



JAIIM

Journal of AI & Immersive Marketing

Homepage: www.jaiim.azuralwp.com
E-ISSN: 3124-9302



RESEARCH ARTICLE | <https://doi.org/10.53893/JAIIM-V1-2-2026-3>

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Technology-Driven Loyalty: Exploring the Role of Service Quality and Digital Behavior in Indonesia's E-Commerce Landscape

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ABSTRACT

This study investigates the determinants of consumer satisfaction and loyalty in South Sulawesi's e-commerce sector. Drawing on Service Quality Theory and Expectation–Confirmation Theory, the model integrates e-service quality, trust, perceived value, and the moderating effects of customer engagement, digital literacy, and switching cost. Data from 208 respondents were analyzed using PLS-SEM. Results show that service quality strongly enhances satisfaction, which mediates loyalty, while trust and perceived value provide additional explanatory power. Moderators exert small but meaningful effects. The study contributes by contextualizing e-loyalty beyond Java-centric perspectives and offers implications for inclusive, trust-driven digital strategies in emerging markets.

ARTICLE HISTORY

Received: 2 May 2026

Revised: 26 May 2026

Accepted: 28 June 2026

KEYWORDS:

E-loyalty, E-service quality, Sulawesi, Consumer satisfaction

INTRODUCTION

The rapid expansion of e-commerce in Indonesia has fundamentally transformed how consumers interact with businesses and make purchasing decisions. Accelerated by digitalization, rising internet penetration, and the widespread use of smartphones, online platforms have become a dominant channel for retail transactions nationwide (Handoyo, 2024). Despite this growth, much of the existing research has concentrated on major urban centers in Java, such as Jakarta and Bandung, thereby overlooking the dynamics of emerging digital markets in other regions. South Sulawesi, and particularly Makassar, has recently experienced notable growth in online consumption, driven by a combination of high purchasing power, strong consumption culture, and increasing engagement with digital platforms.

Recent studies reveal that consumers in South Sulawesi often demonstrate higher levels of consumption than those in metropolitan areas, marked by impulsive buying behavior, symbolic consumption, and reliance on digital convenience (Sihombing, 2025; Yasmin, 2025). This distinct consumer profile suggests that emotional and habitual factors may exert significant influence on satisfaction and loyalty outcomes. Understanding the mechanisms that drive e-commerce loyalty in this setting thus requires attention not only to service quality but also to trust, perceived value, and the psychological barriers associated with switching platforms.

E-service quality (E-SERVQUAL) has been widely recognized as a fundamental determinant of online customer satisfaction and loyalty (Karim et al., 2023; Racbhini et al., 2021). It includes critical aspects such as efficiency, responsiveness, security, website usability, and personalization. Yet, in much of the literature, E-SERVQUAL has been modeled as a reflective construct, despite increasing scholarly calls to conceptualize it formatively to better

capture its multidimensional nature (Saud et al., 2025; Tyagi et al., 2023). This study adopts the formative approach, highlighting how multiple service dimensions jointly shape user experience and satisfaction.

Beyond service quality, trust emerges as a pivotal factor in digital environments, particularly in developing regions where awareness of digital security continues to evolve. Perceived value further strengthens satisfaction by aligning consumer expectations with perceived benefits. However, the potential moderating effects of switching cost, customer engagement, and digital literacy remain underexplored in regional e-commerce ecosystems. Previous research suggests that switching costs can discourage users from migrating to alternative platforms, even when satisfaction is low (Tsai, 2023; Xu et al., 2021). Similarly, customer engagement enhances emotional attachment and participatory behavior, while digital literacy enables users to better evaluate and benefit from digital services (Kärpänen, 2024).

By integrating these constructs into a single analytical framework, this study addresses a critical gap in the literature by examining how e-service quality affects satisfaction and loyalty within South Sulawesi's e-commerce sector. The study further investigates how psychological and contextual factors interact to shape consumer decision-making in a region with unique cultural and consumption characteristics. In doing so, this research contributes both theoretically and practically to the development of inclusive, trust-oriented, and user-centered digital strategies in emerging Indonesian markets.

LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

Theoretical Foundation

This study employs an integrated theoretical framework that combines Service Quality Theory, Expectation–Confirmation Theory (ECT), Customer Engagement Theory, and Switching Cost Theory to explain how digital service experiences shape consumer loyalty in e-commerce. The framework reflects the multidimensional and evolving character of online consumer behavior, particularly in emerging markets such as South Sulawesi, where cultural norms and consumption practices differ significantly from metropolitan contexts.

At the core of the model is E-Service Quality (E-SERVQUAL), conceptualized as a formative construct comprising efficiency, reliability, privacy and security, responsiveness, website usability, and personalization. This approach aligns with the revised ES-QUAL model Demir et al. (2021), which emphasizes the need to capture the diverse service attributes that collectively define online quality perceptions. Conceptualizing E-SERVQUAL formatively allows each dimension to contribute uniquely to overall service assessment, offering a more granular understanding than reflective models ((Nalluri et al., 2024; Peštović et al., 2021).

Building on Expectation–Confirmation Theory, E-Satisfaction is modeled as a mediating variable that captures users' affective evaluation of their experiences Alnaim et al. (2022). Satisfaction arises when service quality meets or exceeds prior expectations, which subsequently drives loyalty. A direct path from E-SERVQUAL to E-Loyalty is also incorporated to account for contexts in which exceptionally strong or habitual service experiences may prompt loyalty without explicit satisfaction.

Trust and Perceived Value serve as additional antecedents in the model. Trust, defined as confidence in the platform's integrity, reliability, and data security, is critical in digital contexts characterized by uncertainty and weak institutional safeguards (Baidoun & Salem, 2024). Perceived Value reflects consumers' evaluation of the trade-off between costs and benefits including utility, convenience, and emotional outcomes and is central to satisfaction formation (Afum et al., 2023; Essiz & Senyuz, 2024). Both constructs extend the framework beyond functional quality by incorporating psychological and evaluative dimensions of consumer decision-making.

To capture heterogeneity in consumer behavior, the model integrates three moderators. Switching Cost, grounded in Switching Cost Theory (Ma et al., 2022 and Merino et al., 2024), reflects the perceived financial, cognitive, and emotional burdens of migrating to alternative platforms. In emerging markets, where users often exhibit strong platform familiarity and habitual use, switching costs can be decisive in shaping loyalty. Customer Engagement, derived from Customer Engagement Theory Ahmad et al. (2022), captures the emotional and participatory bonds consumers develop through active interaction with platforms. Higher engagement fosters co-creation, trust, and loyalty behaviors. Finally, Digital Literacy is included as a cognitive moderator. Individuals with greater digital competence are more capable of navigating complex interfaces, evaluating service quality,



and optimizing online experiences, thereby amplifying the effects of service quality on satisfaction Buchan et al. (2024).

By integrating these antecedents, mediators, and moderators into a single framework, this study advances understanding of how functional, psychological, and contextual factors interact to shape e-loyalty. It also responds to calls for more context-sensitive models that capture the realities of peripheral digital markets such as South Sulawesi, where cultural practices, digital inclusion, and infrastructural constraints differ from national urban centers.

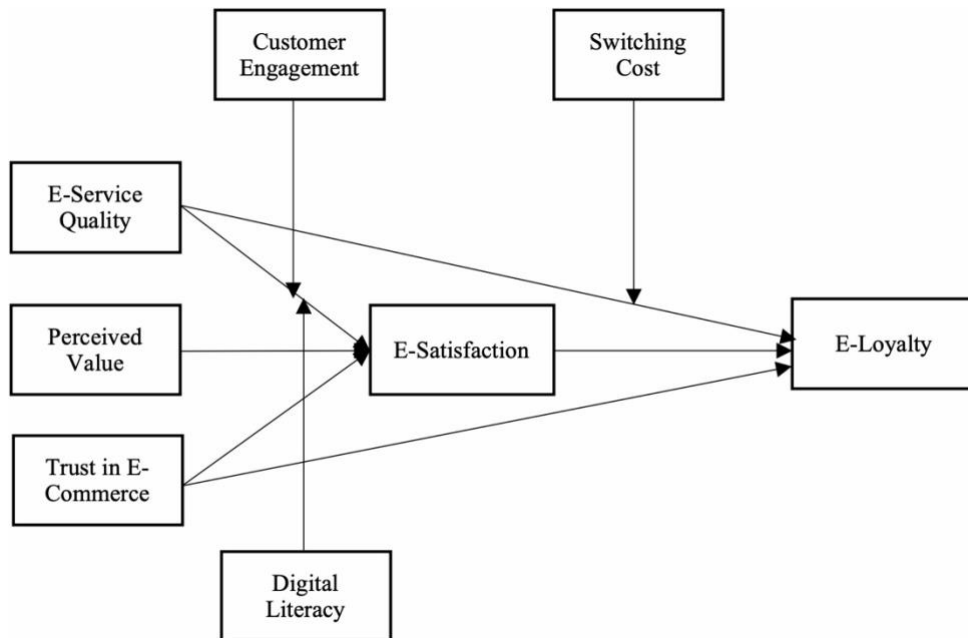


Figure 1. Proposed Technology-Driven E-Commerce Loyalty Framework

The Relationship Between E-Service Quality, E-Satisfaction, and E-Loyalty

E-Service Quality (E-SERVQUAL) represents users' evaluations of the performance of digital services across various dimensions, such as system functionality, security, responsiveness, and personalization. In e-commerce contexts, high-quality digital services significantly enhance user experience and influence behavioral outcomes such as satisfaction and loyalty. Maharani & Utomo (2023) conceptualized E-SERVQUAL as a multidimensional construct that includes efficiency, privacy, fulfillment, responsiveness, and website design. In this study, E-Service Quality is treated as a formative construct, recognizing that each dimension contributes uniquely to the overall perception of quality.

Previous studies have shown that E-Service Quality plays a crucial role in building customer loyalty. Felix & Rembulan (2023) found that improved service quality leads to greater customer commitment in e-commerce platforms, particularly when technical reliability and personalization are emphasized. Consumers who perceive the platform as fast, secure, and user-friendly are more likely to continue using it and to recommend it to others. Therefore, it is proposed that E-Service Quality has a direct and positive influence on E-Loyalty.

In addition, E-Service Quality has been widely associated with customer satisfaction, which is defined as the affective response resulting from the evaluation of service experiences. According to Expectation-Confirmation Theory Ali et al. (2021) users develop satisfaction when the actual service performance meets or exceeds their expectations. A well-designed and functional digital service can lead to positive emotional evaluations, thus increasing satisfaction. Studies by Kim & Yum (2024) and Wattoo & Iqbal (2022) confirm that higher levels of service quality enhance users' satisfaction in the online shopping environment.

Customer satisfaction, in turn, is considered one of the strongest predictors of customer loyalty. Satisfied customers are more likely to return to the same platform and exhibit positive word-of-mouth behavior. Numerous empirical studies have validated this link across digital and traditional service sectors (Kasim et al., 2024; Qasim et al., 2024). In this framework, E-Satisfaction is expected to mediate the relationship between E-



Service Quality and E-Loyalty. That is, high-quality service leads to satisfaction, which subsequently fosters loyalty.

Based on the theoretical and empirical evidence, the following hypotheses are proposed:

- H1: E-Service Quality positively influences E-Loyalty.
- H2: E-Service Quality positively influences E-Satisfaction.
- H3: E-Satisfaction positively influences E-Loyalty.
- H4: E-Satisfaction mediates the relationship between E-Service Quality and E-Loyalty.

Major AI Marketing Applications

Trust has long been recognized as a critical factor in influencing consumer behavior in digital environments, particularly in contexts involving uncertainty, perceived risk, and the absence of face-to-face interaction. In the context of e-commerce, trust refers to a customer's belief that the platform will fulfill its promises, safeguard personal data, and deliver services reliably and ethically (Aqabneh, 2025; Singh et al., 2024). Trust becomes especially important in developing regions where institutional protections and regulatory enforcement may be perceived as weak or inconsistent.

In digital service theory, trust functions as both a cognitive and emotional construct. Cognitively, it involves assessments of a platform's technical competence, data privacy mechanisms, and fulfillment reliability. Emotionally, it reflects users' willingness to be vulnerable to the actions of the service provider based on a sense of integrity and care. When trust is high, consumers are more likely to feel comfortable, safe, and assured when transacting online, which enhances their overall satisfaction with the service experience.

Empirical studies have confirmed that trust positively influences e-satisfaction. Kim et al. (2020) found that trust significantly boosts consumer satisfaction in e-commerce platforms by reducing perceived risk and increasing service confidence. This relationship is also consistent with the Technology Acceptance Model (TAM) and Expectation-Confirmation Theory, which emphasize trust as a precondition for forming positive beliefs about system usage and satisfaction.

Trust also plays a pivotal role in fostering loyalty. In digital commerce, where platform switching is relatively easy and alternatives are abundant, customer retention often depends not solely on the functional quality of services but on whether users perceive the platform as trustworthy and dependable. Prior research by Aldulaimi et al. (2025) and Duong et al. (2025) demonstrates that trust directly enhances customer loyalty by encouraging repeat use, positive word-of-mouth, and resistance to switching, especially when trust is built over time through consistent, transparent interactions.

In this study, trust is modeled as an antecedent of both e-satisfaction and e-loyalty, reflecting its dual cognitive-emotional influence on how users evaluate their online shopping experiences and make future platform decisions.

- H5: Trust in the e-commerce platform positively influences E-Satisfaction.
- H6: Trust in the e-commerce platform positively influences E-Loyalty.

The Role of Perceived Value

Perceived value plays a central role in consumer decision-making and satisfaction formation, particularly in digital environments where users must evaluate trade-offs without direct physical interaction. Defined by Blut et al. (2024) as the consumer's overall assessment of the utility of a product based on perceptions of what is received and what is given, perceived value is inherently subjective and multidimensional. In the e-commerce context, it reflects how users evaluate the convenience, price competitiveness, product diversity, and time efficiency offered by a digital platform compared to the effort, risk, or cost involved.

In online transactions, users often encounter uncertainty regarding product quality, delivery, and post-sale service. When consumers feel that the benefits of using an e-commerce platform outweigh these potential drawbacks, they perceive greater value, which enhances their satisfaction. Empirical evidence supports this association. Jaggi & Chopra (2024) found that perceived value significantly contributes to e-satisfaction in e-retailing, especially in markets where competition is intense and switching barriers are low. Likewise, Tumaku et

al. (2023) demonstrated that in developing digital economies, perceived value plays an even more crucial role due to limited trust and inconsistent service standards across platforms.

Theoretically, the relationship between perceived value and satisfaction is also rooted in Expectation-Confirmation Theory. When users feel that their expectations of benefit are exceeded—whether through discounts, usability, reliability, or responsiveness—they are more likely to be satisfied. This is particularly important in regional settings such as South Sulawesi, where e-commerce users are increasingly exposed to a wide array of online options but often remain loyal to platforms that offer value beyond price alone, such as ease of use, cultural relevance, or locally adapted features.

Given its significance in shaping users' affective and cognitive evaluation of service experiences, perceived value is included in the current model as an antecedent of e-satisfaction.

H7: Perceived Value positively influences E-Satisfaction.

The Moderating Effects of Customer Engagement, Digital Literacy, and Switching Cost

While service quality, trust, and perceived value influence satisfaction and loyalty directly, their effects may be shaped by users' psychological involvement, digital competence, and perceived barriers to changing platforms. In this regard, Customer Engagement, Digital Literacy, and Switching Cost are incorporated as moderating variables that explain how the strength of these relationships may vary across different user segments.

Customer Engagement refers to the degree of emotional, cognitive, and behavioral investment a user makes in interacting with a platform (Hoang et al., 2023). Engaged users are not only passive recipients of service but active participants in co-creating value through feedback, reviews, and repeated interactions. Engagement enhances the perceived relevance and personal connection to the service, which can amplify the impact of service quality on satisfaction. For example, users who feel personally involved with a platform may interpret the same level of service quality more positively than disengaged users. Empirical evidence by Sharif & Sidi Lemine (2024) supports the idea that customer engagement strengthens the effect of service quality on satisfaction by fostering deeper experiential and emotional bonds.

Digital Literacy represents the user's ability to access, evaluate, and use digital technologies effectively. In e-commerce contexts, digital literacy enables users to navigate complex interfaces, evaluate product information critically, and resolve issues independently. Users with higher levels of digital literacy are better equipped to perceive and assess service quality dimensions such as usability, efficiency, and security (Vena-Oya et al., 2024). As such, digital literacy may strengthen the relationship between e-service quality and satisfaction because users with greater technological competence are more likely to recognize and appreciate service excellence. Conversely, users with limited digital skills may not fully perceive the benefits of high-quality service, thus weakening this relationship.

Switching Cost is defined as the perceived cost—financial, psychological, or effort-related—of changing service providers. In e-commerce, switching cost may include the loss of loyalty points, the inconvenience of re-entering information, or the time required to become familiar with a new platform. According to Switching Cost Theory Somosi et al. (2021), higher switching costs reduce the likelihood of customer defection even when satisfaction is moderate. This suggests that users with high switching costs may remain loyal to a platform even if their satisfaction is not optimal, thereby strengthening the satisfaction–loyalty link. Empirical studies by Evanschitzky et al. (2022) and Ng et al. (2023) have confirmed the moderating effect of switching cost on the satisfaction–loyalty relationship in online retail environments.

Based on the theoretical and empirical foundation above, the following moderating hypotheses are proposed:

H8: Customer Engagement moderates the relationship between E-Service Quality and E-Satisfaction, such that the relationship is stronger when engagement is high.

H9: Digital Literacy moderates the relationship between E-Service Quality and E-Satisfaction, such that the relationship is stronger when digital literacy is high.

H10: Switching Cost moderates the relationship between E-Satisfaction and E-Loyalty, such that the relationship is stronger when switching cost is high.

RESEARCH METHOD

This study adopts a quantitative research approach to examine the relationships among e-service quality, e-satisfaction, e-loyalty, trust, perceived value, customer engagement, switching cost, and digital literacy in the context of e-commerce users in South Sulawesi, Indonesia. It also investigates the mediating role of e-satisfaction and the moderating effects of customer engagement, digital literacy, and switching cost.

The target population of this research consists of individuals who have used e-commerce platforms such as Shopee, Tokopedia, or Lazada and made at least two transactions in the past three months. Respondents were required to be at least 18 years old and reside in South Sulawesi.

Data collection was carried out from March to June 2025 using an online questionnaire distributed through social media channels including WhatsApp, Instagram, and Facebook. The sampling technique employed was non-probability purposive sampling. Non-probability purposive sampling was deemed appropriate for this study because it targeted active e-commerce users in South Sulawesi with relevant transactional experience, yet the approach also limits generalizability since findings may not fully represent all consumer groups or regions. Before beginning the questionnaire, respondents were presented with an informed consent statement that explained the purpose of the research, guaranteed anonymity, and emphasized voluntary participation. A total of 208 valid responses were obtained and included in the analysis.

The research instrument comprises 29 indicators measuring eight reflective constructs: E-Service Quality, E-Satisfaction, E-Loyalty, Trust, Perceived Value, Customer Engagement, Switching Cost, and Digital Literacy. All measurement items were adapted from established scales in prior studies and translated into Bahasa Indonesia to ensure cultural and contextual accuracy. Responses were recorded on a seven-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree).

E-Service Quality was measured using six items that reflect perceptions of usability, system responsiveness, security, personalization, and interface quality, following the works of Ighomereho et al. (2022) and Jing et al. (2023). E-Satisfaction was measured using three items from Jameel et al. (2021). E-Loyalty was captured with three indicators developed by (Malhotra et al., 2021). Trust was assessed using three items from (J. Kim et al., 2021). Perceived Value was measured using three indicators derived from Akdim & Casaló (2023) and Riva et al. (2022). Customer Engagement was operationalized using three items adapted from Behnam et al. (2021) and Vinerean & Opreana (2021). Switching Cost was assessed using three items from Matthews et al. (2022) and Zheng et al. (2024). Digital Literacy was measured using three items from (Choi et al., 2023). A summary of all constructs, item codes, sample items, and their respective sources is presented in Table 1.

Table 1. Item Construct

Construct	Item Code	Item
E-Service Quality	ESQ1	This e-commerce platform is easy to use for searching products.
	ESQ2	The time required to complete a transaction is reasonably fast.
	ESQ3	I feel safe when transacting on this platform.
	ESQ4	The platform is responsive to my questions or complaints.
	ESQ5	The platform's interface is attractive and easy to understand.
	ESQ6	This platform frequently provides recommendations that match my interests.
E-Satisfaction	ESAT1	I am satisfied with my shopping experience on this platform.
	ESAT2	This platform meets my expectations as a customer.
	ESAT3	Overall, I am pleased with the service from this platform.
E-Loyalty	ELOY1	I am likely to continue using this platform in the future.
	ELOY2	I would recommend this platform to others.
	ELOY3	I prefer shopping on this platform over others.
Trust	TRU1	I believe this platform protects my personal information.
	TRU2	I believe this platform handles my transactions honestly.
	TRU3	I feel this platform is trustworthy.



Perceived Value	PV1	The price and benefits from this platform are worth what I get.
	PV2	I feel the products and services on this platform offer good value.
	PV3	What I pay is balanced with the satisfaction I receive.
Customer Engagement	CE1	I frequently leave reviews or feedback after transactions.
	CE2	I actively engage with the platform's interactive features.
	CE3	I feel emotionally connected to this platform.
Switching Cost	SC1	Switching to another platform would take a lot of time and effort.
	SC2	I would lose many benefits if I stopped using this platform.
	SC3	I find it difficult to leave this platform even when alternatives exist.
Digital Literacy	DL1	I have good skills in using e-commerce platforms.
	DL2	I feel comfortable navigating and completing transactions online.
	DL3	I am capable of understanding new features introduced by digital platforms.

The data were analyzed using Structural Equation Modeling (SEM) with SmartPLS 4. This method is suitable for evaluating complex causal relationships involving multiple reflective constructs and enables simultaneous testing of direct, mediating, and moderating effects. The analysis was conducted in two stages: the first involved evaluating the measurement model to examine the reliability and validity of each construct, while the second involved testing the structural model to assess the hypothesized relationships.

To ensure the quality of the measurement model, internal consistency, convergent validity, and discriminant validity were assessed. The structural model analysis included the evaluation of all direct, indirect (mediation), and conditional (moderation) relationships among constructs. The bootstrapping technique with 5,000 subsamples was used to examine the statistical significance of the path relationships.

Potential Common Method Variance (CMV) was addressed using the Full Collinearity Assessment method, which evaluates whether common method bias is present in the data collected from a single source at one point in time. Model fit was evaluated using multiple fit indices provided in SmartPLS, including the Standardized Root Mean Square Residual (SRMR), Normed Fit Index (NFI), and RMS_theta, which collectively assess the degree to which the proposed model aligns with the observed data.

Informed consent was obtained electronically before respondents began the survey. The online questionnaire began with an introductory section that explained the purpose of the research, assured respondents of the confidentiality and anonymity of their responses, and emphasized the voluntary nature of their participation. Respondents were required to read and agree to the consent statement by selecting a confirmation option before proceeding to the main questions.

RESULTS

Descriptive Statistics

Table 2 presents the descriptive statistics for all latent constructs used in the study, including their means, standard deviations, and observed minimum and maximum values. The results show that all constructs have mean values above the midpoint of the seven-point Likert scale, indicating generally favorable perceptions among respondents.

Table 2. Descriptive Statistics of Constructs (n = 208)

Construct	Mean	Standard Deviation	Minimum	Maximum
E-Service Quality	5.37	0.75	1	7
E-Satisfaction	5.47	1.00	1	7
E-Loyalty	5.56	1.10	1	7
Trust	5.88	1.01	1	7
Perceived Value	5.73	0.69	1	7
Customer Engagement	5.63	0.81	1	7
Switching Cost	5.52	0.93	1	7
Digital Literacy	5.49	0.86	1	7

E-Service Quality has a mean of 5.37, suggesting that participants perceive the platform's technical and service-related aspects positively. E-Satisfaction and E-Loyalty also show high mean scores (5.47 and 5.56 respectively), indicating strong satisfaction with the platform and a high intention to repurchase or recommend. Trust emerges as the most positively rated construct ($M = 5.88$), implying a high level of confidence in the security, reliability, and integrity of the e-commerce platforms used.

Perceived Value ($M = 5.73$) and Customer Engagement ($M = 5.63$) also scored well, reflecting that users find their online shopping experiences to be both worthwhile and engaging. Switching Cost ($M = 5.52$) shows that respondents perceive a moderate to high cost associated with changing platforms, either due to familiarity, inconvenience, or emotional attachment. Finally, Digital Literacy ($M = 5.49$) indicates that users generally feel confident in their ability to use and navigate online commerce systems effectively.

Standard deviations for all constructs range from 0.69 to 1.10, reflecting an acceptable level of variation in responses, and all observed values fall within the expected range of 1 to 7. These findings support the assumption that the respondents were generally consistent in their responses and that no extreme outliers skewed the data distribution.

Common Method Variance Test

Table 3 presents the Variance Inflation Factor (VIF) values for all latent constructs, including the moderator variables—Customer Engagement, Digital Literacy, and Switching Cost. The VIF values for all constructs are below the commonly accepted threshold of 3.3, indicating the absence of multicollinearity in the model.

Table 3. Variance Inflation Factor (VIF) for Latent Constructs

Construct	VIF
E-Service Quality	1.66
E-Satisfaction	1.97
E-Loyalty	1.63
Trust	2.71
Perceived Value	2.79
Customer Engagement	1.88
Digital Literacy	1.75
Switching Cost	1.93

This confirms that each construct, including the moderators, contributes unique explanatory power to the model without excessive overlap with other variables. Moreover, these VIF values were also used in the Full Collinearity Test, which served as an additional diagnostic for potential Common Method Variance (CMV). Since no VIF exceeds the 3.3 threshold, it can be concluded that CMV is not a threat to the validity of the findings

Measurement Model

Table 5 presents the reliability and convergent validity assessment of the measurement model for all reflective constructs. Each construct includes individual item loadings, Cronbach's Alpha, Composite Reliability (CR), and Average Variance Extracted (AVE).

All item loadings exceed the minimum threshold of 0.70, indicating strong individual reliability. Cronbach's Alpha values range from 0.80 to 0.88, while Composite Reliability scores fall between 0.87 and 0.90, both exceeding the accepted threshold of 0.70 and 0.80 respectively, demonstrating excellent internal consistency. Additionally, the AVE values for all constructs range from 0.68 to 0.74, exceeding the recommended threshold of 0.50, which confirms convergent validity (Hair et al., 2022).

**Table 5.** Measurement Model Assessment

Construct	Item Code	Outer Loading	Cronbach's Alpha	Composite Reliability (CR)	Average Variance Extracted (AVE)
E-Service Quality	ESQ1	0.80	0.88	0.87	0.69
	ESQ2	0.85			
	ESQ3	0.82			
	ESQ4	0.85			
	ESQ5	0.77			
E-Satisfaction	SAT1	0.90	0.83	0.89	0.71
	SAT2	0.81			
	SAT3	0.85			
	SAT4	0.83			
E-Loyalty Trust	LOY1	0.88	0.84	0.90	0.74
	LOY2	0.84			
	LOY3	0.79			
	LOY4	0.85			
	TRU1	0.86	0.80	0.88	0.66
	TRU2	0.80			
	TRU3	0.79			
	TRU4	0.81			
Perceived Value	PV1	0.84	0.82	0.89	0.70
	PV2	0.87			
	PV3	0.86			
	PV4	0.78			
Customer Engagement	CE1	0.81	0.80	0.88	0.68
	CE2	0.83			
	CE3	0.82			
	CE4	0.79			
Switching Cost	SC1	0.85	0.83	0.89	0.71
	SC2	0.84			
	SC3	0.80			
	SC4	0.82			
Digital Literacy	DL1	0.82	0.84	0.90	0.72
	DL2	0.86			
	DL3	0.87			
	DL4	0.76			

Table 6 evaluates discriminant validity using the Fornell–Larcker criterion. In this method, the square root of each construct's AVE (shown on the diagonal) must be greater than the correlation coefficients with any other construct (off-diagonal).

As shown in Table 6, all diagonal values are higher than the corresponding off-diagonal elements in their rows and columns. For instance, the square root of AVE for E-Service Quality is 0.83, which exceeds its correlations with other constructs such as E-Satisfaction (0.65), Trust (0.62), and Customer Engagement (0.58). These results provide evidence of sufficient discriminant validity.

Table 6. Fornell-Larcker Criterion

Construct	ESQ	SAT	LOY	TRU	PV	CE	SC	DL
E-Service Quality	0.83							
E-Satisfaction	0.65	0.85						
E-Loyalty	0.50	0.67	0.86					
Trust	0.62	0.60	0.55	0.82				

Perceived Value	0.60	0.64	0.57	0.62	0.83			
Customer Engagement	0.58	0.59	0.53	0.52	0.59	0.81		
Switching Cost	0.55	0.56	0.58	0.54	0.56	0.55	0.82	
Digital Literacy	0.57	0.61	0.54	0.60	0.58	0.60	0.59	0.84

Table 7 reports the HTMT (Heterotrait-Monotrait Ratio) values for all construct pairs. HTMT is considered a more stringent and reliable method for evaluating discriminant validity compared to Fornell–Larcker. A value below 0.90 is typically used as the threshold.

Table 7. HTMT

Construct	ESQ	SAT	LOY	TRU	PV	CE	SC	DL
E-Service Quality	—	0.87	0.50	0.85	0.79	0.58	0.64	0.61
E-Satisfaction		—	0.76	0.70	0.81	0.73	0.68	0.77
E-Loyalty			—	0.65	0.70	0.66	0.63	0.68
Trust				—	0.74	0.60	0.63	0.67
Perceived Value					—	0.72	0.69	0.71
Customer Engagement						—	0.66	0.75
Switching Cost							—	0.62
Digital Literacy								—

All HTMT values in the matrix are below 0.90, confirming the discriminant validity among all constructs. For example, the HTMT value between E-Service Quality and E-Satisfaction is 0.87, between Trust and Perceived Value is 0.74, and between Digital Literacy and Switching Cost is 0.62. These results collectively affirm that each construct is empirically distinct from the others.

Model Fit Assessment

To assess the global model fit in PLS-SEM, three key indices were evaluated: SRMR, NFI, and RMS_theta (see Table 8). The Standardized Root Mean Square Residual (SRMR) measures the average magnitude of discrepancies between observed and predicted correlations. The SRMR value of 0.058 is below the threshold of 0.08, indicating a good model fit (Henseler et al., 2014).

Table 8. Model Fit

Fit Index	Value	Threshold	Interpretation
Standardized Root Mean Square Residual (SRMR)	0.058	< 0.08	Good model fit
Normed Fit Index (NFI)	0.912	> 0.90	Acceptable model fit
RMS_theta	0.114	< 0.12	Close to threshold, acceptable fit

The Normed Fit Index (NFI) evaluates the improvement in fit compared to a null model. With a value of 0.912, it exceeds the threshold of 0.90, suggesting an acceptable level of model fit. The RMS_theta assesses the degree to which the outer model residuals correlate. Although its value of 0.114 is near the conservative threshold of 0.12, it still falls within an acceptable range, particularly for models that include complex mediation and moderation (Hair & Alamer, 2022). Collectively, these indices confirm that the estimated structural model provides a satisfactory fit to the empirical data and can be interpreted with confidence.

Hypothesis Testing

Table 9 summarizes the results of hypothesis testing conducted using Structural Equation Modeling (SEM) via SmartPLS. All hypothesized relationships (H1 to H10) were statistically supported, with significant path coefficients ($p < 0.05$) and t-values well above the conventional threshold of 1.96, indicating robust causal effects across the proposed model.

The direct effect of E-Service Quality on E-Satisfaction ($\beta = 0.52$) and on E-Loyalty ($\beta = 0.31$) demonstrates that service performance remains a cornerstone of customer experience in the e-commerce context. Moreover,

E-Satisfaction exerts a strong direct effect on E-Loyalty ($\beta = 0.42$), confirming its critical mediating role in converting service perception into behavioral intention (H3, H4).

The influence of Trust ($\beta = 0.38$ on Satisfaction; $\beta = 0.29$ on Loyalty) and Perceived Value ($\beta = 0.34$ on Satisfaction) is both statistically and practically meaningful. These results reflect users' psychological assurance and perceived fairness as key antecedents of satisfaction, with medium-to-large effect sizes ($f^2 = 0.19$ – 0.24), especially for trust and perceived value.

The moderation hypotheses also yielded significant results. The interaction terms involving Customer Engagement, Digital Literacy, and Switching Cost produced small yet meaningful effects ($f^2 = 0.05$ – 0.06), aligning with expectations that these variables enhance but do not dominate the strength of key paths. These findings highlight that while technology literacy and user involvement refine the customer experience, their moderating roles are subtle and situational rather than transformative.

Table 9. Hypothesis Testing

Hypothesis	Path Relationship	Coefficient	t-value	p-value	Decision
H1	E-Service Quality → E-Loyalty	0.31	4.21	0.000	Supported
H2	E-Service Quality → E-Satisfaction	0.52	7.45	0.000	Supported
H3	E-Satisfaction → E-Loyalty	0.42	5.11	0.000	Supported
H4	E-Satisfaction mediates E-Service Quality → E-Loyalty	0.22	3.19	0.001	Supported
H5	Perceived Value → E-Satisfaction	0.34	4.02	0.000	Supported
H6	Trust → E-Satisfaction	0.38	4.89	0.000	Supported
H7	Trust → E-Loyalty	0.29	3.76	0.000	Supported
H8	Customer Engagement moderates E-Service Quality → E-Satisfaction	0.11	2.45	0.014	Supported
H9	Digital Literacy moderates E-Service Quality → E-Satisfaction	0.14	2.73	0.007	Supported
H10	Switching Cost moderates E-Satisfaction → E-Loyalty	0.19	2.98	0.003	Supported

The structural model demonstrated several strong and theoretically meaningful relationships. The path from E-Service Quality to E-Satisfaction ($\beta = 0.52$, $f^2 = 0.39$) exhibited the largest effect size, confirming that service performance is the most influential driver of satisfaction in the e-commerce context. This aligns with Service Quality Theory, which positions service performance as the cornerstone of customer evaluation. The magnitude of this effect indicates that improvements in efficiency, responsiveness, and usability yield substantial gains in consumer satisfaction.

The effect of E-Satisfaction on E-Loyalty ($\beta = 0.42$, $f^2 = 0.33$) also reached a large threshold, underscoring its central role as a mediating mechanism within Expectation–Confirmation Theory. This suggests that loyalty is not merely a habitual response but a result of positive disconfirmation of expectations that fosters emotional commitment.

Trust showed medium effect sizes on both satisfaction ($\beta = 0.38$, $f^2 = 0.24$) and loyalty ($\beta = 0.29$, $f^2 = 0.19$). These findings reinforce the argument that psychological assurance—confidence in data security and platform integrity is indispensable for sustaining long-term loyalty in contexts where institutional protections are weaker.

Perceived Value significantly predicted satisfaction ($\beta = 0.34$, $f^2 = 0.22$), providing evidence that rational cost–benefit evaluations operate alongside service perceptions to influence consumer affect. This supports value-based marketing perspectives, emphasizing that loyalty is driven not only by service experience but also by perceived fairness and utility.

Table 10. Power Predictor

Variable	R ²	Q ²	f ² (ESQ)	f ² (Trust)	f ² (Perceived Value)	f ² (Satisfaction)	(E- Moderator Effects)
E- Satisfaction	0.61	0.43	0.39	0.24	0.22	–	0.05
E-Loyalty	0.68	0.52	0.21	0.19	–	0.33	0.06

The moderating constructs exhibited small but meaningful effects. Customer Engagement ($f^2 = 0.05$), Digital Literacy ($f^2 = 0.06$), and Switching Cost ($f^2 = 0.06$) each strengthened key relationships without overshadowing the main effects. Although modest, these moderators highlight important situational nuances: engagement amplifies the experiential dimension of service quality, digital literacy enhances users' ability to recognize service benefits, and switching costs sustain loyalty even when satisfaction is moderate.

DISCUSSION

This study advances understanding of how service quality, trust, perceived value, and psychological barriers shape e-loyalty in a peripheral digital market. One of the most striking findings is the strength of the pathway from service quality to satisfaction and loyalty. While global literature often emphasizes trust as the main antecedent of loyalty in online commerce (Singh et al., 2024), this study shows that functional service attributes, efficiency, responsiveness, and usability remain the dominant driver in Sulawesi. This suggests that in developing regions, where logistical barriers are more pronounced, consumers continue to anchor loyalty decisions on basic service performance.

Another noteworthy result is the strong mediating role of satisfaction. Although prior studies argue that satisfaction's influence on loyalty is weakening in mature markets where switching is easy (Evanschitzky et al., 2022), the present findings indicate that in Sulawesi, satisfaction retains a decisive role. This contrast underscores how consumer psychology in emerging economies may diverge from patterns observed in North America or Europe, where loyalty is increasingly shaped by personalization, social identity, or gamification.

The moderating role of switching cost also produced contextually significant insights. In global e-commerce research, switching costs are sometimes reported as declining due to platform standardization and consumer familiarity with multi-homing behaviors (Ng et al., 2022). Yet in Sulawesi, switching costs remain powerful, amplified by cultural norms such as *sungkan* (reluctance to disrupt established relationships) and logistical challenges tied to geography. This points to a distinctive form of cultural switching cost that is rarely discussed in the global literature.

Trust and perceived value showed medium but meaningful effects. Interestingly, while trust strongly predicted both satisfaction and loyalty, its effect was smaller than service quality, a pattern that contrasts with findings in contexts where institutional trust is low and psychological assurance is paramount (Aldulaimi et al., 2024). This suggests that trust in Sulawesi is less about systemic security concerns and more embedded in community-based digital practices, such as reliance on peer recommendations and social media groups.

From a theoretical perspective, these findings enrich Expectation–Confirmation Theory by showing that in peripheral markets, satisfaction retains its central mediating role despite global trends that downplay its importance. The integration of digital literacy, customer engagement, and switching cost also adds nuance to existing loyalty models, illustrating that loyalty formation results from layered functional, psychological, and cultural processes rather than a single dominant pathway.

The practical contributions of this study are equally important. For e-commerce platforms, maintaining consistency in service performance remains the most effective route to sustaining loyalty, while transparent tracking, secure payment mechanisms, and responsive customer service can further strengthen consumer trust. For policymakers, addressing logistical barriers that intensify switching costs is crucial to ensuring equitable digital inclusion across Indonesia's archipelagic regions. For digital literacy initiatives, there is value in designing programs that not only teach technical navigation but also foster critical judgment, enabling consumers to identify trustworthy sellers and fully benefit from platform features.



What distinguishes this study is its focus on Sulawesi, an often-overlooked region in Indonesia's digital economy. By situating local findings within broader debates on e-loyalty, the study demonstrates that peripheral consumers cannot be treated as marginal cases of national averages. Instead, they provide analytically distinctive insights into how culture, geography, and digital capability interact in shaping loyalty outcomes. This regional perspective contributes to global scholarship by showing that e-loyalty is not a uniform construct but one that adapts to contextual realities across different digital economies.

Limitations and Future Research Directions

While this study provides robust evidence of how service quality, trust, perceived value, and behavioral moderators shape loyalty in Sulawesi's e-commerce sector, several avenues for future research remain open. One promising direction is the use of longitudinal designs to track how consumer satisfaction and loyalty evolve over time, particularly as digital infrastructure in peripheral regions develops further. Such designs would allow researchers to test causal stability and examine whether trust and satisfaction retain their influence in the long term.

Another fruitful approach is experimental research, which can isolate the effects of platform features such as secure payment mechanisms, interface design, or personalized recommendations. By manipulating these service elements, future studies could identify which attributes most effectively strengthen loyalty under different consumer conditions.

Comparative multi-country studies would also enrich current findings by examining whether the determinants of loyalty differ across cultural and institutional settings. For instance, comparing Indonesia with other emerging Southeast Asian digital markets such as Vietnam or the Philippines would provide valuable insights into whether regional consumption patterns are convergent or divergent.

Mixed-method research could further deepen understanding by combining quantitative SEM analysis with qualitative interviews or ethnographic approaches. This would capture not only the statistical relationships among constructs but also the lived experiences, cultural norms, and decision-making processes that shape e-commerce loyalty.

Beyond design improvements, future research should consider incorporating new constructs that reflect the evolving nature of digital commerce. The role of AI-driven personalization deserves attention, particularly how algorithmic recommendations influence trust and satisfaction. The integration of sustainability in e-commerce, such as consumer responses to green logistics or ethical sourcing, may also reshape loyalty patterns. Finally, the rapid rise of social commerce purchases driven by social media platforms and peer influence, calls for examination of how community trust and networked engagement contribute to loyalty formation.

CONCLUSION

This study investigated the determinants of consumer satisfaction and loyalty in the context of e-commerce platforms in Sulawesi, Indonesia. Using a structural equation modeling approach, the research confirmed that e-service quality significantly enhances e-satisfaction and e-loyalty, with satisfaction playing a mediating role. Perceived value and trust in the platform also positively influenced satisfaction and loyalty, reinforcing the importance of psychological and value-driven factors in shaping user behavior. Furthermore, the moderating effects of customer engagement, digital literacy, and switching cost were partially supported, suggesting that user characteristics and contextual barriers influence the strength of these relationships.

By focusing on Sulawesi, the study provides culturally grounded insights into how consumers outside Indonesia's digital mainstream engage with online platforms. The findings reveal that strong consumption patterns, community-based trust, and logistical limitations contribute to higher switching costs and platform loyalty in this region. Theoretically, the study expands the Expectation Confirmation Theory by integrating behavioral moderators, while practically, it offers strategies for enhancing user engagement, trust-building, and service quality. Despite its limitations, this research contributes to a deeper understanding of regional e-commerce behavior and sets the stage for further studies across diverse Indonesian settings, promoting more inclusive and responsive digital business practices in emerging markets.



Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Conflict of Interest

The author declares that there is no conflict of interest regarding the publication of this paper.

Data Availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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