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Original Article

The Role of Gamification and Social Media Marketing on Brand Loyalty through Customer Engagement: A Case Study of Duolingo

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Abstract

Gamification and social media marketing strategies has become a significant trend in digital marketing, including in language learning platforms such as Duolingo. Gamification elements, such as streaks, leaderboards, and daily challenges, are integrated to enhance user motivation, while social media marketing through creative approaches on TikTok is employed to boost customer engagement. However, despite the success of these approaches in driving interactions, their effectiveness in fostering long-term brand loyalty requires further in-depth evaluation. This research aims to explore the impact of gamification and social media marketing on brand loyalty through customer engagement. Utilizing the Self-Determination Theory (SDT) framework, this research examines the relationships between variables using the Partial Least Square-Structural Equation Modeling (PLS-SEM) method and sentiment analysis based on user data from X. Online surveys and text mining techniques are applied to collect quantitative and qualitative data, ensuring that the research outcomes reflect user perspectives holistically. The study confirms that Duolingo's gamified features and social media presence enhance customer engagement and brand loyalty. User sentiment toward gamification is largely positive, though technical issues generate criticism. Social media content is valued for entertainment but lacks educational depth. PLS-SEM analysis aligns with Self-Determination Theory, demonstrating how Duolingo satisfies users' needs for competence, autonomy, and relatedness. Future research should incorporate multi-platform data, longitudinal methods, and variables like brand experience. These findings provide actionable guidance for businesses implementing interactive digital strategies.

Keywords: Brand Loyalty, Customer Engagement, Gamification, Sentiment Analysis, Social Media Marketing.

1. Introduction

The application of gamification and marketing through social media is currently widely used in digital marketing approaches. This approach can be explained through Self-Determination Theory (SDT), which emphasises that intrinsic and extrinsic motivation play an important role in shaping user engagement. In this context, gamification aims to fulfil basic human needs for competence, autonomy, and social connectedness (Ryan & Deci, 2000). This strategy not only increases customer engagement but also creates a more interactive and enjoyable experience, which strengthens the bond between customers and brands. One successful example is Duolingo, a language learning application that uses gamification techniques and social media promotion to increase customer interaction while achieving learning objectives. Duolingo's innovation in integrating these strategies has made it a leader in the educational technology sector.

Gamification is increasingly important for businesses in the future due to its ability to increase engagement, motivation, and productivity among both employees and customers. By

integrating game elements into a business context, companies can create a more interactive and enjoyable experience that encourages participation and strengthens loyalty. The use of gamification allows businesses to build deeper relationships with consumers, while creating a competitive advantage in an increasingly competitive digital marketplace. This is particularly relevant in the face of increasingly dynamic consumer behaviour and expectations, where gamification acts as a powerful tool to support continuous learning, performance improvement, and adaptation to market demands.

The main appeal of gamification lies in its ability to tap into human instincts for competition, achievement, and reward. Through this approach, customer interactions become more engaging and repetitive, which ultimately increases retention and loyalty rates. In addition, the popularity of gamification continues to grow due to its wide range of applications, from increasing customer engagement and employee performance to loyalty programmes. Each of these applications is driven by gamification's ability to motivate, encourage behavioural change, and create a work environment that supports collaboration and positive competition (Dechow & Dichev, 2002).

Duolingo is widely known for utilising creative gamification techniques to make the language learning experience more engaging and effective for its users, successfully transforming the typically tedious process of learning a language into something enjoyable and addictive. A study by Sari et al. (2022) states that 75% of students consider Duolingo to support independent learning, demonstrating the success of its gamification approach.

Duolingo is widely known for its creative use of gamification to make language learning more engaging and effective. Based on consumer behaviour theory, customer engagement and brand loyalty can be explained through users' affective, cognitive, and conative behaviour towards the brand. Gamification elements such as streaks, skill trees, and leaderboards create positive experiences that increase repeat interactions and a sense of achievement for users, thereby encouraging emotional engagement (affective engagement). At the same time, these experiences also strengthen users' trust in the brand (cognitive loyalty) and increase the likelihood that they will continue to use the service consistently (conative loyalty). According to a report by Business of Apps, Duolingo's gamification is key to retaining its large customer base, who tend to stay with the app 50% longer due to gamification features such as daily challenges and community-based competitions. However, despite its strengths, certain aspects of its gamified system and its integration with broader marketing strategies remain underexplored. Key gaps include a lack of empirical analysis on how specific gamification mechanics directly translate to sustained brand loyalty, and an insufficient understanding of user sentiment regarding technical frustrations or the perceived educational depth of its social media content. To address these gaps, this study analyzes the direct associations between gamification, social media marketing, engagement, and loyalty, and further investigates the nuanced feedback from users, which provides actionable insights for strategic optimization.

However, there are some shortcomings in Duolingo's gamification that could be improved, such as an excessive focus on points and streaks, which can sometimes distract from the original goal of learning a language in depth. Duolingo also lacks personalisation in its learning flow, so individuals with different abilities have the same experience. Social interaction is also still limited, and the feature for speaking in the language being learned is not yet sufficiently developed. In addition, the variety of challenges in its gamification feels monotonous, which can be boring. By improving these aspects, Duolingo can enhance the learning experience and make it more engaging and effective.

Meanwhile, the use of social media platforms and networks to promote goods, services, and brands and connect with a larger audience is known as social media marketing. Social media marketing activities significantly influence brand awareness, which ultimately impacts brand loyalty. This relationship is evident in studies focusing on consumers who actively interact with brands on platforms such as X, TikTok and Instagram (Fatima et al., 2022).

Based on this discussion, this study aims to explore the relationship between gamification strategies, social media marketing, customer engagement and brand loyalty on Duolingo. Although not directly focused on profitability, this analysis is expected to provide insights into how these strategies create value for the company. As such, ccompanies may create more pertinent strategies to boost competitiveness in the increasingly cutthroat digital age by comprehending the mechanisms that underlie the effectiveness of these tactics.

2. Literature Review

2.1. The Relationship Between Gamification and Customer Engagement

Gamification enhances interaction by integrating game elements into non-game contexts, creating a better user experience and higher engagement. Research by Hsu (2023) found that gamification has a positive and significant effect on customer engagement. Meanwhile, Raza et al. (2024) mentioned that gamification in the financial sector affects customer engagement, which then mediates the relationship between gamification and purchase intention in mobile banking services. Research by Prasetyaningrum et al. (2024) shows that gamification strategies are effective in measuring and increasing customer engagement, indicating strong reliability in these engagement instruments. Gamification not only serves as a tool to increase user interaction, but also as a reliable approach to measure customer response and participation in the services provided, which in turn supports increased customer loyalty and satisfaction.

Gamification can effectively increase customer engagement and drive sales, emphasising the importance of building expectations rather than coercion in digital services (Eisingerich et al., 2009). Gamified messages significantly increase customer engagement with tourism brands compared to traditional text messages. The basic mechanism of this effect is the flow experience, which leads to increased behavioural intent towards the brand and the intention to follow influencers (Kapoor et al., 2026).

2.2. The Relationship Between Social Media Marketing and Customer Engagement

Social media marketing plays a crucial role in attracting and maintaining customer engagement. Research findings by Liu et al. (2021) show that focusing on the entertainment, interaction, and timeliness dimensions of luxury brand social media marketing efforts significantly increases customer engagement, while focusing on the customisation dimension does not. Ibrahim and Nashaat (2022) reveal that, in general, social media marketing has a positive impact on online customer engagement and customer satisfaction. Meanwhile, according to Meire et al. (2019), social media marketing significantly influences customer engagement by utilising engaging video content, user-generated feedback, and aligning content with consumer preferences.

Findings by Meetei and Devi (2024) show that marketing through social media influences consumer purchasing decisions and that social media advertising saves time. Social media enables real-time communication, personalised interactions, and targeted advertising, leading to increased customer engagement, brand awareness, and ultimately, sales.

2.3. The Relationship Between Customer Engagement and Brand Loyalty

Research by Widnyani et al. (2024) shows that higher levels of customer engagement contribute to increased brand loyalty among Viva Cosmetics users in Denpasar. This relationship emphasises the importance of actively engaging customers, which not only builds connections with the brand but also increases their loyalty to the products offered. Hasibuan and Rahmidani (2023) state that customer engagement has a significant positive impact on brand loyalty, as demonstrated in a study of Maxim users in Padang. The study indicates that higher levels of customer participation will increase brand loyalty among users.

When customer engagement increases, it directly increases brand loyalty among MPV car users. Therefore, encouraging customer engagement through effective social media strategies and enriching the brand experience is crucial for companies that want to increase brand loyalty among their consumer base (Lestari et al., 2024). A study Lauwrence et al. (2024) found a strong positive correlation (0.852) between social marketing activities and brand loyalty, indicating that effective online consumer engagement, particularly through Instagram, increases loyalty to beauty clinic brands.

2.4. The Relationship Between Gamification and Brand Loyalty

Gamification increases brand loyalty by encouraging emotional and physical interaction during brand events. This creates a deeper connection with the audience, which ultimately increases brand awareness and engagement, resulting in greater brand loyalty (Abdel Halim, 2025).

Research by Bulu (2024) found that gamification through Shopee Games had a positive impact on user brand loyalty, as indicated by a moderate effect. The main dimensions at play included social interaction, sense of control, goal setting, progress tracking, rewards, and cues, which collectively increased user satisfaction and commitment to the brand. Baykal (2023) found that gamification significantly increases brand loyalty by encouraging greater engagement and commitment from customers. Engagement in gamified experiences builds emotional connections, resulting in brand affection, advocacy, and stronger long-term relationships, which ultimately benefit businesses through sustained customer loyalty and increased sales.

2.5. The Relationship Between Social Media Marketing and Brand Loyalty

A study by Alhatami and Owais (2024) found a direct impact of social media marketing on brand loyalty, showing that promotional campaigns and social media platforms significantly increase customer loyalty, influence purchasing decisions, and strengthen the relationship between customers and brands in e-commerce. The study found that the direct influence between social media marketing and brand loyalty is statistically significant, indicating that effective social media marketing strategies have a positive effect on brand loyalty among private hospital customers in Egypt. Social media marketing activities have a significant effect on Elzatta Hijab brand loyalty. This effect is seen both simultaneously and partially, emphasising the importance of effective digital marketing strategies in building brand loyalty among consumers (Nurrasyid, 2024).

Social media marketing directly has a significant influence on cosmetic brand loyalty among female university students in Makassar City, Indonesia, as shown by research findings that highlight the importance of managing brand loyalty to increase purchase intent (Ashdaq et al., 2024). Research by Bashir et al. (2024) found that social media marketing has a significant impact on brand loyalty by increasing trust in the brand and influencing its dimensions: cognitive, affective, conative, and behavioural loyalty. Comprehensive strategies

that are capable of building deep connections with customers are essential for building trust and loyalty in the digital environment.

2.6. The Relationship between Gamification, Customer Engagement, and Brand Loyalty

Susilo (2024) states that gamification has a positive impact on brand loyalty by increasing customer engagement. His study found that the application of game elements in a non-game context strengthens brand loyalty, with customer engagement acting as a significant mediating variable in this relationship.

Gamification significantly increases brand loyalty by enhancing consumer engagement through immersion, realisation, and social interaction. These elements foster deeper connections, leading to increased identification with the brand and stronger social relationships, ultimately driving consumer loyalty in the Portuguese market (Neves et al., 2024).

Research by Ramdhani and Hussein (2024) found that gamification directly influences brand loyalty by increasing consumer engagement and brand awareness. This study found that gamification influences these factors, which then mediate its impact on loyalty among Shopee users in Surabaya. Penampe et al. (2024) also states that game-like experiences significantly increase customer engagement with brands, which in turn has a positive impact on brand loyalty in language learning applications. Thus, gamification directly influences brand loyalty by encouraging deeper engagement among users through specific game mechanics. Gamification directly influences brand loyalty by increasing customer engagement through elements such as reward points and badges, which stimulate the release of dopamine in the brain's reward system, encouraging long-term attachment to the brand, and optimising customer retention and customer lifetime value (Patel, 2025).

2.7. The Relationship between Social Media Marketing, Customer Engagement, and Brand Loyalty

Social media marketing has a positive and significant impact on brand loyalty through customer engagement. Research shows that effective social media strategies increase customer interaction, which ultimately strengthens brand loyalty among users of local products such as Viva Cosmetics (Widnyani et al., 2024).

While Social Media Marketing (SMM) directly influences brand loyalty, its effect is often more significant when mediated by customer engagement. For example, at Zalora Indonesia, SMM has a direct influence on brand loyalty of 25.5% and an indirect influence of 23.7% through customer engagement (Rini & Hasbi, 2024). A study by Ferliansyah et al. (2022) states that social media marketing has a positive impact on brand loyalty through customer engagement. This study found that effective social media marketing increases customer engagement, which in turn significantly increases brand loyalty, highlighting the importance of social media strategies for brands such as Sociolla.

Marketing through social media significantly influences brand loyalty through increased customer engagement, building trust in the brand and dimensions of loyalty such as cognitive, affective, conative, and behavioural loyalty, and emphasising the importance of deep relationships beyond promotional content alone (Bashir et al., 2024).

Social media marketing positively impacts brand loyalty through customer engagement, where social media influencer marketing and content marketing increase such engagement. This engagement mediates the relationship, emphasising the importance of authentic influencers and relevant content to drive loyalty in China's local cosmetics industry (Y. Liu et al., 2024). Based on the above research, the following hypothesis can be formulated:
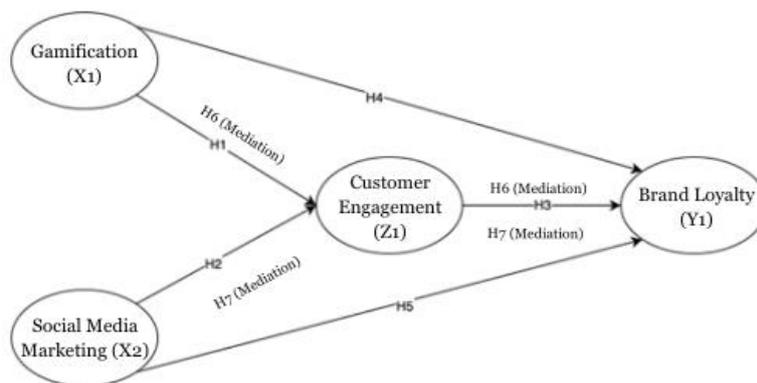
Figure 1. Research Framework

The model positions Gamification and Social Media Marketing as independent variables that are expected to influence Brand Loyalty, both directly and indirectly through Customer Engagement. Customer Engagement acts as an intervening (mediating) variable, reflecting the extent to which customers are emotionally, cognitively, and behaviorally involved with a brand. Based on Figure 1, the relationships between variables are formulated into the following hypotheses:

H1: Gamification (X1) has a positive effect on Customer Engagement (Z1).

H2: Social Media Marketing (X2) has a positive effect on Customer Engagement (Z1).

H3: Customer Engagement (Z1) has a positive effect on Brand Loyalty (Y1).

H4: Gamification (X1) has a positive effect on Brand Loyalty (Y1).

H5: Social Media Marketing (X2) has a positive effect on Brand Loyalty (Y1).

H6: Customer Engagement (Z1) mediates the relationship between Gamification (X1) and Brand Loyalty (Y1).

H7: Customer Engagement (Z1) mediates the relationship between Social Media Marketing (X2) and Brand Loyalty (Y1).

3. Methods

3.1. Research Design

Using a mixed-methods framework, this study examines the effects of Duolingo's gamification on engagement and learning outcomes. The quantitative phase involves a survey analyzed with SEM-PLS to investigate the connections between gamification elements (points, streaks, avatars), user engagement, and language learning results. Complementing this, the qualitative component employs sentiment analysis of social media data (Twitter/X) using Orange Data Mining to understand public perception and user experiences with Duolingo's gamification features. This mixed-methods design enables triangulation of findings, where quantitative survey data provides statistical evidence of relationships between variables, while sentiment analysis offers contextual insights into user attitudes and experiences, thereby strengthening the validity and depth of the research findings.

3.2. Research Population and Sample

The population in this study consists of individuals who actively use social media and have used the Duolingo application as a language learning tool. As the exact number of the population is unknown, this study uses an operational population approach, namely individuals who meet two criteria: (1) active on TikTok social media and (2) have used the Duolingo application at least in the last three months.

This study set 120 respondents, exceeding the minimum limit. This number was chosen because only 120 of the total questionnaire respondents met the inclusion criteria and provided complete, valid, and reliable answers. Thus, this number not only meets statistical requirements but also considers data quality and the stability of the PLS-SEM model.

The sampling technique used was simple random sampling (probability sampling), in which each eligible member of the population had an equal chance of being selected (Sugiyono, 2017). The questionnaire was distributed online through various social media platforms and also through an online survey platform (Populix), with active users of the Duolingo and TikTok applications as the target respondents. To ensure the suitability of the respondents and the research population, the questionnaire began with screening questions, and only data from respondents who passed the selection were analysed further. Subsequently, 120 respondents were randomly selected from the collected data to be used as samples and processed in this research analysis.

3.3. Data Collection Methods

In this study, the questionnaire was distributed through the online survey platforms PopSurvey and Google Form (Duolingo Questionnaire), which contained 27 questions and was distributed online through social media such as X, Reddit, and Discord. PopSurvey from Populix is an application-based online survey platform that makes it easy for researchers and companies to collect data quickly and measurably. One of its advantages is the screening question feature, which allows researchers to filter respondents according to specific criteria, such as TikTok users or individuals who play video games, so that the data obtained is more relevant and in line with the research objectives.

In collecting data through questionnaires, this study did not provide incentives in the form of gifts, digital wallet balances (e.g., GoPay, Dana, and the like), or other compensation. This decision was made because the questionnaire was distributed through various online platforms, some of which have policies that do not allow the collection of private or sensitive data related to respondent identity, such as Discord and Reddit. Thus, the questionnaire only requested data relevant to the research needs without any financial incentives.

The questionnaire was targeted at Duolingo users on social media and through personal connections to reach respondents. The data collection period was from April 2025 to May 2025. In this study, the measurement instrument used a 5-point Likert scale. The selection of a 5-point Likert scale was based on the results of a pilot test that had been conducted previously. Several respondents said that the use of a 5-point scale was easier to understand and provided a more balanced space for them to express their level of agreement, especially with the middle (neutral) option.

3.4. Analysis Method

The research method consisted of two main approaches. Sentiment analysis was conducted using Orange Data Mining to understand public perception of Duolingo's gamification features on social media. Data was collected by scraping tweets using Python scripts and libraries such as snscrape, with relevant keywords and hashtags (#duolingo, #duolinfostreak, #duolingopoints, #duolingoavatar). The scraping results were stored in CSV format containing tweet text, date, username, and other metadata, then analysed to assess user opinions regarding the points system, daily streaks, and avatars. Meanwhile, for quantitative research, data was obtained through Google Forms and analysed using SmartPLS (SEM-PLS). The data was exported to Excel, verified for consistency and completeness, coded according to the measurement scale, then exported to CSV before being loaded into SmartPLS for structural modelling and hypothesis testing in accordance with the research objectives.

4. Results and Discussion

4.1. Research Results

4.1.1. Sentiment Analysis
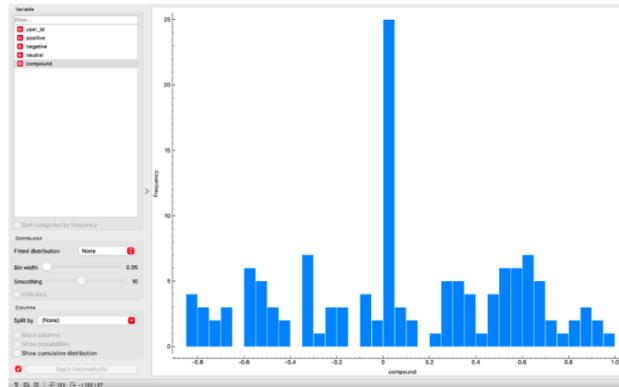
A. Sentiment Distribution (Histogram)

Figure 2. Sentiment Analysis Histogram Results

Based on the results of the sentiment score distribution analysis as in Figure 2, it can be seen that the distribution of compound values varies widely, ranging from around -0.8 to close to 1.0. The compound value indicates the overall sentiment polarity in the text, where negative values indicate negative sentiment, positive values indicate positive sentiment, and values close to zero indicate neutral sentiment.

The data distribution shows that most user comments are around neutral values with the highest frequency peak close to 0. This indicates that most conversations about Duolingo on social media are neutral, tending to be informative opinions or comments without strong emotional expressions. However, there is also a significant distribution in the positive value range (around 0.4-0.6), which indicates expressions of satisfaction and positive experiences with the application. Meanwhile, the distribution on the negative side (around -0.6 to -0.8) shows that there are still complaints, criticisms, or dissatisfaction from users regarding certain features or policies of Duolingo.
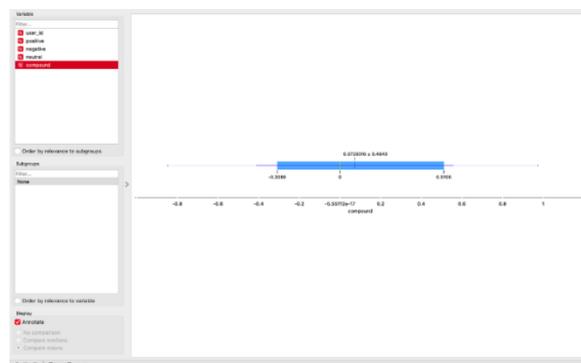
B. Sentiment Box Plot

Figure 3. Results of Sentiment Analysis Box Plot

The box plot visualisation in Figure 3 shows a mean sentiment score of 0.0726 ± 0.4840, with a median close to 0. This indicates that, in general, users' perceptions of Duolingo on social media tend to be neutral to slightly positive.

The fairly wide interquartile range shows that there's a lot of variation in opinion among users, with most values ranging from -0.30 to 0.51. A few extreme points show the existence of outliers with very negative or very positive values, illustrating that a small number of users express very strong emotions, either in the form of praise or complaints about the app.

C.   Word Cloud

Figure 4. Word Cloud Visualisation Results

The word cloud visualisation in Figure 4 depicts the words that appear most frequently in user conversations related to Duolingo on social media. Words such as 'duolingo,' 'streak,' 'day,' 'lesson,' 'lost,' and 'please' dominate the conversation. The dominance of the term 'streak' indicates that the daily streak feature is the topic most frequently discussed by users.

The appearance of words such as 'lost,' 'help,' 'repair,' and 'please' indicates that many users are discussing their experience of losing their streak or asking for help to recover it. Meanwhile, words such as 'learn,' 'language,' and 'lesson' show a strong connection between language learning activities and the user experience with the application.

In general, this word cloud shows that gamification aspects (such as streaks and leaderboards) are central to user perception, which can influence engagement as well as positive and negative perceptions of the Duolingo brand.

D.   Heat Map Sentiment

Figure 5. Heat Map Analysis Results

The heat map in Figure 5 displays the relationship between positive, negative, neutral, and compound sentiment values for each text. Blue represents negative sentiment, green indicates neutral sentiment, while yellow indicates high positive sentiment.

The varied colour patterns indicate that not all comments have the same sentiment tendency; some users show very positive reactions, while others express significantly negative sentiments. The compound value in the middle between green and yellow reinforces the previous finding that the majority of user opinions about Duolingo tend to be neutral to positive.

This visualisation helps to clarify the distribution of user emotions and shows the consistency of the pattern found in the histogram and box plot, namely a relatively balanced perception but with a positive tendency.

E. SEM-PLS

Based on the results of testing with SEM-PLS, the following model in figure 6 was obtained:
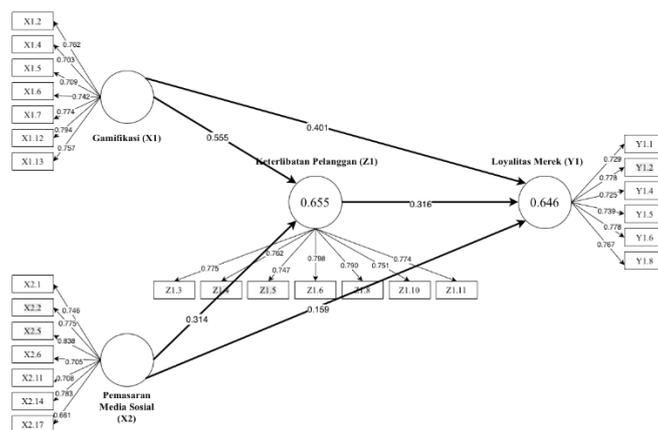

Figure 6. SEM-PLS graph results

4.1.2. Outer Model Evaluation

The outer model evaluation was conducted through four main components, namely indicator loading, internal reliability, convergent validity, and discriminant validity, as recommended by Hair et al. (2019)

A. Reliability Test

Table 1. Reliability Test Results

	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)
Gamification (X1)	0.869	0.872	0.899
Customer Engagement (Z1)	0.887	0.892	0.911
Brand Loyalty (Y1)	0.848	0.851	0.887
Social Media Marketing (X2)	0.867	0.871	0.898

Based on the reliability analysis results in Table 1, all constructs in this study showed Cronbach's Alpha, Composite Reliability (rho_A), and Composite Reliability (rho C) values above the threshold value of 0.70. This indicates that all constructs have good internal reliability (Hair et al., 2019).

Although Cronbach's Alpha is still used as a classic measure of reliability, in the context of PLS-SEM, Composite Reliability (rho_C) and rho_A values are more reliable because they do not assume identical indicator contributions and better reflect accurate reliability estimates for reflective models (Hair et al., 2019). Therefore, these results reinforce the internal consistency between indicators in measuring the intended reflective constructs.

B. Convergent Validity Test

A good AVE value is 0.50 or higher, which means that the construct is able to explain at least 50% of the variance of its indicators (Hair et al., 2019).

Table 2. AVE Results

	Average variance extracted (AVE)
Gamification (X1)	0.561
Customer Engagement (Z1)	0.595
Brand Loyalty (Y1)	0.567
Social Media Marketing (X2)	0.558

The results of convergent validity testing in Table 2 show that all variables have an AVE value above 0.50. This indicates that each statement item is able to represent the construct being measured consistently and significantly.

4.1.3. Inner Model Evaluation

A. Coefficient of Determination

Table 3. Determination Coefficient Results

	Original sample (O)
Customer Engagement (Z1)	0.655
Brand Loyalty (Y1)	0.646

The results of the coefficient of determination analysis in Table 3 show that Customer Engagement (Z1) has an R^2 value of 0.655, and Brand Loyalty (Y1) has an R^2 value of 0.646. This means that the model is able to explain 65.5% and 64.6% of the variance of the endogenous constructs, respectively. Based on Hair et al. (2019), these R^2 values fall into the moderate category, indicating that the model has fairly good predictive ability.

B. Path Coefficient Test

Path coefficients are values that indicate the magnitude of the influence of one variable on another variable in a structural model. These values are derived from estimates of the relationships between constructs. According to Hair et al. (2019), the p-value (< 0.05) and t-statistic (> 1.96) are important for assessing the significance of paths in a model.

Table 4. Path Coefficient Results

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
Gamification (X1) -> Customer Engagement (Z1)	0.555	0.538	0.107	5.163	0.000
Gamification (X1) -> Brand Loyalty (Y1)	0.401	0.385	0.125	3.218	0.001
Customer Engagement (Z1) -> Brand Loyalty (Y1)	0.316	0.311	0.120	2.629	0.009
Social Media Marketing (X2) -> Customer Engagement (Z1)	0.314	0.335	0.099	3.163	0.002
Social Media Marketing (X2) -> Brand Loyalty (Y1)	0.159	0.180	0.121	1.308	0.191

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As shown in Table 4, the results show that gamification has the strongest influence on customer engagement (β = 0.555; p = 0.000) and significantly increases brand loyalty (β = 0.401; p = 0.001), confirming that features such as points, levels, and daily challenges not only make the learning process more interesting but also build emotional closeness to the brand. Furthermore, customer engagement also acts as an important mediator between gamification and loyalty (β = 0.316; p = 0.009). Social media marketing has been proven effective in increasing user engagement through creative content on platforms such as TikTok (β = 0.314; p = 0.002), but its direct influence on brand loyalty is not significant (β = 0.159; p = 0.191), indicating that social media acts more as a trigger for initial engagement than a direct driver of loyalty. Overall, gamification is the primary factor in maintaining long-term interaction and user loyalty, while social media supports initial engagement.

4.1.4. Specific Indirect Effect

Bootstrapping on the inner model of PLS-SEM produces the original sample (O), mean (M), standard deviation (STDEV), T-statistic, and P-value. A specific indirect effect can be considered significant if the T-statistic value is > 1.96 and the P-value is < 0.05, indicating that the tested mediation effect contributes significantly to the relationship between constructs in the model (Hair et al., 2019).

Table 5. Specific Indirect Effect Results

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
Gamification (X1) -> Customer Engagement (Z1) -> Brand Loyalty (Y1)	0.175	0.170	0.080	2.194	0.028
Social Media Marketing (X2) -> Customer Engagement (Z1) -> Brand Loyalty (Y1)	0.099	0.101	0.046	2.136	0.033

Based on the results of the specific indirect effect analysis in Table 5, the mediation path from Gamification (X1) through Customer Engagement (Z1) to Brand Loyalty (Y1) shows an original sample value of 0.175 with a p-value of 0.028, which is significant at the 5% level. This indicates that customer engagement significantly mediates the relationship between gamification and brand loyalty. Similarly, the path from Social Media Marketing (X2) through Customer Engagement (Z1) to Brand Loyalty (Y1) also shows a significant indirect effect with an original sample value of 0.99 and a p-value of 0.033. Thus, both paths reinforce the role of customer engagement as an important mediating variable in influencing brand loyalty.

4.2. Discussion

4.2.1. Sentiment Analysis

The results of sentiment analysis on user posts on the X platform show that public perception of Duolingo tends to be neutral to positive, with an average compound sentiment value of 0.0726 ± 0.4840. The majority of users share their learning experiences or routine use of the application without strong emotional expressions, indicating that Duolingo has become part of their daily learning activities. However, the significant positive sentiment, particularly related to the streaks, leaderboard, and rewards features, illustrates the satisfaction and intrinsic motivation that arise from these game elements. This supports the

principle of competence in Self-Determination Theory (Deci & Ryan, 1980), namely that a sense of personal achievement can increase user engagement and satisfaction.

Conversely, a small amount of negative sentiment arises from the loss of streaks or technical glitches, as illustrated in the word cloud through keywords such as 'lost,' 'please,' and 'help.' This phenomenon highlights the paradoxical side of gamification: elements intended to motivate can also cause frustration when the system is perceived as unfair. The heat map and box plot visualisations show this polarisation of emotions, where the majority of positive responses are related to learning success, while negative responses are related to loss of results or control.

Conceptually, these results confirm that user emotions on social media reflect the effectiveness of gamification design. When the game system is able to meet the needs for competence, autonomy, and social connectedness, users show positive reactions that strengthen their engagement and loyalty to the brand. Conversely, when the aspect of autonomy is not fulfilled, negative responses arise that can reduce satisfaction. Thus, the results of this sentiment analysis not only describe general public perceptions but also reinforce the findings of the SEM-PLS model by explaining the emotional and psychological dimensions underlying the relationship between gamification, customer engagement, and brand loyalty among Duolingo users.

Furthermore, the findings in this study, which show a neutral to positive sentiment trend, are in line with various recent studies on user perceptions of gamified applications on social media. For example, investigation by Hursen and Bas (2019). and Mert and Samur (2018) revealed that the majority of public conversations about gamified educational applications tend to be neutral or positive, especially when game elements are considered capable of increasing learning motivation and providing an enjoyable experience. The findings of Jia et al. (2016) also found that positive sentiment strengthened when gamification features encouraged achievement and consistency, similar to the dominance of terms such as 'streak', "lesson", and 'day' that appeared in this study. Furthermore, the study by Ren and Yang (2024) emphasises that on platforms such as TikTok and X, positive sentiment towards EdTech brands is generally triggered by a combination of creative content and ease of use of the application. Therefore, the sentiment analysis results in this study not only describe public perceptions of Duolingo but also align with global empirical trends confirming that gamification and brand activities on social media play a crucial role in shaping user emotions, engagement, and loyalty.

4.2.2. The Relationship between Gamification and Customer Engagement

Based on path analysis, the Gamification variable was found to have a positive and significant impact on Customer Engagement in the use of the Duolingo application. This indicates that Duolingo's game elements effectively increase user engagement, meaning the stronger the gamification, the higher the engagement in the language learning process. These results are consistent with prior research. For instance, Raza et al. (2024) stated that gamification affects customer engagement, which then mediates between gamification and purchase intention. Hsu (2023) also found a positive and significant effect ($\beta = 0.53$, $p < 0.01$), while Prasetyaningrum et al. (2024) concluded that gamification strategies effectively measure and increase customer engagement.

Viewed through Self-Determination Theory (Ryan & Deci, 2020), this positive relationship can be explained by the fulfillment of three basic psychological needs. Autonomy is supported through features such as personalization, allowing users to customize their experience, which increases intrinsic motivation and a sense of control. Competence is met via points, badges, and progress streaks, which provide visual feedback on achievement and

reinforce a user's perception of progress. Social connectedness is addressed through team quests and competitive leaderboards, which foster a sense of community and belonging. Overall, Duolingo's case illustrates that gamification designed with psychological needs in mind significantly boosts engagement. The application does not use gamification merely for entertainment, but as a motivational architecture that fulfills autonomy, competence, and relatedness. This confirms that successful gamification depends not on the quantity of features, but on its ability to tap into users' intrinsic motivation, thereby sustaining long-term engagement and loyalty.on the number of features, but primarily on its ability to tap into users' intrinsic motivation.

4.2.3. The Relationship between Social Media Marketing and Customer Engagement

Based on the analysis, Social Media Marketing (SMM) significantly and positively influences Customer Engagement in the context of Duolingo, confirming that the platform's marketing strategies effectively enhance user involvement. This finding aligns with existing literature. Abbasi et al. (2024) note that SMM activities like sharing useful information and word-of-mouth positively affect engagement. Similarly, X. Liu et al. (2021) found that entertainment, interaction, and trend-focused content significantly boost engagement, though customization alone may not. Ahamed K (2024) also reinforces this, highlighting the impact of engaging video content, user feedback, and preference-aligned content on engagement.

Through the framework of Self-Determination Theory, Duolingo's SMM particularly on TikTok effectively fulfills three core psychological needs, thereby driving engagement. Autonomy is supported through personalized and trend-aligned content featuring the brand mascot Duo, allowing users to feel a sense of choice and relevance. Competence is addressed by sharing educational yet accessible content, such as language tips and cultural facts, which help users gain knowledge and feel capable. Social connectedness is fostered via interactive strategies, including replying to comments and participating in community trends, making users feel part of a dynamic and valued community. Thus, Duolingo's social media success is not merely due to viral content, but stems from a psychologically informed strategy that meets users' intrinsic needs, thereby fostering organic and sustained engagement. This empirical evidence underscores the role of need-focused SMM in enhancing customer engagement with the app.

4.2.4. The Relationship Between Customer Engagement and Brand Loyalty

The results confirm that Customer Engagement has a significant positive effect on Brand Loyalty among Duolingo users. This indicates that greater user interaction with the app and its social media content translates to stronger, more sustained loyalty. Engagement, measured across dimensions such as attention, emotional involvement, social interaction, and content sharing, serves as a direct pathway to fostering loyal users. These findings are supported by prior research. Lauwrence et al. (2024) identified a strong positive correlation (0.852) between social media marketing activities and brand loyalty. Similarly, Bazi et al. (2020). concluded that customer engagement drives brand love and loyalty, and Wongsansukcharoen (2022) found a direct and highly significant effect of engagement on loyalty (p < 0.001).

In practice, Duolingo's approach illustrates how engagement cultivates loyalty. The brand's humorous and trend-savvy TikTok presence, centered on the Duo mascot, captures attention and promotes social enjoyment, encouraging likes, shares, and comments that deepen user-brand bonds. This content also fosters emotional involvement and attachment, making users feel part of a community rather than just customers. Furthermore, active discussion and sharing of content, along with awareness tracking, show that engagement is

participatory. Users become co-creators in Duolingo's digital ecosystem, strengthening loyalty collectively.

4.2.5. The Relationship Between Gamification and Brand Loyalty

The study confirms that gamification has a positive and significant effect on brand loyalty within the Duolingo application. This indicates that well-designed game elements not only enhance engagement but also directly foster user loyalty, making enjoyable gamification a key driver of retention and advocacy. These findings align with established research. Hsu and Chen (2018), demonstrated that gamification components such as task systems, achievements, and social interaction improve user experience, which in turn positively correlates with brand loyalty. Similarly, Baykal (2023) concluded that gamification strengthens loyalty by deepening customer engagement and emotional commitment, ultimately supporting long-term business relationships.

Through the lens of Self-Determination Theory, Duolingo's gamification builds loyalty by fulfilling three core psychological needs. Autonomy is supported through personalization features such as avatar selection and customizable learning paths which give users a sense of control and ownership over their experience. Competence is reinforced by reward systems like badges, points, and progress streaks, which provide tangible recognition of achievement and foster a sense of efficacy tied to the brand. Relatedness is cultivated through social features such as friend quests and leaderboards, creating a sense of community and shared purpose among users. By addressing these intrinsic needs, Duolingo transcends functional utility to create a meaningful and emotionally resonant experience. The resulting loyalty is thus not merely transactional, but psychological and affective. Ultimately, the more effectively gamification meets users' psychological needs, the stronger and more sustained their loyalty to the brand becomes.

4.2.6. The Relationship Between Social Media Marketing and Brand Loyalty

The analysis reveals that social media marketing does not exert a significant direct effect on brand loyalty among Duolingo users. While the relationship is directionally positive, it lacks statistical strength in this context. This finding contrasts with several previous studies. Rais (2025) asserts that social media marketing can enhance trust, equity, and loyalty in retail, while Erdoğmuş & Cicek (2012) and Almohaimmeed (2019) also report a significant direct effect of social media marketing on brand loyalty.

In Duolingo's case, although its social media presence featuring updates, educational content, and humorous memes theoretically aligns with Self-Determination Theory by potentially supporting autonomy (personalized content), competence (learning support), and relatedness (community interaction), it does not directly translate to loyalty. Several factors explain this discrepancy. The content primarily serves as entertainment and brand reminder, fostering superficial engagement rather than deep commitment. The personalization offered is often not fully integrated with the in-app learning experience, and interactions remain largely transactional. Ultimately, loyalty to Duolingo is more strongly rooted in the intrinsic, gamified experience within the application itself which maintaining streaks, earning badges, and witnessing personal progress. Social media acts as an effective gateway for initial engagement and brand awareness, but the primary driver of sustained loyalty is the direct user experience and the emotional attachment formed through consistent app usage.

4.2.7. The Relationship between Gamification, Customer Engagement, and Brand Loyalty

Based on the mediation effect analysis, gamification has a positive and significant indirect effect on brand loyalty through customer engagement in the Duolingo context. This

shows that gamification builds loyalty not just directly, but also by first deepening user engagement. Higher-quality game elements lead to greater engagement, which in turn fosters sustained brand loyalty. This mediation aligns with Self-Determination Theory: gamification fulfills psychological needs (autonomy, competence, relatedness), thereby enhancing engagement, which subsequently strengthens brand commitment.

These findings are consistent with prior research. Punwatkar & Verghese (2025) found that gamification indirectly influences loyalty via engagement, affecting purchase intent. Similarly, Susilo (2024) confirmed that gamification positively impacts brand loyalty, with customer engagement serving as a significant mediator. Ramdhani et al. (2024) also noted gamification's direct and indirect effects on loyalty through heightened engagement and brand awareness. Therefore, Duolingo's gamification strategy through features like streaks, badges, leaderboards, and friend quests effectively promotes brand loyalty by creating an engaging, interactive, and personalized experience. This engagement transforms functional interaction into emotional attachment, ultimately reinforcing long-term loyalty to the brand.

4.2.8. The Relationship between Social Media Marketing, Customer Engagement, and Brand Loyalty

Based on mediation analysis, Social Media Marketing has a significant positive indirect effect on Brand Loyalty through Customer Engagement. While its direct impact on loyalty is not significant, this finding underscores that engagement serves as the essential mediator, transforming social media interaction into lasting brand commitment. This result aligns with existing literature. Ferliansyah et al. (2022) found that social media marketing influences brand loyalty through customer engagement. Similarly, Bashir et al. (2024) noted that social media marketing builds loyalty by enhancing engagement and fostering multidimensional trust. Liu et al. (2024) also affirmed that influencer marketing and content-driven strategies boost loyalty via heightened engagement.

In Duolingo's case, this mediation is clearly demonstrated. The brand's social media presence characterized by humorous, trending, and interactive content featuring the Duo mascot effectively drives engagement. By fostering two-way communication through comments, polls, and relatable memes, Duolingo builds an emotionally and socially connected community. This strategy prioritizes relationship-building over direct promotion, aligning with Self-Determination Theory by supporting users' needs for relatedness and autonomy. Thus, while social media marketing alone may not directly ensure loyalty, it successfully cultivates the customer engagement that ultimately sustains it. Duolingo exemplifies how meaningful digital interaction can serve as a critical bridge between brand visibility and long-term user allegiance.

5. Conclusion

Based on the results of the study, it can be concluded that Duolingo's gamification and social media marketing positively influence customer engagement, which in turn increases brand loyalty. Sentiment analysis shows that users' perceptions of gamification features are neutral to positive, with the majority rating elements such as streaks, leaderboards, and rewards as capable of increasing learning motivation, although some technical issues have given rise to negative sentiment. Duolingo's social media marketing strategy is appreciated for being creative and entertaining, although educational content could still be improved. PLS-SEM results confirm that gamification has a direct effect on engagement and loyalty, while social media marketing increases engagement, which in turn impacts loyalty, supporting the Self-Determination Theory (SDT) framework related to the fulfilment of competence,

autonomy, and social connectedness needs. The integration of these two elements creates an interactive and emotional digital experience, fostering sustained engagement and strengthening brand identity.

Recommendations from this study include expanding data sources with multi-platform sentiment analysis to capture more representative user perceptions, using longitudinal or field experiment approaches to monitor the dynamics of engagement and loyalty over time, and improving construct validity through more consistent translation and measurement techniques. Furthermore, future research is advised to add variables such as brand experience, trust, or perceived enjoyment, and apply mixed methods approaches to enrich the understanding of digital consumer behavior. Thus, future research can more deeply explore how gamification and social media strategies support each other in building brand loyalty based on experience and intrinsic motivation.

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