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Integrating Cue Utilization Theory and SOR Framework for Digital Payment Use Among Jakarta Millennials

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Abstract
Purpose: This study explains why digital payment adoption remains uneven among Jakarta's millennials despite high online shopping activity, by integrating Cue Utilization Theory with the Stimulus–Organism–Response framework and positioning Technology Adoption as a higher-order construct linking extrinsic and intrinsic cues to actual digital payment behaviour.
Research Methodology: Data were collected via a self-administered online questionnaire targeting Jakarta-based millennials. After screening for eligibility and data quality, 162 valid responses were analysed using PLS-SEM with SmartPLS and Jamovi.
Results: Perceived convenience (β=.509, p<.001) and perceived security (β=.309, p<.001) as intrinsic cues positively and significantly affected Technology Adoption, whereas social influence and promotion and discount as extrinsic cues had no significant effects. Technology Adoption significantly predicted Use of Digital Payment (β=.643, p<.001) and mediated the effects of perceived convenience (β=.327, p < .001) and perceived security (β=.199, p<.001), but not those of the extrinsic cues.
Conclusions: Among digitally mature urban millennials, functional and security-related attributes outweigh social pressure or monetary incentives in driving sustained digital payment use, underscoring Technology Adoption's role as the mechanism that translates cue evaluation into actual behaviour.
Limitations: The study is limited to one generational cohort in Jakarta and a cross-sectional design, restricting generalisability and the ability to capture how usage evolves over time.
Contributions: This study integrates CUT with the SOR framework and guides fintech providers and policymakers to prioritise usability and trust over promotional and social-influence strategies

Keywords: *Cue Utilization Theory, Digital Payment, Jakarta Millennials, Stimulus–Organism–Response, Technology Adoption*

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1. Introduction
Digital payment has evolved from a convenient add-on to a structural pillar of contemporary economic life, and a nation's competitiveness is now closely tied to how effectively it weaves digital

innovation into its broader socio-economic system (Zhao, Shen, & Jiang, 2024). Several Asian economies illustrate what that integration can look like in practice: China, Singapore, and Malaysia have each cultivated mobile payment ecosystems that are widely regarded as mature (Best, 2022; Kemp, 2023a). Indonesia's trajectory tells a different story. Despite ranking among the world's largest digital markets, with a population approaching 281 million, its mobile payment penetration sits at a modest 24.2 percent ((Kemp, 2023a)). What makes this figure striking is the contrast it forms with online shopping behaviour: roughly 62.6 percent of Indonesians, or about 176 million people, already shop online regularly (Kredivo & Katadata, 2023). The arithmetic leaves an estimated 108.5 million consumers who buy online yet stop short of paying digitally a gap wide enough that Indonesia has been identified as having the third-highest resistance to digital payment adoption globally, trailing only China and India (Fidelity, 2022).

This tension is not evenly distributed across generations; it is especially pronounced among Jakarta's millennials, broadly defined as those born between 1981 and 1996. As the largest generational cohort in the country, millennials account for roughly 25.87 percent of the national population and drive close to 46.2 percent of all online transactions (Kemp, 2024; Rainer, 2023). Yet their mobile payment adoption hovers around 46 to 47 percent, trailing behind Generation Z's 51 to 58 percent, and this is despite millennials generally commanding higher income levels (IDN, 2022a). This pattern persists even though the government has worked to strengthen the digital payment ecosystem through the National Non-Cash Movement (Gerakan Nasional Non-Tunai), the Indonesia Payment System Blueprint 2025, and the rollout of QRIS (Bank, 2019; Permana, & Apriani, 2025; Sugiarti, Rusmana, Soedirman, & Tengah, 2022) . Most of these initiatives, however, concentrate on infrastructure rails, standards, interoperabilit while the psychological undercurrents that keep users, particularly in an already infrastructure-mature market like Jakarta, hesitant remain comparatively underexplored (Statista, 2025).

A closer look at the adoption literature suggests part of the reason why. Much of the existing work still leans on linear frameworks such as the Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT) to account for usage intention and behaviour (Usman, Rianto, & Aujirapongpan, 2025). These models are useful but incomplete: they say relatively little about how external stimuli are filtered through internal psychological processes before surfacing as actual use (Nguyen, Tran, Thai, Duong, & Nguyen, 2024). Compounding this, findings on the roles of convenience, security, social influence, and financial incentives as long-term drivers of adoption have been inconsistent across studies, and the once-dominant "cash-burning" strategy flooding the market with promotions and subsidies appears to be losing traction among urban millennials who already possess considerable digital literacy and decision-making autonomy.

Taken together, these gaps point to a shortfall in the literature: existing adoption models rarely explain how extrinsic and intrinsic cues are cognitively processed before they translate into actual digital payment use, and studies focused specifically on Jakarta's millennials a segment that is digitally engaged yet inconsistent in its adoption remain scarce. The present study addresses this gap by integrating Cue Utilization Theory into a Stimulus–Organism–Response (SOR) framework, examining how extrinsic cues (promotion and discount, social influence) and intrinsic cues (perceived convenience, perceived security) shape the Use of Digital Payment. Technology Adoption built from perceived usefulness and perceived ease of use is positioned here as a hierarchical mediator linking these stimuli to actual usage behaviour. Jakarta's millennials offer a particularly instructive setting for this inquiry: they combine high digital engagement and economic stability with digital payment usage rates that remain modest even in a market with mature infrastructure (Kemp, 2023b; Kredivo and Katadata, 2023).

The novelty of this study lies in treating Technology Adoption as a hierarchical mediating mechanism linking cue-based stimuli to actual usage behaviour, an integration that has not been explicitly tested within Jakarta's millennial segment. Accordingly, the objective of this study is twofold: to examine how extrinsic and intrinsic cues shape Technology Adoption and, in turn, the Use of Digital Payment, and to test Technology Adoption's mediating role in that relationship. Theoretically, the study contributes by extending the integration of Cue Utilization Theory and the SOR framework to the digital payment domain, offering a fuller account of the cognitive mechanisms linking external stimuli to usage behaviour; practically, its findings are intended to inform how fintech providers and policymakers can design more effective strategies to expand digital payment use among Jakarta's millennials.

2. Literature Review and Hypotheses Development

2.1 Cue Utilization Theory

The idea that consumers rely on external signals when they cannot directly assess quality can be traced to Olson (1978), who introduced Cue Utilization Theory (CUT) to explain how individuals use cues as proxy indicators under uncertainty (Tian, Gao, Lin, Yu, & Li, 2026; Wang, Cui, Huang, & Dai, 2016). CUT distinguishes between intrinsic cues, which are inherent to the product or service, and extrinsic cues, such as promotions, discounts, and social influence (Chen, Tong, Yang, & Zhou, 2023; Tian et al., 2026)

Not all cues are equally influential; their effects depend on diagnosticity, or how relevant and reliable a cue is perceived to be in evaluating service performance(Chen et al., 2023; Wang et al., 2016). In technology contexts, extrinsic cues may dominate initial evaluation, whereas intrinsic cues may become more influential as users gain experience (Chen et al., 2023; (Tian et al., 2026)).

Despite these insights, CUT-based research has predominantly examined retail, hospitality, and live-streaming contexts, with limited application to financial technology. Digital payment involves repeated and security-sensitive transactions, making it a distinct context for examining cue diagnosticity. This study therefore extends CUT to digital payment by examining how intrinsic and extrinsic cues shape Technology Adoption and subsequent payment use.

2.2 Stimulus–Organism–Response Framework

The Stimulus–Organism–Response (SOR) framework, proposed by Mehrabian and Russell (1974), explains how environmental stimuli influence internal states and subsequently shape behavioural responses. Recent digital payment studies show that technological, social, and environmental stimuli influence cognitive evaluations before adoption or usage behaviour (Chen et al., 2023; Nguyen et al., 2024; Zhu et al., 2023). This study conceptualises Social Influence, Promotion & Discount, Perceived Convenience, and Perceived Security as stimuli, Technology Adoption as the organism, and Use of Digital Payment as the response. Technology Adoption is operationalised as a higher-order construct comprising Perceived Usefulness and Perceived Ease of Use. This integration extends SOR by incorporating cue utilisation to explain digital payment behaviour among Jakarta millennials.

CUT identifies and differentiates intrinsic and extrinsic cues based on their diagnosticity, whereas SOR explains how stimuli are processed through an internal state before producing behavioural responses. Their integration therefore provides a more differentiated explanation of how specific cues shape Technology Adoption and subsequent digital payment use, addressing the limitation of earlier models that often treat external factors as homogeneous antecedents.

2.3 Technology Adoption as a Higher-Order Organism

The Technology Acceptance Model (TAM) identifies Perceived Usefulness and Perceived Ease of Use as central cognitive beliefs underlying technology adoption (Davis, 1989), with both constructs widely applied in digital technology, mobile payment, and fintech research (Marangunić & Granić, 2015; Venkatesh & Davis, 2000). This study conceptualises PU and PEOU as Lower-Order Components (LOCs) forming the Higher-Order Construct (HOC) of Technology Adoption, consistent with higher-order modelling in PLS-SEM (Hair et al., 2022). Within SOR, Technology Adoption represents the organism that connects cue stimuli to Use of Digital Payment. This approach consolidates PU and PEOU into a coherent adoption pathway and represents a key theoretical contribution of the study.

2.4 Technology Adoption and Use

Technology adoption and technology use, while often discussed together, are not the same thing. (Kim & Crowston, 2011) break the adoption process into three stages: pre-adoption, adoption, and post-adoption Figure 1 . The first two stages capture the evaluation and acceptance side of the process, while post-adoption reflects the continued, routinised use of a technology once it has become embedded in a person's activities.

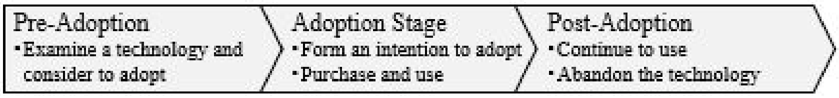

Figure 1. Technology Adoption Process

Building on this distinction, the present study treats Technology Adoption as the evaluative and acceptance stage specific to digital payment, while Use of Digital Payment represents the actual behavioural stage that follows, corresponding to post-adoption. Technology Adoption is therefore positioned as the mediator capturing the adoption process itself, and Use of Digital Payment as the outcome reflecting sustained usage, as illustrated in Figure 1 and Figure 2 (Kim & Crowston, 2011).

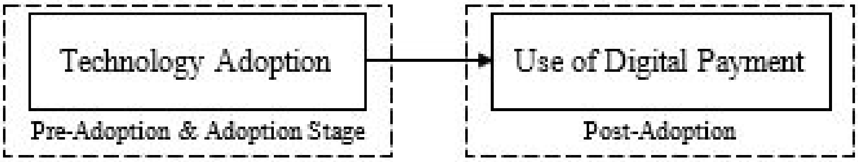

Figure 2. Conceptual of Technology Adoption & Use of Digital Payment

2.5 Hypotheses Development

2.5.1 Extrinsic Cue to Technology Adoption

Social Influence (SI) refers to the extent to which individuals consider the opinions of important others, such as family, friends, and peers, when adopting a technology (Al-Qudah, Al-Okaily, Shiyyab, Taha, Almajali, & Warrad, 2024; Venkatesh, Morris, Davis, & Davis, 2003; Wang, Chen, & Liu, 2026). Prior studies have reported a positive effect of SI on technology adoption (Duy, & Giang, 2022; Kuria, Peters, & Wabwoba, 2022; Mbuya, Chachage, & Pasape, 2025; Sebastián, Antonovica, & Sarmiento, 2023). However, other studies suggest that its influence diminishes when technology use is voluntary and users operate in digitally mature environments (Kariapper, 2021; Usman, Rianto, & Aujirapongpan, 2025; Venkatesh et al., 2003). This inconsistency suggests that the role of social influence may depend on the technological maturity of users and context. Given the continued relevance of social networks in shaping technology-related perceptions among Jakarta millennials (Hameed, Akram, Khan, Khan, & Hameed, 2024; IDN, 2022b), this study tests whether Social Influence remains an important extrinsic cue for Technology Adoption (TA). This reasoning leads to the following hypothesis:

> H_1*:* As an extrinsic cue, Social Influence has a positive effect on Technology Adoption

Promotion & Discount (PD) refers to financial incentives such as cashback, price reductions, and reward points that increase the perceived value of digital payment services and encourage adoption (Bernando, & Ramli, 2023; Yeo, Tan, Lim, Lee, Chelvarayan, & Leong, 2026; Zhang, Ariffin, Richardson, & Wang, 2023). These incentives function as a cue-to-action, nudging a favourable attitude toward an actual adoption decision more quickly than it might otherwise occur (Chang, Gunawan, & Sumarwan, 2023; Su, Paradis, & Kuo, 2023; Yeo et al., 2026). Previous studies have found that promotions and discounts positively influence digital payment adoption, particularly among younger users (Auralia, Manggabarani, & Wahyudi, 2022; Linh, 2025; Su et al., 2023). However, recent studies suggest that their influence may weaken in digitally mature markets, where users become less responsive to promotional incentives and financial benefits (Kraiwanit, Limna, &

Wattanasin, 2024; Oladipo, Oladipo, Abiodun, Adigbole, Eroundu, Ajagbe, Ogundele, & Stella, 2025). This inconsistency indicates that the effectiveness of promotional incentives may depend on the maturity and characteristics of users. Given the relevance of economic value to digital payment decisions (Chang et al., 2023; Sebastián et al., 2023), this study tests whether Promotion & Discount remains an important extrinsic cue for TA. Accordingly:

H_2: As an extrinsic cue, Promotion & Discount has a positive effect on Technology Adoption

2.5.2 Intrinsic Cue to Technology Adoption

Perceived Convenience (PC) captures a user's subjective sense of time efficiency, operational ease, and flexibility when interacting with a system (Al-Qudah, Al-Okaily, Shiyyab, Taha, Almajali, & Warrad, 2024; Lai, & Liew, 2021). When digital payment is easy and efficient, users are more likely to evaluate it positively and consider adopting it (Al-Qudah et al., 2024; Su, Paradis, & Kuo, 2023). Convenience has been identified as a significant predictor of fintech adoption (Al-Qudah et al., 2024; Wang, & Peters, 2025). This positive effect has also been reported among digitally oriented users (Kee, 2022; Kraiwanit, Limna, & Wattanasin, 2024; Yeo, Tan, Lim, Lee, Chelvarayan, & Leong, 2026). However, the extent to which convenience influences TA may vary across contexts and user groups. Given the importance of transaction efficiency in Jakarta's fast-paced urban environment (Al-Qudah et al., 2024; Bernando, & Ramli, 2023), this study tests whether PC remains a significant intrinsic cue for TA. This leads to:

H_3: As an intrinsic cue, Perceived Convenience has a positive effect on Technology Adoption

Perceived Security (PS) reflects a user's confidence that a given digital platform can adequately protect personal data and transaction integrity against cyber threats or misuse (Mbuya, Chachage, & Pasape, 2025). Feeling secure is, in a sense, a prerequisite for trust—it keeps perceived risk in check and allows users to build the internal confidence needed to adopt a financial technology in the first place (Liébana-Cabanillas, Ghazanfar, Higueras-Castillo, & Wagner, 2025). Most empirical work in this area confirms that security ranks among the more decisive factors shaping cognitive adoption decisions (Lai and Liew, 2021; Mbuya et al., 2025; Wang and Peters, 2025). However, contradictory findings indicate that security may be less influential among highly technology-oriented users, who may prioritise functional benefits (Duy, & Giang, 2022; Thapaliya, & Dongol, 2026). This inconsistency suggests that the role of security may vary across user characteristics and contexts. Given the importance of security in digital payment decisions, particularly in the Jakarta context (Mbuya et al., 2025), this study tests whether Perceived Security remains a significant intrinsic cue for Technology Adoption. Thus:

H_4: As an intrinsic cue, Perceived Security has a positive effect on Technology Adoption

2.5.3 Technology Adoption and Use of Digital Payment

Technology Adoption (TA) represents the cognitive state of users, capturing both Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) (Davis et al., 1989). A positive evaluation of a technology's usefulness and ease of use is expected to encourage its actual use (Usman et al., 2025). The integration of PU and PEOU has been shown to significantly underlie individuals' behavioural intention to adopt fintech services (Haripin & Fatmawati, 2026). Prior research also supports a positive relationship between technology acceptance and actual technology use (Purwanto et al., 2023). However, recent studies suggest that positive technology evaluations do not always translate into consistent use, particularly in some market contexts (Nguyen et al., 2024; Usman et al., 2025). Given Jakarta's relatively mature digital payment infrastructure, Technology Adoption is expected to translate into actual use (Bernando & Ramli, 2023). Hence:

H_5: Technology Adoption has a positive effect on Use of Digital Payment

2.5.4 The Mediating Role of Technology Adoption

Within the Stimulus–Organism–Response paradigm, TA occupies the organism position, acting as the cognitive bridge connecting external and internal stimuli to actual behavioural response (Nguyen et al., 2024). This mediating mechanism implies that environmental stimuli such as promotion and social influence, along with system-level cues such as convenience and security, do not translate directly into actual use they first have to pass through an internal evaluative process (Nguyen et al., 2024; Usman et al., 2025). Although prior research supports the role of TA as a cognitive mechanism linking stimuli to behavioural outcomes, the mediating effects of these specific cues may vary across contexts. This provides a rationale for testing whether TA mediates the relationships between each cue and UDP among Jakarta millennials (Bernando & Ramli, 2023; Purwanto et al., 2023). Based on this reasoning:

H_6a: Technology Adoption mediates the effect of Social Influence on Use of Digital Payment

H_6b: Technology Adoption mediates the effect of Promotion & Discount on Use of Digital Payment

H_6c: Technology Adoption mediates the effect of Perceived Convenience on Use of Digital Payment

H_6d: Technology Adoption mediates the effect of Perceived Security on Use of Digital Payment

2.5.5 Research Model

The research model proposed in this study builds on the literature review outlined in Section 2, grounded in CUT, the SOR framework, and the TA perspective. Broadly speaking, the study proposes that external and internal cue stimuli function as stimuli influencing TA, which in turn drives UDP. TA is further hypothesised to serve as a mediating variable, explaining how cue stimuli translate into UDP. Based on these hypothesised relationships, the proposed research model is presented in Figure 3 below.

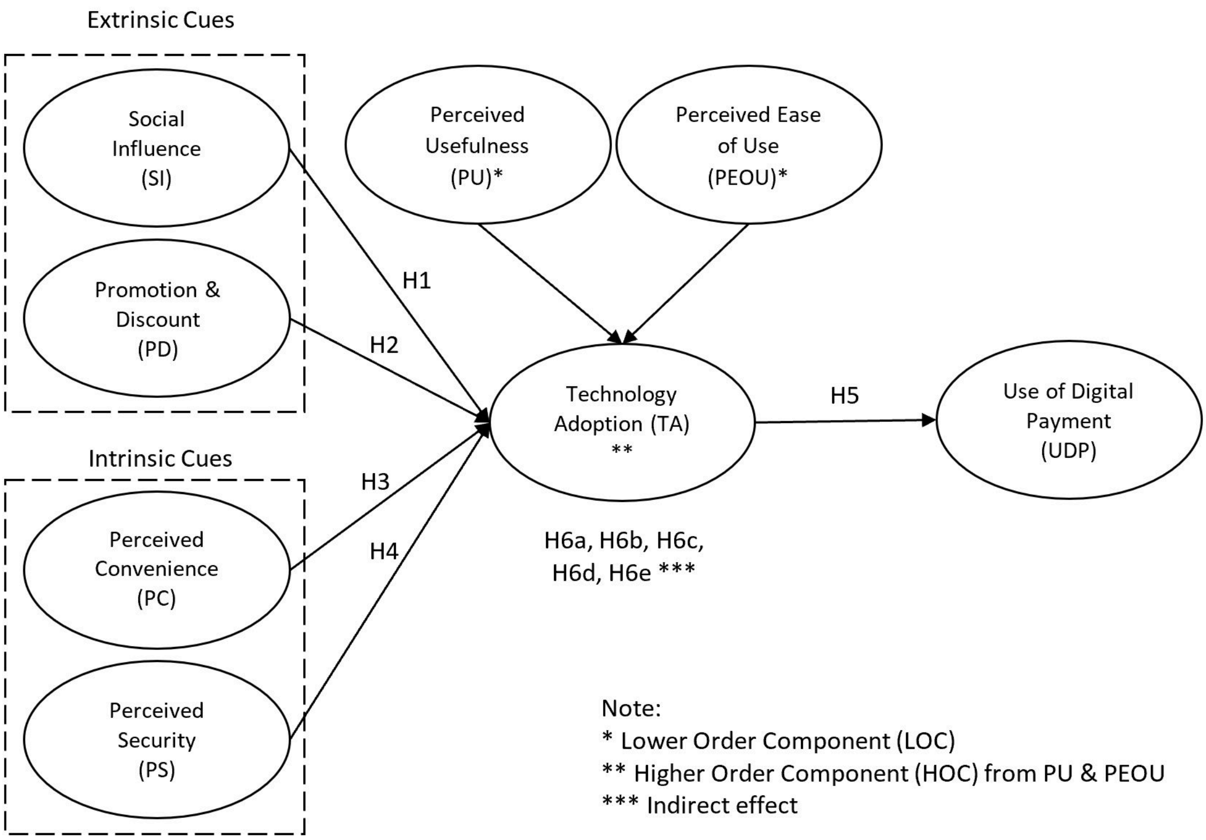

Figure 3. Proposed Research Model

3. Research Methodology

3.1 Research Design and Philosophy

This study is grounded in a positivist philosophy, one that places a premium on objectivity and on knowledge that can be empirically verified (Saunders et al., 2009, p. 113). The reasoning follows a deductive path: hypotheses are drawn from existing theory and then tested against quantitative data (Saunders et al., 2009). Data collection relied on an online questionnaire survey, chosen for its ability to gather numerical data systematically from a fairly large population (Saunders et al., 2009). The time horizon is cross-sectional, meaning data were collected at a single point in time to capture a snapshot of the phenomenon under investigation (Saunders et al., 2009).

3.2 Population, Sampling, and Sample Size

The target population comprises millennials (born 1981–1996) residing in DKI Jakarta who have prior experience as online shoppers. Jakarta was selected given its standing as an economic hub with a comparatively well-established digital payment infrastructure. Sampling followed a purposive, non-probability approach, in which respondents were selected based on criteria directly relevant to the study's objectives (Saunders et al., 2009, p. 237). The minimum sample size was determined using the Inverse Square Root method (Hair, Hult, Ringle, & Sarstedt, 2017, p. 24; Kock & Hadaya, 2018). Assuming a minimum significant path coefficient of .20 and a significance level of 5%, this translates into a minimum requirement of 155 respondents (Kock & Hadaya, 2018).

3.3 Research Instrument and Measurement

Data were collected through a self-administered questionnaire (Saunders et al., 2009, p. 360), structured into four parts: (1) an introduction outlining the study's purpose, (2) respondent demographic information, (3) formative indicator statements for the extrinsic and intrinsic cues, along with TA (PU and PEOU), and (4) statements measuring the UDP variable. All variables were measured on a 7-point Likert scale, ranging from (1) strongly disagree to (7) strongly agree. Indicators were adapted from relevant prior literature to ensure content validity. Table 1 presents the variable labels, statement wording, and the corresponding literature sources from which each indicator was adapted.

Table 1. Variables Labelling and Statements Development

Label	Statement	Reference
Promotion & Discount (PD)		
PD1	If digital payment offers a price discount, it could be a reason for me to use it.	(Osman et al., 2011)
PD2	I use digital payment because it gives me various discounts.	(Oladipo et al., 2025)
PD3	I prefer digital payment over other payment methods because of more promotional offers.	(Osman et al., 2011)
Social Influence (SI)		
SI1	People who can influence my behaviour (such as family, friends, idols) think that I should use digital payment.	(Kariapper, 2021; Venkatesh et al., 2003, 2012)
SI2	People who are important to me (such as family, friends, idols) think that I should use digital payment.	(Kariapper, 2021; Venkatesh et al., 2003, 2012)
SI3	I use digital payment because most of my friends use it.	(Elias et al., 2020)
SI4	Suggestions and recommendations from friends influence my decision to use mobile payment.	(Elias et al., 2020)
Perceived Convenience (PC)		
PC1	I feel comfortable being able to pay anytime and anywhere through digital payment.	(Al-Qudah et al., 2024)
PC2	I feel comfortable using digital payment because it speeds up the payment process.	(Park, Ahn, Thavisay, & Ren, 2019)

Label	Statement	Reference
PC3	Digital payment makes me feel comfortable as it allows me to conduct financial transactions without cash, plastic cards, or bank transfers.	(Al-Qudah et al., 2024)
PC4	Digital payment makes me feel comfortable because transactions are managed automatically.	(Al-Qudah et al., 2024)
PC5	Digital payment is convenient as my smartphone is usually always with me.	(Wang & Peters, 2025)
Perceived Security (PS)		
PS1	The service provider has the ability to verify user identities to ensure payment security.	(Obidat et al., 2022)
PS2	I feel that the service provider takes security measures to protect my payments.	(Obidat et al., 2022)
PS3	I trust the security of the transaction process in digital payment.	(Wang & Peters, 2025)
PS4	There are government and central bank regulations concerning the security of digital payment services.	(Duy & Giang, 2022)
Perceived Usefulness (PU)		
PU1	Using digital payment increases my effectiveness in conducting purchase transactions.	(Venkatesh & Davis, 2000)
PU2	I find digital payment beneficial for my purchase transactions.	(Venkatesh & Davis, 2000)
Perceived Ease of Use (PEU)		
PEUO1	When using digital payment, my interaction with it is clear and easy to understand.	(Venkatesh & Davis, 2000)
PEUO2	I find digital payment easy to use.	(Venkatesh & Davis, 2000)
PEUO3	I find digital payment easy to use in accomplishing what I want.	(Venkatesh & Davis, 2000)
Use of Digital Payment (UDP)		
UDP1	I frequently use digital payment.	(Vejačka & Štofa, 2017)
UDP2	I use digital payment more often than conventional payment methods.	(Vejačka & Štofa, 2017)
UDP3	I use digital payment as my primary method for making online purchases.	(Vejačka & Štofa, 2017)

3.4 Data Analysis Technique: PLS-SEM

Data were analysed using Partial Least Squares Structural Equation Modelling (PLS-SEM), with SmartPLS 3.2.9 and Jamovi 2.7.38 as the supporting software. PLS-SEM was selected for its capacity to handle complex structural models, latent variables, and non-normally distributed data (Hair, Hult, Ringle, Sarstedt, et al., 2017; Kock & Hadaya, 2018). The model follows a Hierarchical Component Model (HCM) with a Reflective-Formative type, in which the HOC for TA is formed from PU and PEOU at the LOC level. The HCM was specified as a reflective-formative hierarchical model, with PU and PEOU serving as reflective Lower-Order Components (LOCs) and TA specified as a formative Higher-Order Component (HOC). The remaining constructs PC, PS, SI, PD, and UDP were also specified as reflective LOCs. This specification distinguishes the measurement properties of the LOCs from those of the formative HOC.

In line with reflective-formative HCM specifications, the LOC were assessed as reflective constructs because their indicators represent manifestations of the underlying constructs and are expected to correlate. In contrast, TA was modelled formatively at the HOC level because PU and PEOU represent conceptually distinct components that jointly form TA. Following Hair et al. (2022), the HCM was estimated using a two-stage approach. In Stage 1, the reflective LOCs were estimated and their latent variable scores were obtained. In Stage 2, the latent variable scores of PU and PEOU were used as formative indicators of the TA HOC, which was then incorporated into the structural model to assess its relationships with the antecedent cues and UDP.

The analysis followed the PLS-SEM evaluation procedure recommended by Hair et al. (2022). First, the measurement models were evaluated according to the reflective or formative specification of each construct. Second, the structural model was assessed sequentially for collinearity, significance and relevance of the structural relationships, explanatory power (R^2), effect sizes (f^2), predictive relevance (Q^2), and predictive effect sizes (q^2).

The analysis proceeded through the following steps:

1. Data Preprocessing: included checking for missing data, detecting potential outliers using box plots, and examining data distribution through skewness and kurtosis.
2. Descriptive Analysis: was conducted using a One-Sample t-test to assess respondents' general tendencies toward the measured variables.
3. Measurement Model Evaluation: The measurement models were evaluated separately according to their reflective or formative specification. For the reflective LOCs (PC, PS, SI, PD, PU, PEOU, and UDP), indicator loadings (≥ .708), internal consistency reliability using Cronbach's alpha and composite reliability (≥.70), and convergent validity using average variance extracted (AVE ≥ .50) were assessed. Discriminant validity was examined using the Fornell-Larcker criterion and the Heterotrait-Monotrait ratio (HTMT < .85 or .90).For the formative TA HOC in Stage 2, the assessment focused on collinearity among its formative indicators (PU and PEOU) using the Variance Inflation Factor (VIF < 5) and the significance and relevance of their outer weights through bootstrapping.
4. Structural Model (Inner Model) Evaluation: The structural model was assessed following the sequence proposed by Hair et al. (2022). First, potential collinearity issues among predictor constructs were examined using VIF. Second, the significance and relevance of the structural relationships were assessed using path coefficients (β), t-values, and p-values. Third, the explanatory power of the endogenous constructs was assessed using the coefficient of determination (R^2). Fourth, the effect sizes (f^2) were examined to determine the contribution of each exogenous construct. Fifth, predictive relevance was assessed using Q^2, followed by q^2 to evaluate the predictive effect size of individual predictors. Hypothesis significance was determined using a bootstrapping procedure with 5,000 subsamples, with statistical significance evaluated at $t > 1.96$ and $p < .05$.

3.5 Pilot Study

Prior to full-scale data collection, a pilot study was conducted with 34 respondents. Initial testing revealed that one indicator, SI3, fell below the .708 loading threshold, prompting a revision of the related questionnaire item to more accurately capture Social Influence and to strengthen construct validity ahead of the main study.

4. Results and Discussions

4.1 Data Collection and Preprocessing

The online survey was conducted from 9 to 23 May 2025 and generated 305 responses. After eligibility screening, 51 responses were excluded for not meeting the Jakarta-millennial criteria. A further 92 responses were excluded following data-quality screening using boxplot inspection and response-pattern checks in Excel, which identified extreme and highly repetitive responses, including straight-lining. Consequently, 162 valid responses were retained for analysis, exceeding the minimum sample size of 155 determined a priori (Kock & Hadaya, 2018). Skewness and kurtosis were also examined to assess data distribution. These procedures helped ensure response quality and minimise potential bias in the PLS-SEM estimates.

4.2 Demographic Characteristics of Respondents

The sample skewed slightly female, at 55.6% compared to 44.4% male, and was dominated by bachelor's degree holders (72.8%), with private-sector employees (37.0%) and students (37.7%) making up the largest occupational groups. Female respondents reported using digital payment more frequently than their male counterparts, particularly within the "often" and "always" usage categories.

4.3 Descriptive Analysis

A One-Sample T-Test (test value = 4) confirmed that all variable means sat significantly above the neutral midpoint ($p < .001$). Perceived Convenience recorded the highest mean score (6.01), followed by Perceived Usefulness (5.76) and Perceived Ease of Use (5.70) an early indication that convenience plays an outsized role in how respondents approach technology adoption.

4.4 Measurement Model Evaluation

The measurement model was evaluated to establish instrument validity and reliability before testing the structural relationships.

4.4.1 Lower-Order Components (LOCs)

As shown in Table 2 every reflective indicator produced outer loadings above the .708 threshold, pointing to a strong relationship between each indicator and its corresponding latent variable. Convergent validity held up well, with Average Variance Extracted (AVE) values for all constructs including PC, PS, and TA exceeding .5. Internal consistency reliability was likewise solid, with Cronbach's Alpha and Composite Reliability values falling within the ideal .70 to .95 range.

Discriminant validity was confirmed through the Fornell-Larcker criterion, where the square root of each construct's AVE exceeded its correlations with other constructs. HTMT values also stayed below the .85/.90 cutoff, reinforcing that each variable in the digital payment model is empirically distinct rather than overlapping.

Table 2. Results Summary for LOCs

Latent Variables	Indicators	Convergent Validity			Internal Consistency Reliability		Discriminant Validity
		Loadings	Indicator Reliability	AVE	Composite Reliability	Cronbach Alpha	
PC	PC1	.818	.670	.700	.921	.892	Yes
	PC2	.856	.732	.700	.921	.892	Yes
	PC3	.897	.804	.700	.921	.892	Yes
	PC4	.865	.748	.700	.921	.892	Yes
	PC5	.740	.547	.700	.921	.892	Yes
PEOU	PEOU1	.825	.681	.701	.875	.786	Yes
	PEOU2	.872	.761	.701	.875	.786	Yes
	PEOU3	.813	.661	.701	.875	.786	Yes
PS	PS1	.828	.686	.636	.874	.808	Yes
	PS2	.825	.681	.636	.874	.808	Yes
	PS3	.813	.661	.636	.874	.808	Yes
	PS4	.718	.516	.636	.874	.808	Yes
PU	PU1	.910	.828	.829	.906	.793	Yes
	PU2	.911	.829	.829	.906	.793	Yes
PD	PD1	.834	.696	.752	.901	.835	Yes
	PD2	.897	.804	.752	.901	.835	Yes
	PD3	.870	.757	.752	.901	.835	Yes
SI	SI1	.868	.753	.608	.860	.795	Yes
	SI2	.812	.660	.608	.860	.795	Yes
	SI3	.713	.508	.608	.860	.795	Yes

Latent Variables	Indicators	Convergent Validity			Internal Consistency Reliability		Discriminant Validity
SI	SI4	.716	.513	.608	.860	.795	Yes
UDP	UDP1	.851	.723	.730	.890	.816	Yes
	UDP2	.848	.720	.730	.890	.816	Yes
	UDP3	.863	.745	.730	.890	.816	Yes

4.4.2 Higher-Order Components (HOCs)

Evaluation of both the reflective and formative measurement models Table 3 revealed no multicollinearity concerns, with all indicator VIF values falling below 5. All outer weights and outer loadings for the formative indicators were statistically significant ($p < .05$), and consequently every indicator was retained in the model.

Table 3. Results Summary for HOCs Formative Measurement Model Evaluation

Reflective Measurement Model Evaluation			Formative Measurement Model Evaluation				
Latent Variables	Indicator	Outer Loading	VIF	Convergent Validity			Decision
				Path Indicator	Outer Weight	Outer Loading	
TA	LVS_PEOU	.918	1.897	LVS_PEOU →TA	.000	.918	Accepted
TA	LVS_PU	.919	1.897	LVS_PU→TA	.000	.919	Accepted
PC	PC1	.820	2.133	PC1→PC	.000	.820	Accepted
PC	PC2	.855	2.440	PC2→PC	.000	.855	Accepted
PC	PC3	.897	3.400	PC3→PC	.000	.897	Accepted
PC	PC4	.864	2.701	PC4→PC	.000	.864	Accepted
PC	PC5	.740	1.665	PC5→PC	.000	.740	Accepted
PS	PS1	.827	1.843	PS1→PS	.000	.828	Accepted
PS	PS2	.827	1.908	PS2→PS	.000	.827	Accepted
PS	PS3	.812	1.741	PS3→PS	.000	.812	Accepted
PS	PS4	.718	1.406	PS4→PS	.000	.718	Accepted
PD	PD1	.835	1.722	PD1→PD	.000	.836	Accepted
PD	PD2	.895	2.576	PD2→PD	.000	.896	Accepted
PD	PD3	.870	2.098	PD3→PD	.000	.870	Accepted
SI	SI1	.869	1.817	SI1→SI	.000	.869	Accepted
SI	SI2	.813	1.770	SI2→SI	.000	.813	Accepted
SI	SI3	.709	1.777	SI3→SI	.000	.709	Accepted
SI	SI4	.716	1.905	SI4→SI	.011	.716	Accepted
UDP	UDP1	.850	1.902	UDP1→UDP	.000	.850	Accepted
UDP	UDP2	.848	1.904	UDP2→UDP	.000	.848	Accepted
UDP	UDP3	.864	1.674	UDP3→UDP	.000	.864	Accepted

4.5 Structural Model Evaluation

Structural model evaluation began by confirming the absence of collinearity between latent variables (Inner VIF < 5). Based on the coefficient of determination (R^2), the independent variables accounted for 65% of the variance in TA (moderate) and 41% of the variance in UDP (moderate). Hypothesis testing through path coefficients produced the following pattern:

1. PC ($\beta = .509$; $t = 6.715$; $p = .000$) and PS ($\beta = .309$; $t = 3.952$; $p = .000$) each showed a positive and statistically significant direct effect on Technology Adoption.

2. TA exerted a strong, positive, and significant effect on UDP (β = .643; t = 13.817; p = .000). By contrast, neither SI (p = .080) nor PD (p = .396) showed a significant effect on TA within this Jakarta millennial sample. A summary of the direct and indirect relationships tested is presented in Table 4 below.

Table 4. Direct and Indiriect Relationship Results

Hypothesis	Relationship	Relationship	β	Mean	SD	T-Test	p-value	
H_1	Direct Effect:	SI⟶TA	.097	.099	.056	1.749	.080	Not Supported
H_2		PD⟶TA	.046	.050	.055	.849	.396	Not Supported
H_3		PC⟶TA	.509	.507	.076	6.715	.000	Supported
H_4		PS⟶TA	.309	.309	.078	3.952	.000	Supported
H_5		TA⟶UDP	.643	.645	.047	13.817	.000	Supported
H_6a	Indirect Effect:	SI⟶ TA⟶ UDP	.063	.064	.036	1.759	.079	Not Supported
H_6b		PD⟶TA⟶ UDP	.030	.032	.036	.840	.401	Not Supported
H_6c		PC⟶TAU ⟶DP	.327	.328	.060	5.473	.000	Supported
H_6d		PS⟶TA⟶ UDP	.199	.199	.050	3.985	.000	Supported

The f² analysis Table 5 indicated that PC exerts a large effect on TA (f^2 = .423), while PS registers a medium effect (f^2 = .146); SI and PD, by comparison, show effects ranging from small to negligible Table 6. The model also demonstrated strong predictive relevance, with Q^2 values of .53 for TA (large) and .29 for UDP (medium), confirming the model's accuracy in predicting digital payment usage.

Table 5. f2 Effect Size

	f2 Effect Size	
PC	.423	Large
PS	.146	Medium
PD	.004	No effect
SI	.02	Small
TA	.703	Very large

Note. f^2 value .02 indicate small, .15 indicate medium, and .35 indicate large (Hair et al., 2019).

Table 6. Predictive Relevance Q2

	SSO	SSE	Q^2 (=1-SSE/SSO)
TA	324.00	150.89	.53
UDP	486.00	345.75	.29

Note. Q^2 value < .25, ≥ .25 and < .50, ≥ .50 indicate small, medium, and large predictive relevance (Hair et al., 2019).

Table 7 the q^2 results show that PC provides a medium predictive contribution to TA (q^2 = .255), while PS has a small contribution (q^2 = .085). SI and PD show no incremental predictive contribution (q^2 = .000), as excluding either predictor leaves Q^2 unchanged at .53. Thus, convenience and security contribute more to the predictive relevance of TA than SI or PD.

Table 7. Predictive Relevance q2 Effect Size

Predictor	Endogenous Construct	Q² Included	Q² Excluded	q²	Effect Size
SI	TA	.53	.53	0	None
PD	TA	.53	.53	0	None
PC	TA	.53	.41	.255	Medium
PS	TA	.53	.49	.085	Small

Note. q^2 value > predictive relavance; .02 small, .15 medium, .35 large (Hair et al., 2019).

Table 8 shows that PLS outperforms the Linear Model (LM) benchmark, as indicated by lower RMSE and MAE values and higher Q²_predict scores. Model fit was assessed using SRMR and NFI Table 9 . The SRMR values of .07 for the saturated model and .08 for the estimated model are within the commonly recommended threshold of .08, indicating acceptable approximate fit, while the NFI of .75 provides additional evidence of model fit. These indices are interpreted as complementary measures of model fit and are not used to assess predictive relevance, which is evaluated separately using Q² and Q²_predict.

Table 8. PLS Predictive Power

	PLS			Linear Model (LM)			RMSEPLS-LM	MAEPLS-LM	Q2PLS-LM
	RMSE	MAE	Q²_predict	RMSE	MAE	Q²_predict	RMSEPLS-LM	MAEPLS-LM	Q2PLS-LM
LVS_PU	67.552	52.446	.548	71.738	55.044	.491	-4.186	-2.599	.058
LVS_PEOU	71.621	56.649	.495	72.581	57.222	.481	-.960	-.573	.014
UDP1	.901	.738	.231	.962	.762	.122	-.062	-.025	.109
UDP2	1.025	.870	.290	1.085	.861	.206	-.059	.009	.085
UDP3	1.155	.947	.149	1.215	.992	.057	-.061	-.045	.092
PLS better than LM when:							PLS < LM	PLS < LM	PLS > LM

Table 9. Model Fit

	Saturated Model	Estimated Model
SRMR	.07	.08
NFI	.75	.75

4.6 Mediation Analysis

Mediation analysis, carried out via bootstrapping with 5,000 subsamples, underscored the pivotal role Technology Adoption plays as a mediator.

1. Significant mediation effects: Technology Adoption significantly mediated the relationship between Perceived Convenience and Use of Digital Payment (H6c), as well as between Perceived Security and Use of Digital Payment (H6d), both at p = .00.
2. Non-significant mediation effects: no meaningful mediation effect emerged for Social Influence (H6a) or Promotion & Discount (H6b) through Technology Adoption.

Table 10. Upsilon Statistics

No.	Effect Size	Statistik Upsilon (v)	Interpretation
		(v) = β2MXβ2YM.X	
1	SI→TA→UDP	(.097).(.643) = .063	(.01) Small effect
2	PD→TA→UDP	(.046).(.643) = .03	(.01) Small effect
3	PC→TA→UDP	(.509).(.643) = .327	(>.175) Large effect
4	PS→TA→UDP	(.309).(.643) = .199	(>.175) Large effect

4.7 Discussions

Taken together, the findings offer a fairly comprehensive picture of the psychological mechanisms driving digital payment use among Jakarta's millennials, achieved by weaving CUT and the SOR framework together. What stands out most is a notable shift in consumer behaviour: intrinsic cues (PC and PS) have come to dominate over extrinsic cues (SI and PD) in shaping both technology adoption and actual usage.

4.7.1 The Dominance of Intrinsic Cues: The Diagnosticity of Convenience and Security

PC emerged as the strongest predictor of TA ($\beta = .509$; $p < .001$), with a large effect size ($f^2 = .423$). This aligns with the descriptive results, where PC recorded the highest mean score (6.01), reinforcing the idea that for millennials navigating a fast-paced metropolis like Jakarta, time efficiency and operational flexibility are no longer merely a "nice-to-have" but have become an essential functional attribute. This pattern echoes several earlier studies that position convenience as a key determinant in digital payment adoption, functioning variously as the primary utility solution, an innovation attribute, a usage facilitator, a critical factor, and a core driver of technology use (Al-Qudah, Al-Okaily, Shiyyab, Taha, Almajali, & Warrad, 2024; Arli, & Bakpayev, 2023; Wang, & Peters, 2025). That said, the result diverges from Kraiwanit, Limna, and Wattanasin (2024), who found perceived risk and social influence to outweigh convenience, and from Kee (2022), whose findings suggest that rewards, ease of use, and trust mattered more than convenience during e-wallet adoption amid the COVID-19 pandemic.

PS likewise showed a significant effect on adoption ($\beta = .309$; $p < .001$). Viewed through the CUT lens, security functions as a highly diagnostic intrinsic cue, one capable of meaningfully lowering perceived risk. Given how often scams, phishing attempts, and data breaches surface in Indonesia's digital landscape, it makes sense that Jakarta millennials would treat platform integrity as a non-negotiable precondition for trust. This finding is broadly consistent with prior research identifying perceived security as an important determinant of digital payment adoption, largely because it builds trust and lowers the psychological barriers to using the technology (Al-Qudah et al., 2024; Arli and Bakpayev, 2023; Lai, & Liew, 2021; Liébana-Cabanillas, Ghazanfar, Higueras-Castillo, & Wagner, 2025; Wu, Wang, & Li, 2026). It runs counter, however, to Duy and Giang (2022) and Park, Ju, Kim, and Chang (2025), who reported that security had no significant bearing on adoption or usage attitudes, particularly in contexts where functional needs and habitual use took precedence.

4.7.2 The Diminishing Role of Extrinsic Cues: A Shift Toward Millennial Autonomy

Unlike much of the earlier TAM- and UTAUT-based literature, this study found that neither SI nor PD had a statistically significant effect on technology adoption among Jakarta millennials ($p > .05$). This marks a meaningful departure from prior work that treated social pressure and financial incentives as primary adoption drivers. The non-significance of SI suggests that millennials in a digitally mature market like Jakarta operate with a fairly high degree of digital literacy and personal autonomy, relying more on rational, functional evaluation than on social norms or recommendations from their immediate circle. This finding lends support to Usman, Rianto, and Aujirapongpan (2025), who similarly observed that social variables tend to lose their explanatory power in voluntary-use contexts among digitally mature populations.

The failure of PD to drive adoption ($\beta = .097$; $p = .080$) points to something resembling a saturation point within the digital payment ecosystem. Incentives may still spark initial interest at the pre-adoption stage, but they no longer appear sufficient to build the stable cognitive evaluation needed for sustained technology adoption, especially in an environment where discounts have become the norm rather than the exception. This contrasts with a body of earlier work showing financial incentives to meaningfully boost adoption by strengthening perceived benefit, attitude, or usage intention (Chang, Gunawan, & Sumarwan, 2023; Elsotouhy, Mobarak, Dakrory, Ghonim, & Khashan, 2025; Linh, 2025; Su, Paradis, & Kuo, 2023; Yeo, Tan, Lim, Lee, Chelvarayan, & Leong, 2026). It aligns more closely, however, with Kraiwanit, Limna, and Wattanasin (2024), Kubota, Ochiai, and Hoshino (2025), Usman et al. (2025), Sebastián, Antonovica, and Sarmiento (2023) and Djamhari, Mustika, Sjabadhyni, and Ndaru (2024), all of whom found that in increasingly mature digital payment markets, promotions and discounts tend to encourage short-term or transactional behaviour without necessarily fostering durable technology adoption, particularly among digitally literate populations.

4.7.3 The Mediating Mechanism of Technology Adoption

One of this study's central contributions lies in validating TA as a robust mediator between intrinsic stimuli and UDP. Within the SOR framework, TA occupies the organism role reflected through perceived usefulness and perceived ease of use processing environmental stimuli before they translate into behavioural response. The significant indirect effects of PC ($\beta = .327$) and PS ($\beta = .199$) on UDP through TA (H6c and H6d) confirm that, for Jakarta millennials, the path from perceiving a cue to actually using the technology is not automatic. It requires successful internal cognitive evaluation, one where the technology is perceived as both useful and easy to use. The sheer magnitude of TA's effect on UDP ($\beta = .643$; $f^2 = .703$) offers strong empirical evidence that routine usage behaviour stems directly from a well-consolidated cognitive acceptance of the technology.

4.7.4 Theoretical Integration: CUT and SOR in Digital Payment

By bringing CUT and SOR together, this study helps unpack the apparent "paradox" of digital payment resistance in Indonesia. The findings suggest that the resistance still observed in the market may stem from policymakers' continued emphasis on extrinsic cues infrastructure, social signals, financial incentives while actual users, millennials in this case, are prioritising the diagnosticity of intrinsic cues instead. As consumers move into the post-adoption stage, their reliance shifts away from external signals and toward attributes that are more rational and functional in nature. Ultimately, this study suggests that in a mature market, the behavioural Response (UDP) hinges largely on how the Organism (TA) evaluates Stimuli in the form of convenience and security.

5. Conclusions

5.1 Conclusion

This study aimed to examine how intrinsic and extrinsic cues influence digital payment use among Jakarta millennials by integrating CUT with the SOR framework and positioning TA as the organism. The findings show that PC and PS significantly strengthen TA, whereas SI and PD do not. TA, in turn, strongly predicts UDP and mediates the effects of convenience and security. These findings support the proposed CUT–SOR integration and identify TA as the key mechanism linking cue evaluation to actual digital payment use.

5.2 Research Limitations

A few limitations should be considered when interpreting the findings. First, the study focuses on millennials in Jakarta, limiting generalisability to other generations and regions. Second, its cross-sectional design captures relationships at a single point in time and cannot establish how Technology Adoption and payment use evolve. Third, the model focuses on constructs derived from CUT and SOR and therefore does not capture other factors that may influence digital payment use.

5.3 Suggestions and Directions for Future Research

Future studies could test the model across generations, regions, and different levels of digital-payment maturity to assess the robustness of the findings. Longitudinal research could further examine how cue diagnosticity, Technology Adoption, and payment use change as users gain experience. Future research could also incorporate additional relevant constructs to extend the explanatory scope of the integrated CUT–SOR model. No consumer remains loyal to a technology service amidst numerous alternatives solely due to incentives, influencer, or community support, which are often perceived as temporary gimmicks. Instead, consumers remain loyal when the service is functional, convenient, and secure to use.

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Author Contributions

DS was responsible for the overall conduct of the study, including conceptualization, research design, data collection, formal analysis, interpretation of results, and preparation, review, and editing of the manuscript. SW contributed specifically to the literature review, analysis, and synthesis of the findings, and provided critical intellectual input to the manuscript.

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