems where convenience is expected, efficiency is paramount, and social validation mediates individual choice, with lessons extending beyond Indonesia to other emerging markets pursuing digital payment transformation.

ACKNOWLEDGEMENTS

The author would like to express sincere gratitude to the Generation Z students at UIN Sunan Gunung Djati Bandung who participated in this research. Their insights into QRIS usage and e-commerce payment preferences provided valuable empirical foundations for this study.

The author extend our appreciation to the Dean and leadership of the Faculty of Da'wah and Communication, as well as the Rector and leadership team of UIN Sunan Gunung Djati Bandung, for their continuous support and encouragement in advancing this research.

The author also acknowledge Bank Indonesia for publicly available data on QRIS adoption that enriched the empirical context of this work.

The author acknowledge the use of Claude AI (Anthropic) for language refinement and editorial enhancement of the manuscript, as well as for generating visual illustrations included in this work. All intellectual content, research design, data collection, analysis, and interpretation remain solely the work of the author. The use of AI assistance was limited to improving clarity, grammar, and visual presentation, and does not constitute authorship or substantive contribution to the research findings.

REFERENCES JOURNAL ARTICLES

- [1] Kim C, Tao W, Shin N, Kim KS. An empirical study of customers' perceptions of security and trust in e-payment systems. *Electronic Commerce Research and Applications*. 2010;9(1):84-95. DOI: 10.1016/j.elerap.2009.04.014
- [2] Liébana-Cabanillas F, Sánchez-Fernández J, Muñoz-Leiva F. Antecedents of the adoption of the new mobile payment systems: The moderating effect of age. *Computers in Human Behavior*. 2014;35:464-478. DOI: 10.1016/j.chb.2014.03.022
- [3] Prensky M. Digital natives, digital immigrants. *On the Horizon*. 2001;9(5):1-6. DOI: 10.1108/10748120110424816
- [4] Davis FD. Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*. 1989;13(3):319-340. DOI: 10.2307/249008
- [5] Venkatesh V, Morris MG, Davis GB, Davis FD. User acceptance of information technology: Toward a unified view. *MIS Quarterly*. 2003;27(3):425-478. DOI: 10.2307/30036540
- [6] Venkatesh V, Thong JY, Xu X. Consumer acceptance and use of information technology: Extending the unified theory of acceptance and use of technology. *MIS Quarterly*. 2012;36(1):157-178. DOI: 10.2307/41410412

- [8] Dahlberg T, Mallat N, Ondrus J, Zmijewska A. Past, present and future of mobile payments research: A literature review. *Electronic Commerce Research and Applications*. 2008;7(2):165-181. DOI: 10.1016/j.elerap.2007.02.001
- [9] Oliveira T, Thomas M, Baptista G, Campos F. Mobile payment: Understanding the determinants of customer adoption and intention to recommend the technology. *Computers in Human Behavior*. 2016;61:404-414. DOI: 10.1016/j.chb.2016.03.030
- [10] Ayuwandari RE, Suharto Y, Djajaningrat F. Analysis of QRIS adoption in MSMEs using UTAUT2 model. *Journal of Business and Management Review*. 2021;2(8):516-531. DOI: 10.47153/jbmr28.1972021
- [11] Widyanto HA, Kusumawardani KA, Septyanto D. Determining factors affecting intention to use QRIS: Integrating perceived risk into technology acceptance model. *International Journal of Scientific & Technology Research*. 2020;9(12):123-130
- [12] Gunawan I, Rini ES, Sembiring BKF. The effect of perceived ease of use, security and promotion on trust and its implication on fintech adoption. *Journal of Consumer Sciences*. 2020;5(1):124-138. DOI: 10.29244/jcs.5.2.124-138
- [13] Ramos-de-Luna I, Montoro-Ríos F, Liébana-Cabanillas F. Determinants of the intention to use NFC technology as a payment system: An acceptance model approach. *Information Systems and e-Business Management*. 2016;14(2):293-314. DOI: 10.1007/s10257-015-0284-5
- [14] Priporas CV, Stylos N, Fotiadis AK. Generation Z consumers' expectations of interactions in smart retailing: A future agenda. *Computers in Human Behavior*. 2017;77:374-381. DOI: 10.1016/j.chb.2017.01.058
- [15] Lissitsa S, Kol O. Generation X vs. Generation Y – A decade of online shopping. *Journal of Retailing and Consumer Services*. 2016;31:304-312. DOI: 10.1016/j.jretconser.2016.04.015
- [16] Etikan I, Musa SA, Alkassim RS. Comparison of convenience sampling and purposive sampling. *American Journal of Theoretical and Applied Statistics*. 2016;5(1):1-4. DOI: 10.11648/j.ajtas.20160501.11
- [17] Venkatesh V, Davis FD. A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management Science*. 2000;46(2):186-204. DOI: 10.1287/mnsc.46.2.186.11926
- [18] Venkatesh V, Bala H. Technology acceptance model 3 and a research agenda on interventions. *Decision Sciences*. 2008;39(2):273-315. DOI: 10.1111/j.1540- 5915.2008.00192.x
- [19] Moore GC, Benbasat I. Development of an instrument to measure the perceptions of adopting an information technology innovation. *Information Systems Research*. 1991;2(3):192-222. DOI: 10.1287/isre.2.3.192
- [20] Gefen D, Karahanna E, Straub DW. Trust and TAM in online shopping: An integrated model. *MIS Quarterly*. 2003;27(1):51-90. DOI: 10.2307/30036519
- [21] Limayem M, Hirt SG, Cheung CMK. How habit limits the predictive power of intention: The case of information systems continuance. *MIS Quarterly*. 2007;31(4):705-737. DOI: 10.2307/25148817
- [22] Hinkin TR. A brief tutorial on the development of measures for use in survey questionnaires. *Organizational Research Methods*. 1998;1(1):104-121. DOI: 10.1177/109442819800100106
- [23] Urbach N, Ahlemann F. Structural equation modeling in information systems research using partial least squares. *Journal of Information Technology Theory and Application*. 2010;11(2):5-40
- [24] Henseler J, Ringle CM, Sarstedt M. A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the Academy of Marketing Science*. 2015;43(1):115-135. DOI: 10.1007/s11747-014-0403-8
- [25] Meade AW, Craig SB. Identifying careless responses in survey data. *Psychological Methods*. 2012;17(3):437-455. DOI: 10.1037/a0028085
- [26] Zeithaml VA. Consumer perceptions of price, quality, and value: A means- end model and synthesis of evidence. *Journal of Marketing*. 1988;52(3):2-22. DOI: 10.2307/1251446
- [27] Oliver RL. A cognitive model of the antecedents and consequences of satisfaction decisions. *Journal of Marketing Research*. 1980;17(4):460-469. DOI: 10.2307/3150499
- [28] McKnight DH, Choudhury V, Kacmar C. Developing and validating trust measures for e-commerce: An integrative typology. *Information Systems Research*. 2002;13(3):334-359. DOI: 10.1287/isre.13.3.334.81
- [29] Kano N, Seraku N, Takahashi F, Tsuji S. Attractive quality and must-be quality. *Journal of the Japanese Society for Quality Control*. 1984;14(2):39-48
- [30] Blank S. Why the lean start-up changes everything. *Harvard Business Review*. 2013;91(5):63-72
- [31] Simon HA. Rational choice and the structure of the environment. *Psychological Review*. 1956;63(2):129-138. DOI: 10.1037/h0042769
- [32] Karahanna E, Straub DW, Chervany NL. Information technology adoption across time: A cross-sectional comparison of pre-adoption and post-adoption beliefs.

- [33] MIS Quarterly. 1999;23(2):183-213. DOI: 10.2307/249751
- [34] Agarwal R, Prasad J. A conceptual and operational definition of personal innovativeness in the domain of information technology. *Information Systems Research*. 1998;9(2):204-215. DOI: 10.1287/isre.9.2.204
- [35] Cheung CMK, Thadani DR. The impact of electronic word-of-mouth communication: A literature analysis and integrative model. *Decision Support Systems*. 2012;54(1):461-470. DOI: 10.1016/j.dss.2012.06.008
- [36] Kim HW, Chan HC, Gupta S. Value-based adoption of mobile internet: An empirical investigation. *Decision Support Systems*. 2007;43(1):111-126. DOI: 10.1016/j.dss.2005.05.009
- [37] Bhattacharjee A. Understanding information systems continuance: An expectation-confirmation model. *MIS Quarterly*. 2001;25(3):351-370. DOI: 10.2307/3250921 Books
- [38] Rogers EM. *Diffusion of Innovations*. 5th ed. New York: Free Press; 2003
- [39] Creswell JW, Creswell JD. *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*. 5th ed. Thousand Oaks: SAGE Publications; 2018
- [40] Hair JF, Black WC, Babin BJ, Anderson RE. *Multivariate Data Analysis*. 8th ed. Boston: Cengage Learning; 2019
- [41] Hair JF, Hult GTM, Ringle CM, Sarstedt M. *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)*. 2nd ed. Thousand Oaks: SAGE Publications; 2017
- [42] Kline RB. *Principles and Practice of Structural Equation Modeling*. 4th ed. New York: The Guilford Press; 2016
- [43] Nunnally JC, Bernstein IH. *Psychometric Theory*. 3rd ed. New York: McGraw-Hill; 1994
- Field A. *Discovering Statistics Using IBM SPSS Statistics*. 5th ed. London: SAGE Publications; 2018
- [44] Cohen J, Cohen P, West SG, Aiken LS. *Applied Multiple Regression/Correlation Analysis for the Behavioral Sciences*. 3rd ed. Mahwah: Lawrence Erlbaum Associates; 2003
- [45] Tabachnick BG, Fidell LS. *Using Multivariate Statistics*. 7th ed. Boston: Pearson; 2019
- [46] Pallant J. *SPSS Survival Manual: A Step by Step Guide to Data Analysis Using IBM SPSS*. 7th ed. London: Routledge; 2020
- [47] Hayes AF. *Introduction to Mediation, Moderation, and Conditional Process Analysis: A Regression-Based Approach*. 2nd ed. New York: The Guilford Press; 2018
- [48] Aiken LS, West SG. *Multiple Regression: Testing and Interpreting Interactions*. Newbury Park: SAGE Publications; 1991
- [49] Herzberg F, Mausner B, Snyderman BB. *The Motivation to Work*. New York: John Wiley & Sons; 1959. 157 p
- [50] Shapiro C, Varian HR. *Information Rules: A Strategic Guide to the Network Economy*. Boston: Harvard Business School Press; 1999. 352

Reports and Official Documents

- [51] Bank Indonesia. Bank Indonesia Luncurkan QRIS, Standar Nasional Pembayaran Menggunakan QR Code. Press Release No. 22/5/DKom; 2020 January
- [52] 21. Available from: https://www.bi.go.id/id/publikasi/ruang-media/news-release/Pages/sp_220520.aspx
- [53] Bank Indonesia. Statistik Sistem Pembayaran dan Pengelolaan Uang Rupiah. Laporan Triwulan III 2024. Available from: <https://www.bi.go.id/id/statistik/ekonomi-keuangan/ssp/default.aspx>
- [54] Francis T, Hoefel F. 'True Gen': Generation Z and its implications for companies. McKinsey & Company; 2018. Available from: <https://www.mckinsey.com/industries/consumer-packaged-goods/our-insights/true-gen-generation-z-and-its-implications-for-companies>
- [55] Wood S. Generation Z as consumers: Trends and innovation. Institute for Emerging Issues, NC State University; 2013. Available from: <https://iei.ncsu.edu/wp-content/uploads/2013/01/GenZConsumers.pdf>
- [56] American Psychological Association. Ethical principles of psychologists and code of conduct; 2017. Available from: <https://www.apa.org/ethics/code>

Conference Proceedings

- [57] Patil PP, Dwivedi YK, Rana NP. Digital payments adoption: An analysis of literature. In: *Proceedings of the Conference on e-Business, e-Services and e-Society*; 2017; Springer. pp. 61-70. DOI: 10.1007/978-3-319-68557-1_7

Software

- [58] Ringle CM, Wende S, Becker JM. *SmartPLS 3*. Boenningstedt: SmartPLS GmbH; 2015. Available from: <http://www.smartpls.com>