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How gamification affects switching behaviors in the mobile-commerce platform: the role of customer engagement and switching cost

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This study examines the relationship between gamification in m-commerce and customer switching behavior, with customer engagement as a mediator and switching costs as a moderator. Data was collected using a cross-sectional approach involving 356 respondents in Indonesia. PLS-SEM analysis with moderator variables was applied to test the model and hypothesis. The findings indicate that gamification positively influences customer engagement and negatively affects switching behavior. Additionally, customer engagement has been confirmed to be significantly related to switching behavior and a significant mediator between gamification and switching behavior. Switching costs further moderate the negative relationship between customer engagement and switching behavior. These results provide important implications for business practices and the development of gamification-based customer retention strategies.

KEYWORDS

gamification, m-commerce, switching behavior, customer engagement, switching costs

1 Introduction

A new era of globalization has begun with the increasing use of digital technology in various aspects of the business and economy. One of the most dominant changes is that technological advances have changed consumer purchasing behavior (Habib et al., 2024). Today, consumers have easy and flexible shopping access using only their mobile devices. Through mobile technology, consumers can take advantage of their time to shop online anytime and anywhere. E-commerce technology has also developed rapidly in terms of ease of marketing, and various payment features have also been adjusted, including digital payments, e-wallet, and buy-now pay-later (Chaturvedi and Ranjan, 2025; Mappadang et al., 2025). Consequently, many retailers increasingly adopt digital transformation strategies, developing websites and smartphone-based applications (mobile apps) to align with evolving consumer demands and capitalize on the growing reliance on mobile commerce.

Mobile-commerce-based marketplace is a development of the e-commerce method (Senn, 2000), allowing transaction buying and selling of products and services via mobile devices such as smartphones and tablets (Safieddine, 2017). M-commerce has experienced exponential growth, propelled by the global proliferation of mobile devices and advances in mobile internet technologies (Pousttchi et al., 2015). Current industry projections suggest this upward

trajectory will continue, with substantial revenue growth expected across multiple markets (Bhandari et al., 2024). Developing economies present auspicious opportunities where expanding mobile penetration is accelerating m-commerce adoption. India's market, for example, is projected to nearly double from 47 billion in 2020 to 47 billion in 2020 to 83 billion by 2025 (Bhandari et al., 2024). Similarly, Indonesia's digital economy—where m-commerce plays a pivotal role—has emerged as a key driver of economic development, demonstrating a sustained positive impact on the nation's growth (Weiyn and Napitupulu, 2017). This potential is further amplified by Indonesia's rapidly expanding internet user base, which creates fertile ground for m-commerce expansion (Tafianoto et al., 2024). Behind the various conveniences offered by M-commerce through various online buying and selling platforms, retaining consumers is a challenge for marketers. As a part of e-commerce, the M-commerce market is highly competitive, with numerous platforms vying for consumer attention. This makes it easy for consumers to switch platforms if their expectations are unmet (Huang et al., 2013; Huang and Tsui, 2016; Liu et al., 2023). Consequently, marketers must be creative in maintaining engagement, and preventing consumers from switching to competitors is challenging.

Gamification has become a pivotal strategy in m-commerce, effectively enhancing user engagement, satisfaction, and purchasing behavior. Defined as the implementation of game-design elements (points, badges, leaderboards, tasks, and levels) in non-game contexts (Gupta et al., 2024), m-commerce gamification strengthens user motivation and brand attachment by rewarding various interactions, including purchases and app engagement (Sharma et al., 2024). These gamification components include redeemable point systems that drive transactions, leaderboards that stimulate competition through performance rankings, and progressive challenges that maintain user participation through reward-unlocking mechanisms (Sharma et al., 2024). While existing literature has well-established gamification's positive impact on engagement metrics (Punwatkar and Verghese, 2025; Rakhmanita et al., 2022; Raza et al., 2024), its potential role in influencing switching behavior is underexplored. This oversight is particularly notable given the established theoretical framework that connects switching behavior, customer retention, and loyalty in customer relationship management. As demonstrated by several authors, switching behavior operates inversely to retention and loyalty (Chang and Chen, 2008; Patterson, 2004; Shah et al., 2013). For example, retention stems from two primary mechanisms: loyalty-building strategies that foster customer commitment and structural barriers that elevate switching costs (Mathew, 2024; Patterson, 2004). On the other hand, loyalty is the psychological cornerstone of retention, creating emotional bonds and trust that naturally reduce switching tendencies (Xhema et al., 2018). These interconnected yet distinct concepts - switching behavior (customer-focused actions), retention (company-focused outcomes), and loyalty (psychological commitment)—collectively form the foundation of customer-company relationship dynamics. Hence, the present study addresses the critical gap in understanding how gamification in M-commerce platforms might enhance engagement and reduce switching behavior. Through customer engagement, this study examines the direct and indirect relationship between gamification and switching behavior on m-commerce platforms. Also, it proposes switching cost a moderator of the relationship between customer engagement and switching behavior (see Figure 1).

This study offers three contributions: First, this study addresses a critical research gap by examining how gamified m-commerce platforms can effectively mitigate customer switching behavior. Thus, we add insight into the role of gamification on various other consumer behaviors, such as retention, loyalty, and purchase intentions. Second, this study proposes switching costs as a boundary condition in the relationship between customer engagement and switching behavior, which previously used more different concepts such as loyalty (Baloglu et al., 2017; Ngo and Pavelková, 2017; Yen, 2010) and repurchase behavior (Nagengast et al., 2014). Third, this study makes significant contributions to the literature on customer behavior in digital commerce platforms by developing and testing a mediation-moderation (modded) model that integrates multiple theoretical mechanisms into a unified framework. Unlike previous research, which often examines mediation and moderation effects separately, this study advances the field by simultaneously analyzing (1) the mediating role of customer engagement in explaining how gamification platforms influence switching behavior and (2) the moderating effect of switching costs on this mediated relationship. This combination approach offers a more comprehensive understanding of customer decision-making for developers of gamification platforms. In addition, this study can be utilized by

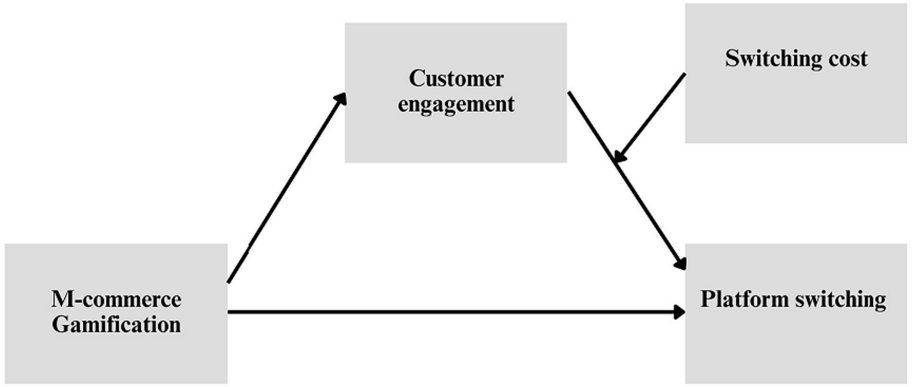

FIGURE 1
Proposed research model.

marketers in m-commerce to utilize the right strategies to reduce retention and switching behavior through gamification.

2 Literature review

This study synthesizes the Stimulus-Organism-Response (S-O-R) framework (Mehrabian and Russell, 1974) and Self-Determination Theory (SDT; Deci and Ryan, 2002) to create a unified theoretical lens for analyzing gamification-driven engagement and its impact on user retention. The S-O-R framework provides the structural foundation, where gamification elements (rewards, challenges, progress tracking) serve as *external stimuli* that initiate user engagement. Crucially, these stimuli do not operate in isolation but are psychologically processed through SDT's core needs—autonomy, competence, and relatedness—which act as the *organism-level mediators* that transform stimuli into sustained motivation. For instance, progress tracking (S-O-R stimulus) enhances perceived *competence* (SDT need) by providing tangible evidence of skill mastery (Adeborna et al., 2024), while customizable challenges (stimulus) foster *autonomy* (SDT need) by empowering user agency in goal-setting (Schaper et al., 2022). This integration reveals how SDT's need-fulfillment mechanisms fundamentally shape S-O-R's "black box" of cognitive-affective processing (organism). The synergy between the theories becomes evident in the *response* phase: when gamification stimuli successfully address SDT needs, they generate intrinsic motivation (e.g., enjoyment) and internalized extrinsic motivation (e.g., value recognition), which collectively reduce switching behavior. Social gamification elements (S-O-R stimuli), such as leaderboards or team tasks, further amplify this effect by fulfilling *relatedness* needs (Aubert et al., 2023), creating emotional bonds that transcend transactional platform interactions. By mapping S-O-R's linear causality (stimulus → organism → response) onto SDT's psychological need-satisfaction pathways, this model advances beyond mechanistic interpretations of engagement to explain *why* certain stimuli resonate with users. For example, the framework predicts that rewards (stimuli) will only reduce switching if they enhance autonomy (e.g., flexible redemption options) rather than undermine it (e.g., coercive requirements), thereby reconciling contradictory findings in the gamification literature (Krath et al., 2021).

2.1 M-commerce gamification and customer engagement

Customer engagement is a multidimensional marketing construct encompassing various facets of customer-brand interactions. Scholars have identified several key dimensions of customer engagement, including cognitive, affective, behavioral, social, and absorption-related aspects (Connell et al., 2021; Naumann et al., 2017; van Tonder and Petzer, 2018; Youssef et al., 2018). From a cognitive perspective, engagement is characterized by customers' mental processes and attentional focus on a brand or service. This dimension reflects how consumers are mentally absorbed in brand-related content and communications (Connell et al., 2021; Naumann et al., 2017). Affective engagement, on the other hand, pertains to the emotional bonds customers form with a brand, encompassing feelings of enthusiasm, attachment, and brand identification (Naumann et al., 2017; van Tonder and Petzer, 2018; Youssef et al., 2018). Behavioral engagement refers to customers' observable actions about a brand, such as participation in brand activities, repeat purchases, and other forms of interaction (Connell et al., 2021; Youssef et al., 2018). Another critical dimension, social engagement, involves customer interactions within brand-related communities, including peer-to-peer communication and relationship-building with the brand and other consumers (Mustafa et al., 2024). Finally, the absorption dimension—analogous to its conceptualization in work engagement literature—denotes a state of deep immersion in brand-related experiences, where customers exhibit high levels of concentration and involvement (van Tonder and Petzer, 2018).

Beyond multidimensional frameworks, alternative models classify customer engagement into two primary types: rational and emotional (Brodie et al., 2011; Chen et al., 2019). Rational engagement is driven by extrinsic incentives, such as economic benefits (e.g., discounts and rewards) and functional utility (e.g., convenience efficiency). Rational engagement is the logical thinking of consumers when receiving a brand's benefits, value, and advantages. In contrast, emotional engagement stems from intrinsic motivations, including psychological attachment, brand affinity, and deep emotional connections. This type of engagement fosters loyalty through feelings of trust, belonging, and personal identification with the brand (Brodie et al., 2011).

M-commerce gamification integrates game elements into mobile commerce platforms to attract consumer attention and engagement. M-commerce is generally applied by providing rewards, points, badges, leaderboards, and immersive features like avatars and fantasy scenarios (Putra Rahmadhan et al., 2023). The primary goal of gamification is to make consumers perceive a good experience in shopping activities as more engaging and enjoyable, thereby encouraging users to interact more frequently and intensely with the platform (Mominzada et al., 2022; Punwatkar and Verghese, 2025; Rakhmanita et al., 2022).

In this study, gamification in m-commerce can be a valuable tool for increasing user engagement. Although, in the context of m-commerce, gamification has not been extensively explored, the concept of gamification in general has been confirmed as a determinant of customer engagement. For example, gamification elements such as challenges, points, and enjoyment significantly enhance the customer experience by making interactions more enjoyable and engaging (Lacap et al., 2023; Tsou and Putra, 2023); increased enjoyment leads to higher levels of customer engagement. Another study reveals that gamification elements such as immediate rewards and virtual points motivate users to be more active and continue using the platform (Rakhmanita et al., 2022; Raza et al., 2024). When sellers use game mechanics in promotional activities, they stimulate their consumers' intrinsic and extrinsic motivation. Consequently, when customers perceive joyful experiences in-game interactions, they are more likely to develop an emotional connection and engage with the platform over time (Hammedi et al., 2019). Hence, consumer preference for games that offer rewards indicates that gamification elements positively impact user experience, making consumers more active and involved in interactions with m-commerce.

> *H1*: M-commerce gamification is positively related to customer engagement.

2.2 Gamification and switching behavior

Gamification has emerged as a significant factor in shaping user behavior by addressing the fundamental psychological needs identified in SDT (Deci and Ryan, 2002)—autonomy, competence, and relatedness. Through the strategic implementation of game-like mechanics—such as progress indicators, reward systems, and social engagement features—gamification facilitates a transition along the motivation continuum, encouraging a shift from extrinsic to intrinsic motivation (Gao, 2024; Hammerschall, 2019). For example, design elements that support autonomy (e.g., user-defined goals) and competence (e.g., real-time feedback) promote intrinsic motivation, which is closely linked to long-term behavioral persistence (Hammerschall, 2019). The fulfillment of these psychological needs through gamification thus catalyzes sustained user engagement and behavioral change (Hervas et al., 2017; Schmidt-Kraepelin et al., 2020). In addition to its motivational effects, gamification influences switching behavior—users' propensity to abandon one platform in favor of alternatives. Existing research demonstrates a negative relationship between gamification and adverse consumer behaviors, including diminished retention rates and strengthened brand loyalty (Liu et al., 2024; Punwatkar and Verghese, 2025; Rakhmanita et al., 2022; Raza et al., 2024). This study argues that gamification exerts a direct suppressive effect on switching intentions via two primary pathways. First, appropriately designed gamification components (e.g., transparent milestone systems) mitigate users' perceived uncertainties and disengagement tendencies, reducing the likelihood of defection to competing platforms (Li et al., 2023). Second, gamification fosters emotional and cognitive attachment to the platform to elevate user engagement and satisfaction (García-Jurado et al., 2021). Consequently, gamification functions as a behavioral retention mechanism, curbing user switching behavior when applied effectively.

> *H2*: M-commerce gamification is negatively related to platform switching tendency.

2.3 Customer engagement and switching behavior

Consumer switching behavior is a multifaceted phenomenon influenced by perceived service failures, weak firm commitment, pricing inequity, and negative emotional experiences, all amplifying switching intentions (Antón et al., 2007). Conversely, customer engagement—the psychological connection and active relationship between consumers and brands—has become a vital competitive differentiator in modern marketing (Garcia-Rivera et al., 2022). Empirical evidence highlights engagement's role in reducing switching tendencies, as highly engaged consumers demonstrate greater brand loyalty, satisfaction, and commitment (Brodie et al., 2013; Siamagka et al., 2016). Strong emotional and cognitive bonds with a brand diminish switching susceptibility, enhancing customer retention (Sondhi et al., 2017). Furthermore, prior studies suggest that gamification can strengthen customer engagement through its ability to foster emotional and rational investments, particularly in mobile platforms (Mominzada et al., 2022; Rakhmanita et al., 2022). Given the established negative relationship between engagement and switching behavior (Sondhi et al., 2017), customer engagement may mediate how gamification mitigates switching tendencies. Thus, engagement is not only a predictor of switching behavior but also mediates the link between gamification and switching behavior.

> *H3*: Customer engagement is negatively related to platform switching tendency.
>
> *H4*: Customer engagement mediates the relationship between M-commerce gamification and platform switching tendency.

2.4 The moderating effect of switching cost

Switching costs pertain to customers' expenses when moving from one service provider to another. In m-commerce, these costs can be monetary or non-monetary, encompassing the time and effort needed to build a relationship with a new platform and forfeiting advantages tied to the existing platform (Shi et al., 2015; Torres and Martins, 2009; Whitten and Green, 2005). While switching costs have been widely demonstrated to moderate relationships between customer engagement and related constructs like loyalty and repurchase behavior (Baloglu et al., 2017; Nagengast et al., 2014; Ngo and Pavelková, 2017; Yen, 2010), empirical evidence regarding their moderating effects remains inconsistent. Existing literature reveals mixed findings, with some studies reporting significant positive or negative moderation effects while others show non-significant results (El-Manstrly, 2015; Nagengast et al., 2014). Other studies also found the dual role of switching costs as both an antecedent and a moderator (quasi-moderator) in explaining consumer behavior (Aydin et al., 2005; Sharma, 2003). This variability suggests that the moderating role of switching costs is likely context-dependent and potentially influenced by factors such as service characteristics, industry type, and individual customer perceptions.

The other emerging perspective on switching costs reveals complex, nonlinear moderation patterns. Nagengast et al. (2014) demonstrate an inverted U-shaped relationship where moderate switching costs optimally enhance the satisfaction-repurchase linkage, while both extremely high and low costs diminish this effect, suggesting optimal threshold levels in customer decision-making (Nagengast et al., 2014). The valence of switching costs further moderates these relationships: benefit-based costs (e.g., reward forfeiture) positively reinforce service value conversion to loyalty, whereas penalty-based costs (e.g., contract termination fees) may inadvertently weaken satisfaction's loyalty effects (Ngo and Pavelková, 2017). This evidence positions switching costs as a double-edged sword. While substantial costs create behavioral inertia that overrides dissatisfaction (Jungwoo et al., 2008), inadequate costs leave even engaged customers vulnerable to competitive offers (Yen, 2010). Building on these insights, we propose that customer engagement in reducing switching behavior is contingent on switching cost levels: engagement serves as a primary deterrent when switching costs are low, as psychological attachments compensate for minimal structural barriers; conversely, engagement's protective effect diminishes when high switching costs dominate the retention calculus, as economic and procedural barriers supersede psychological factors in customer decision-making.

> *H5*: Switching costs moderate the relationship between customer engagement and platform-switching tendency, where the negative

> effect of customer engagement on platform switching is more substantial when switching costs are low.

3 Methods

3.1 Sample and procedures

The sampling technique employed a non-probability sampling approach, specifically a purposive sampling method, which involves selecting samples based on predetermined criteria. This approach has also been used in similar studies (Gui et al., 2024; Pelet et al., 2017). The target sample is consumers who have shopped online through m-commerce-based marketplaces in the last 3 months and have used the game features available in m-commerce-based marketplaces. The data collection technique in this study was by distributing questionnaires online via Google Forms, carried out after obtaining approval from the Bina Nusantara University ethics committee. Online questionnaires were distributed to consumers on various platforms such as Lazada, Tokopedia, Shopee, Blibli, and Bukalapak with the help of several official seller accounts.

The questionnaire distribution process was carried out from 8 to 30 November 2023. Each respondent was involved voluntarily, and no compensation was given for participating in this survey. Data from 507 respondents was collected based on the questionnaire distribution results. However, 356 respondents met the criteria who had shopped online in m-commerce-based marketplaces, had used the game features available in m-commerce-based marketplaces, and filled out the questionnaire completely. The sample size also meets the criteria for PLS-SEM analysis (Hair et al., 2017).

Table 1 indicates that most respondents are male (58.7%) compared to female (41.3%), revealing a slightly higher male representation in this sample. Based on age, respondents aged 21–30 years dominate respondents (55.6%). Most respondents are private employees (48.1%) and students (23.0%). Finally, based on education, most respondents have a high school/vocational high school education (48.6%), with a significant number also coming from undergraduate student (22.47%).

TABLE 1 Demographics of respondents in this study.

	Counts	% of total
Gender		
Female	147	41.3%
Male	209	58.7%
Age		
< 20 yrs	36	10.1%
20–30 yrs	198	55.6%
31–40 yrs	67	18.8%
> 40 yrs	55	15.4%
Education		
Senior High School	173	48.6%
Undergraduate Student	133	37.4%
Bachelor Degree	41	11.5%
Other / n.a	9	2.5%
Status / Employment		
Student	82	23.0%
Private employee	171	48.1%
Self-employee/entrepreneur	76	21.3%
Other / n.a	27	7.6%

3.2 Measurement

The measurement of the variables all adapted various scales used in previous studies (Brodie et al., 2011; Chang and Chen, 2008; De Canio et al., 2019; Kamble and Walvekar, 2019; Yang et al., 2017). Some adjustments were made by involving five expert panels in digital marketing and customer behavior. All items were responded to using a 5-point Likert scale: 1 (strongly disagree) and 5 (strongly agree). M-commerce gamification was measured using nine items adapted from (De Canio et al., 2019; Raza et al., 2024; Wu et al., 2023; Yang et al., 2017). An example of an item is "I enjoy getting rewards when playing games in m-commerce." Customer engagement was measured with nine items (Brodie et al., 2011; Wongkitrungrueng and Assarut, 2020; Wu et al., 2023). Example items: "I can always interact with the seller to get more information about my desired product." The switching cost is measured by nine items (Kamble and Walvekar, 2019); for example, "I will lose my relationship/social network if I switch to another m-commerce." Switching behaviors are measured by seven items (Chang and Chen, 2008). Example item: "I will not switch to another m-commerce because the m-commerce I am currently using has a good reputation."

3.3 Data analysis procedures

Data analysis was conducted in several stages. First, we use an Exploratory Factor Analysis (EFA) to identify the factor structure for all constructs. EFA provides practical guidelines for adapting scales to ensure the quality and accuracy of the research instruments used (Lloret-Segura et al., 2014; Watson, 2017). Second, common methods bias assessment was conducted using Harman's single factor (Podsakoff et al., 2003) and full collinearity assessment (Kock, 2017). Third, Structural Equation Modeling (SEM) Partial Least Squares (PLS) was applied to test the model and hypothesis. The analysis procedure followed the guidelines of Hair J. et al. (2019) and Hair J. F. et al. (2019), starting with evaluating the outer model and continuing with the structure model. This study employs a product-indicator approach with standardized indicator data to estimate interaction effects within the moderation model. The analysis is restricted to reflective measurement models to ensure methodological consistency and alignment with conventional structural equation modeling (SEM) practices for testing moderated relationships (Becker et al., 2018). While performing simple slope analysis, we use the Process approach in SMART PLS 4.0 to identify the predictor's conditional effect on the dependent based on the moderator values.

4 Results

4.1 Exploratory factor analysis (EFA)

The first step in EFA is to ensure the data is suitable for factor analysis using tests like Bartlett's test of sphericity and the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy (Dabbagh et al., 2023; Lloret-Segura et al., 2014; Suryani et al., 2022). As shown in Table 2, all constructs have met the initial requirements for analysis with KMO-MSA values > 0.60 and Bartlett's test of sphericity (p-value < 0.001). Next, determine the number of factors to retain based on the Kaiser criterion (eigenvalues > 1), scree plot, and parallel analysis (Hair J. et al., 2019). The analysis results show that, except for switching cost, all other constructs are unidimensional. Finally, evaluation of the loading factor indicates that all items are > 0.40, which indicates a strong relationship (Asfiati et al., 2022; Trendafilov and Hirose, 2022). Thus, the EFA results provide the structure of the measurement model used in the subsequent PLS-SEM analysis.

The exploratory factor analysis results indicated that while all other constructs in the study exhibited unidimensionality and could, therefore, be directly analyzed using PLS-SEM, the switching cost construct demonstrated multidimensional characteristics. The analysis identified two factors of switching costs: financial switching costs, measured by three items (SC1, SC2, and SC3), and procedural and relational switching costs, measured by six items (SC4 - SC9). The latent variable score (LVS) approach in SmartPLS version 4 accounted for this multidimensionality while maintaining model parsimony. This methodological approach enabled the switching cost construct to be simplified to a first-order level in the measurement model, thereby preserving the conceptual distinctions revealed by the exploratory factor analysis while facilitating subsequent structural equation modeling. Moreover, using LVS in PLS-SEM ensures maximum reliability and numerical stability (Yuan and Deng, 2021).

4.2 Common methods bias assessment

The first assessment for testing CMB utilizes Harman's single-factor model. Table 2 shows that the first factor of variance explained is lower than the threshold of 50%, providing evidence that common method bias is not a serious problem in this dataset (Podsakoff et al., 2003). The next test uses the Full collinearity using variance inflation factor (VIF) approach (Kock, 2017). The VIF analysis, conducted through sequential model testing with alternate endogenous variables, demonstrated acceptable levels of multicollinearity across all specified models. As presented in Table 2, the VIF values ranged from 1.522 to 2.637 when examining three distinct model configurations: Model 1 (with M-commerce gamification as the endogenous variable), Model 2 (customer engagement as endogenous), and Model 3 (switching behavior as endogenous). All obtained VIF values were substantially below the established threshold of 3.3 (Kock, 2017, p. 253), indicating that multicollinearity does not pose a significant concern in the specified model configurations.

4.3 PLS-SEM results

The measurement model evaluation's first stage is assessing the loading factor, at which 0.707 is recommended (Hair J. et al., 2019; Hair J. F. et al., 2019; Hair et al., 2020). The results shown in Table 3 show that all indicators have a loading factor > 0.707, so it is declared acceptable item reliability (Hair J. et al., 2019; Hair J. F. et al., 2019; Hair et al., 2020). The second stage is to evaluate internal consistency reliability based on the Composite Reliability (CR) and Cronbach Alpha (CA) values; both are recommended > 0.70. The results show that the four constructs have met internal consistency reliability with each CA of 0.939 (customer engagement), 0.927 (gamification), 0.911 (switching behavior), and 0.794 (switching cost). Similarly, the CA values range from 0.877–0.940 for the four constructs, indicating that all have met the internal consistency requirements. The third stage assesses convergent validity through the Average Variance Extracted (AVE). As shown in Table 3, all AVE values are more significant than the cut-off value of 0.50, indicating convergent validity has been met (Hair J. et al., 2019; Hair J. F. et al., 2019).

The fourth stage is assessing discriminant validity through Fornell and Larcker's (1981) criteria and heterotrait-monotrait (HTMT) ratio shown in Table 4. Based on Fornell and Lacker criteria, no root of AVE (bold italic, diagonal) that is less than shared variance for all model constructs, indicating discriminant validity has been met (Fornell and Larcker, 1981). Furthermore, based on HTMT, all values are lower than 0.90 (Hair J. et al., 2019; Hair J. F. et al., 2019; Henseler et al., 2015); hence, discriminant validity is met for this model.

After the measurement model assessment is fulfilled, according to the guidelines of Hair J. et al. (2019); Hair J. F. et al. (2019), the structural model is evaluated. Several assessment criteria include the variance inflation factor (VIF) to identify multicollinearity, the coefficient of determination (R^2), f^2 effect sizes, and the statistical significance of the path coefficients. First, the evaluation of multicollinearity has been fulfilled based on the results shown in

TABLE 2 Exploratory factor analysis results and common method bias assessment.

	Number of items	KMO-MSA	Bartlett's test of Sphericity	% of variance	Number of factor
M-commerce gamification	9	0.937	< 0.001	74.7	1
Customer engagement	9	0.938	< 0.001	71.2	1
Switching cost	9	0.887	< 0.001	55.8	2
Switching behavior	7	0.899	< 0.001	65.5	1
Variance explained of the first factor based on EFA	32.51%				
Full collinearity VIFs	1.522	2.637			

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TABLE 3 Construct reliability, validity, and internal consistency.

	Loading	Mean	SD	CA	CR	AVE
Customer engagement						
CE01	0.760	4.497	0.709	0.939	0.940	0.711
CE02	0.866	4.610	0.672			
CE03	0.852	4.663	0.635			
CE04	0.851	4.576	0.689			
CE05	0.779	4.500	0.755			
CE06	0.864	4.528	0.705			
CE07	0.878	4.640	0.645			
CE08	0.873	4.635	0.646			
CE09	0.859	4.654	0.642			
Gamification						
GA01	0.798	4.213	0.824	0.927	0.930	0.747
GA02	0.866	4.309	0.864			
GA03	0.869	4.140	0.999			
GA04	0.872	4.090	1.061			
GA05	0.874	4.039	1.078			
GA06	0.837	3.992	1.115			
GA07	0.874	4.154	0.975			
GA08	0.902	4.149	0.999			
GA09	0.881	4.017	1.101			
Switching behavior						
SB01	0.721	4.169	0.980	0.911	0.912	0.654
SB02	0.821	3.642	0.825			
SB03	0.774	1.694	0.737			
SB04	0.821	1.640	0.711			
SB05	0.849	1.621	0.703			
SB06	0.837	1.584	0.667			
SB07	0.832	1.629	0.717			
Switching cost						
FINSC	0.872	1.596	0.682	0.794	0.877	0.825
RESSC	0.943	1.553	0.675			

GA, Gamification; CE, Customer engagement; SB, Switching behavior; SC, Switching cost; SD, standard deviation.

TABLE 4 Discriminant validity.

	CE	GA	SB	SC
HTMT				
Customer engagement				
Gamification	0.555			
Switching behavior	0.469	0.599		
Switching cost	0.834	0.755	0.706	
Fornell-Lacker criterion				
Customer engagement	**0.843**			
Gamification	0.536	**0.864**		
Switching behavior	−0.439	−0.563	**0.809**	
Switching cost	0.786	0.676	−0.62	**0.908**

GA, Gamification; CE, Customer engagement; SB, Switching behavior; SC, Switching cost. The bold values represent the square root of the Average Variance Extracted (AVE) as per the Fornell–Larcker criterion= YES, The diagonal value (bold) in Fornell-Lacker Table is a square root of the AVE.

Table 2 with a VIF range from 1.522 to 2.637, below the cut-off value of 3.3. Next, the coefficient of determination in the customer engagement (CE) model is 0.287, and switching behavior (SB) is 0.604; both are at a moderate level (Hair J. et al., 2019; Hair J. F. et al., 2019). Next, the f^2 effect sizes on each path show the numbers 0.403 (GA to CE), 0.057 (GA to SB), and 0.065 (CE to SB). As a rule of thumb (Hair J. F. et al., 2019), two values higher than 0.02 are at the trim level, and one path higher than 0.35 is at the significant level.

The structural model results, presented in Table 5, confirm all hypothesized relationships. Hypothesis 1, which posited a positive relationship between gamification and customer engagement, was strongly supported ($\beta = 0.536$, $p < 0.001$). Similarly, Hypothesis 2, proposing a negative association between gamification and switching behavior, was validated ($\beta = -0.205$, $p < 0.001$). Consistent with Hypothesis 3, customer engagement significantly negatively affected switching behavior ($\beta = -0.309$, $p < 0.001$). Further, the mediation analysis (Hypothesis 4) revealed that customer engagement partially mediates the relationship between gamification and switching behavior, as evidenced by the significant indirect effect ($\beta = -0.166$, $p < 0.05$). Finally, Hypothesis 5 was supported, confirming switching costs as a significant moderator in the engagement–switching behavior relationship. The negative interaction effect ($\beta = -0.187$, $p < 0.001$) indicates that lower switching costs strengthen the negative influence of engagement on switching tendencies.

The interaction analysis (Table 5 and Figure 2) reveals two distinct patterns: in high switching cost level (+1 SD), the attenuated slope ($\beta = -0.182$, $p < 0.001$) shows that procedural complexities, potential reward losses and relational investments substantially reduce switching tendencies, thereby weakening engagement's influence on switching decisions. Conversely, in low switching cost conditions (−1 SD), the steeper negative slope ($\beta = -0.202$, $p < 0.001$) demonstrates customer engagement's heightened role in preventing switching behavior when structural barriers are minimal.

4.4 Robustness analysis

The robustness check is evaluated by two approaches: first, using Gaussian Copula to test Endogeneity (Hair J. et al., 2019; Hair J. F. et al., 2019) and then randomly dividing the sample group to compare the results with the entire sample (Guo et al., 2020). First, the results of the Gaussian Copula test in Table 6 show that all the main relationship paths are insignificant (p-value > 0.05), indicating that an endogeneity issue is not present in this research model. Second, the analysis by dividing the samples randomly ($n = 178$) showed consistent results, where the direction and significance of the path were in line with the complete data ($n = 356$).

5 Discussion

Grounded in the Stimulus-Organism-Response (S-O-R) framework and Self-Determination Theory (SDT), this study

TABLE 5 Structural models and hypothesis testing.

	Coeff.	SD	*t*-value	*p*-value	R-square	f-square
Main effect						
GA - > CE	0.536	0.050	10.801	0.000	0.287	0.403
GA - > SB	−0.205	0.053	3.887	0.000	0.604	0.057
CE - > SB	−0.309	0.096	3.229	0.001		0.065
Mediating effect						
GA - > CE - > SB	−0.166	0.058	2.841	0.005		
Moderating effect						
SC - > SB	−0.598	0.095	6.293	0.000		0.262
SC x CE - > SB	−0.187	0.050	3.717	0.000		0.445
Conditional effect (SC at +1 SD/ High)	−0.182	0.030	6.083	0.000		
Conditional effect (SC at −1 SD/ Low)	−0.202	0.025	8.017	0.000		

GA, Gamification; CE, Customer engagement; SB, Switching behavior; SC, Switching cost; SD, standard deviation.

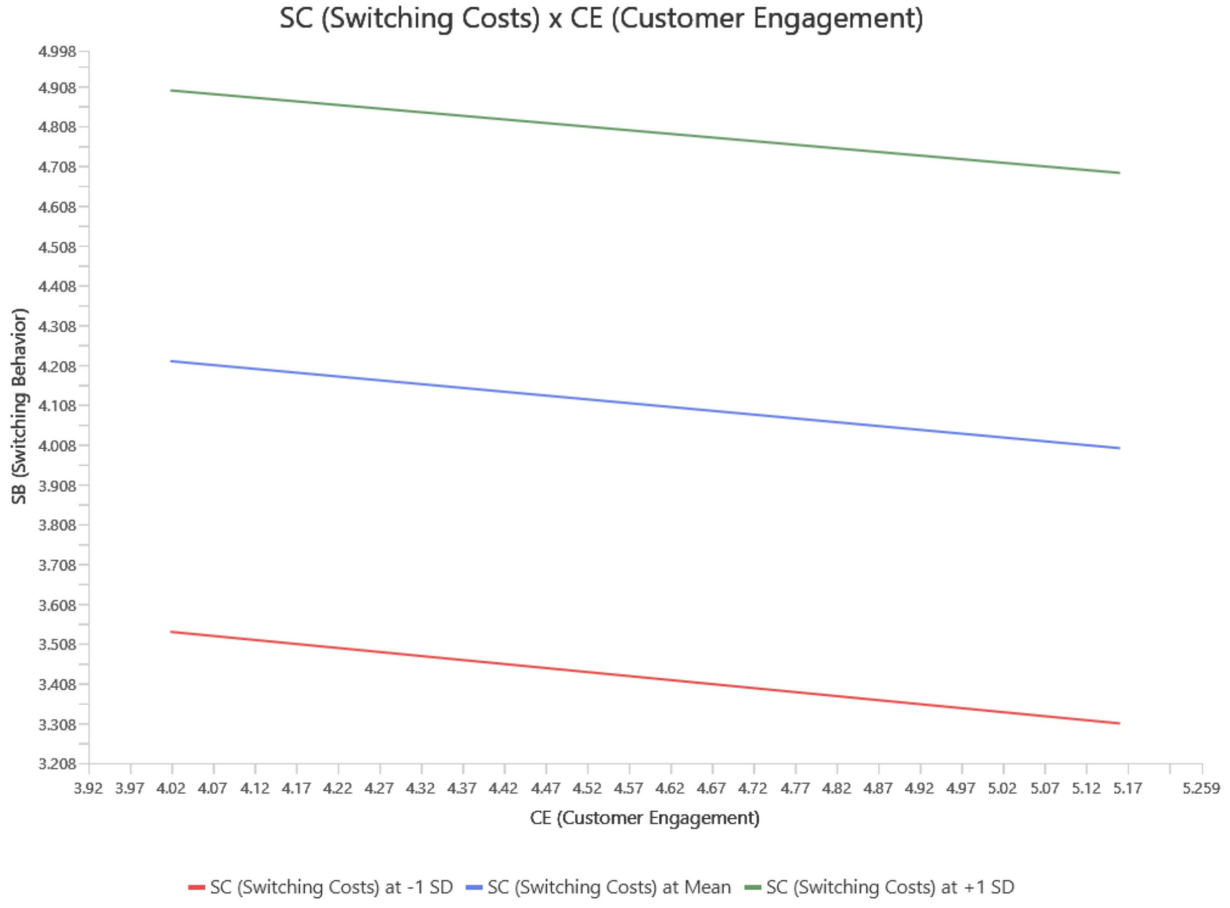

FIGURE 2
The moderating effect of switching costs (SC) on the relationship between customer engagement (CE) and switching behavior (SB) is based on simple slope analysis. SC x CE is the interaction variable.

investigates how gamification in m-commerce influences customer switching behavior through customer engagement as a mediator, with switching costs serving as a moderator between engagement and switching behavior. The empirical results demonstrate that gamification significantly enhances customer engagement while directly attenuating switching tendencies. Furthermore, the

TABLE 6 Robustness checks.

	coeff	SD	t	*p*-value
Gaussian copula				
GC (GA - > SB) - > SB	0.809	0.471	1.716	0.086
GC (CE - > SB) - > SB	−0.003	0.045	0.075	0.940
GC (GA - > CE) - > CE	−0.843	0.514	1.642	0.101
Split sample (n = 178)				
GA - > CE	0.521	0.054	9.612	0.000
GA - > SB	−0.151	0.059	2.575	0.010
CE - > SB	−0.389	0.113	3.447	0.001
SC - > SB	−0.599	0.105	5.679	0.000
SC x CE - > SB	−0.235	0.063	3.727	0.000

GA, Gamification; CE, Customer engagement; SB, Switching behavior; SC, Switching cost; SD, standard deviation.

analysis reveals that customer engagement fully mediates the impact of gamification on switching behavior and that switching costs effectively moderate the inverse relationship between customer engagement and switching behavior. These findings offer important theoretical contributions by validating the complementary explanatory power of S-O-R and SDT in gamification research while providing practical insights for m-commerce platforms seeking to optimize customer retention strategies through gamified experiences.

5.1 Theoretical implications

First, the analysis reveals a statistically significant positive relationship between m-commerce gamification and customer engagement, supporting previous findings (Raza et al., 2024). This effect stems from key gamification elements - immediate rewards (triggering dopamine responses), competitive features (leveraging achievement motivation), and social interactions (fulfilling belongingness needs) - which collectively enhance user experience and prolong platform interaction (Rodrigues et al., 2016; Mominzada et al., 2022). These results align with the Self-Determination Theory, demonstrating how gamification satisfies competence (through challenges), autonomy (via customizable participation), and relatedness (through social connectivity) needs.

Secondly, m-commerce gamification negatively affects the switching behavior of consumers, indicating that gamification directly reduces switching tendencies. These results can provide information that dynamic and enjoyable gamified experiences can serve as a unique competitive advantage that is difficult for rivals to replicate. This study is the first empirical evidence of the role of gamified interactions on m-commerce platforms in reducing the likelihood of customers switching to competitors. Furthermore, the study extends current understanding by revealing gamification's cascading benefits across the customer journey—enhancing not only retention rates (Liu et al., 2024) but also fostering brand loyalty and stimulating purchase frequency, as evidenced in recent literature (Punwatkar and Verghese, 2025; Raza et al., 2024).

Third, the hypothesis test results show a positive and significant relationship between customer engagement and switching behavior in m-commerce marketplace consumers. The results of this study support similar studies that confirm the relationship between customer engagement and various consumer behaviors such as switching behavior and retention (Menidjel et al., 2023; Torkzadeh et al., 2022), behavioral intentions (Ahmed et al., 2022), commitment and trust (Chen et al., 2024; Rather, 2019), and loyalty (Amoako et al., 2020; Nauen and Enke, 2022). The findings of this study add empirical evidence to the relatively limited relationship between customer engagement and switching behavior (Ahmed et al., 2022).

Fourth, the present study shows that customer engagement has been confirmed to mediate the relationship between gamification and switching behavior. This mediation effect suggests that the engagement level partially drives gamification's negative impact on customer switching behavior- when effectively implemented, gamification programs enhance customer engagement, reducing the likelihood of customers switching to competitors at the next stage. This study provides a new perspective on studying the indirect effects of gamification on switching behavior through engagement which has previously been studied more in other behavioral contexts, including loyalty (Arcas et al., 2022; Bravo et al., 2023; Hollebeek et al., 2021), desirable behavior (Ebrahimi et al., 2024), repurchase intention (Elgarhy et al., 2024), and retention (Liu et al., 2024). Moreover, this study supports the Technology Acceptance Model (TAM), where the perceived playfulness of a gamification program enhances user acceptance and engagement by making the experience enjoyable (Lin et al., 2022; Wu et al., 2023), and the Stimulus-Organism-Response (S-O-R) process model which offers an alternative explanation of how game mechanics (e.g., rewards, challenges) as stimulus drive emotional engagement (organism), which in turn influences customer behavior (Lin et al., 2022), including switching behavior.

Finally, this study establishes switching costs as a key moderator in the relationship between customer engagement and switching behavior among m-commerce consumers, offering a new insights by examining switching costs as a boundary condition rather than through conventional lenses like loyalty (Baloglu et al., 2017; Ngo and Pavelková, 2017; Yen, 2010) or repurchase behavior (Nagengast et al., 2014). These findings clarify how switching costs conditionally alter engagement's effectiveness in reducing switching behavior and advance existing literature by delineating the contextual dominance of psychological versus structural switching deterrents in m-commerce environments.

Our analysis provides empirical validation for switching costs' dual role as a quasi-moderator (Judd, 2015). It supports prior research identifying their simultaneous function as antecedents and moderators in customer relationship frameworks (Aydin et al., 2005; Sharma, 2003). The results reveal two distinct behavioral patterns: In high switching cost environments, customer engagement's protective effect against switching behavior diminishes significantly ($\beta = -0.182$) as existing financial, procedural, and relational barriers substantially reduce switching tendencies. Conversely, in low switching cost conditions, customer engagement emerges as the dominant preventive mechanism ($\beta = -0.202$), where psychological attachment and perceived value effectively deter switching when structural barriers are absent. These findings advance our theoretical

understanding by demonstrating that (1) switching costs and engagement function as complementary deterrents in a dynamic equilibrium, (2) engagement's preventive capacity is maximized in low-barrier contexts, and (3) switching costs become the primary antecedent variable when exceeding critical thresholds, thereby confirming their unique quasi-moderator status in switching behavior models.

5.2 Practical implications

This study offers several practical implications related to gamification in m-commerce that positively and significantly affect customer engagement and negatively affect switching behavior. First, the results of this study show that users who engage in in-game elements are more likely to engage more strongly. In other words, rewards, competitions, and social interactions as gamification elements in m-commerce-based marketplaces can be potential strategies to encourage consumers to continue using the application. Furthermore, m-commerce gamification can effectively decrease switching intentions. Therefore, companies can develop various types of games that can attract consumer interest by tracking which gamification elements drive the most engagement and refine strategies accordingly. Moreover, various experiments with different gamification approaches (e.g., competitive vs. cooperative) can be done to see what works best for the target audience. Second, this study shows that switching costs reduce consumers' switching behavior intentions, which implies the importance of m-commerce marketplace managers in managing switching costs as a vital strategy. Therefore, managers can use switching costs to mitigate the potential switching behavior of their consumers. For example, e-commerce developers can make relational switching costs effective through personalized services to strengthen the emotional bond with their customers and make them less likely to switch. Other practices that can be applied are providing financial incentives and designing loyalty programs as part of switch costs to encourage customers to stay engaged and loyal.

5.3 Limitations

The limitations of this study can be explained in several points:

Cultural context. The present study focuses exclusively on Indonesian consumers, particularly urban populations with relatively high digital literacy. While this provides valuable insights into an emerging market, the findings may not generalize to other cultural contexts or regions with lower technological adoption. Future research should examine these relationships across diverse cultural and economic settings to assess the broader validity of the proposed framework.

Generalizability. The sample was drawn primarily from three major Indonesian m-commerce platforms (Shopee, Tokopedia, and Lazada). As such, the results may not fully represent gamification implementations in other digital commerce sectors, such as travel booking platforms, luxury goods marketplaces, or service-based applications (e.g., fintech or ride-hailing services). Additionally, Western platforms often employ different gamification strategies, which can yield varying effects on user engagement and switching behavior. Future studies should investigate these variations to determine whether the observed patterns are consistent across different platform types and business models.

Design and methodology limitations. Several potential factors were not included in the present study, including variations in platform interface design, differences in marketing expenditures, lingering effects of COVID-19 on consumer behavior, and disparities in users' mobile device capabilities. Hence, future research should incorporate these factors as control variables or moderators to better isolate the effects of gamification. Another limitation is the cross-sectional nature of the data, which prevents an examination of how these relationships evolve over time. Important temporal dynamics—such as the formation of user habits, potential diminishing returns of gamification elements, and seasonal fluctuations in platform usage—could not be assessed. Future studies should adopt longitudinal designs, tracking user behavior over six to 12 months, to better understand the long-term effects of gamification on retention. Additionally, comparative studies across different platform types and cultural contexts using standardized measurement approaches would help establish the generalizability of these findings.

6 Conclusion

This study examined how m-commerce gamification influences customer switching behavior, with customer engagement as a mediator and switching costs as a moderator to consumers in Indonesia. The findings confirm that gamification significantly increases engagement while directly reducing switching tendencies, with engagement playing a key mediating role. Furthermore, switching costs have been confirmed to moderate the customer engagement and switching behavior relationship, showing that switching costs can be boundary conditions in this link. This empirical study generally supports the Self-Determination Theory (SDT) and Stimulus-Organism-Response (S-O-R) model to explain gamification's role in shaping user experience and retention. The study also highlights gamification as a strategic tool for improving engagement and reducing customer switches, particularly when combined with switching cost optimization.

Data availability statement

The original contributions presented in the study are included in the article/Supplementary material, further inquiries can be directed to the corresponding author.

Ethics statement

The studies involving humans were approved by Dr. Sri Bramantoro Abdinasoro (Deputy of Head of Doctor of Research in

Management, Binus University). The studies were conducted in accordance with the local legislation and institutional requirements. Written informed consent for participation in this study was provided by the participants' legal guardians/next of kin.

Author contributions

EY: Formal analysis, Writing – original draft, Methodology, Conceptualization, Data curation, Funding acquisition. LS: Validation, Supervision, Methodology, Writing – review & editing. HS: Writing – review & editing, Software, Validation, Supervision. SC: Validation, Methodology, Writing – review & editing, Supervision.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Generative AI statement

The authors declare that no Gen AI was used in the creation of this manuscript.

Publisher's note

Supplementary material

The Supplementary material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fcomm.2025.1608764/full#supplementary-material

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