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Boosting User Engagement in Ticketing System Through Gamification in Indonesia

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Abstract: The rapid growth of mobile applications in Indonesia, exemplified by the rise from 7.31 billion downloads in 2021 to 7.56 billion in 2023, poses a significant challenge in retaining user engagement post-download. This study explores how gamification can enhance user engagement in ticketing applications. Using the Self-System Model of Motivational Development (SSMMD), we investigate the influence of gamification elements achievement, social, and immersion orientations on satisfying users' psychological outcomes (competence, autonomy, and relatedness) and their impact on user engagement. Data collected from Ticketing system users indicate that gamified features significantly improve user satisfaction and engagement, promoting continued app usage, positive word-of-mouth, and higher app ratings. These findings provide crucial insights for app developers and marketers in Indonesia, suggesting that effective gamification strategies can lead to better user retention and overall app success.

Keywords: Gamification, User Engagement, Self-System Model of Motivational Development

Introduction

In Indonesia, mobile application development has seen rapid growth, with app downloads increasing from 7.31 billion in 2021 to 7.56 billion in 2023 (Statista, 2024). However, developers struggle with retaining user engagement post-download, as most users only use an app once before deleting it. To combat low retention rates, gamification strategies have become a primary focus (Bitrián *et al.*, 2023).

Gamification, which incorporates game elements into applications to enhance user experience, has been effective in increasing engagement in various contexts, including ticketing systems (Cechetti *et al.*, 2019). In spite of the growing popularity of ticketing apps in Indonesia, there is no scientific data on how gamification affects user engagement. (García-Jurado *et al.*, 2021).Current research highlights the need for a more thorough comprehension of the variables influencing user engagement and how they affect learning results. (Esponda *et al.*, 2022; Sakas *et al.*, 2023).

The Self-System Model of Motivational Development (SSMMD) (Connell & Welborn, 1991) explains how psychological needs competence, autonomy, and relatedness drive motivation and engagement. In the context of gamified ticketing apps, this model provides a framework for understanding how game elements such as rewards, challenges, and social interactions enhance user motivation and encourage sustained engagement. By integrating SSMMD with gamification principles, this study examines how various gamified elements align with users' psychological needs and influence their interaction with the ticketing app.

This study uses the self-report User engagement Scale Short Form (UES-SF) (O'Brien *et al.*, 2018) to better understand user engagement in gamified ticketing apps, in contrast to previous research that typically employed performance indicators to measure user engagement. This approach addresses the limitation of prior studies that do not explain the reasons behind users' behaviors (O'Brien & Toms, 2010).

The results of the study should provide Indonesian application developers with useful information to improve user interfaces and design. Additionally, it aims to contribute to the literature on gamification and user engagement in local contexts (Balalle, 2024). The practical implications of this research are anticipated to help formulate more effective marketing strategies for ticketing applications, ultimately improving user retention rates and overall user satisfaction.

In conclusion, this research emphasizes the importance of integrating suitable gamification elements to boost user engagement in ticketing applications in Indonesia (Hong *et al.*, 2024). By exploring the psychological and motivational factors behind user interactions, developers can create more satisfying and

sustainable experiences (Sierra-Pérez *et al.*, 2021). The article advocates for gamification as an effective strategy to enhance user engagement in the local ticketing market.

Previous Studies on Gamification and Engagement

Research on the effectiveness of gamification in teaching and learning is divided into two main areas: analysis methods and studies on game elements (Kapp, 2012). As shown in Table 1, gamification has been shown to significantly improve the user experience by providing a sense of accomplishment and success, which motivates learners to continue pursuing their educational goals. Furthermore, gamification is essential to customer relationship management, especially in loyalty programs, by enhancing customer loyalty, increasing participation, and boosting app downloads (Ashaari, 2018; Webb, 2013).

Table 1: Relevant empirical research examines how engagement relates to gamification

Customer Engagement					
Citation	Independent Variables	Mediators	Dependent Variables	Study Design	Main Results
Hammedi *et al*. (2017)	Gamification features	Age, medical predispositions, challenge, entertainment, social dynamics, and escapism	Patient engagement (cognitive, emotional and behavioral)	Case study	Four experience outcomes—challenge, entertainment, social dynamics, and escape—are produced in patients by gamification mechanics, which increase patient engagement.
Yang *et al*. (2017)	Perceived utility, usability, social impact, and pleasure	Intention of Customer Engagement	Brand sentiment	Surveys and focus groups	Perceived utility and enjoyment predict brand sentiment and intention to join. Perceived ease of use has no bearing on these characteristics. Perceived social influence is the only factor influencing brand attitude.
Xu *et al*. (2017)	Game elements		Brand recognition, visitor experiences, visitor involvement, patronage, amusement, and staff supervision	Case study	Marketing for travel can profit from gamification.
Jang *et al*. (2018)	Customer gains from gamification include epistemic, social, and personal integration.	Experience and age	Purchases and customer engagement behavior	Longitudinal design	The best incentives for participation and purchases are those that are socially and personally integrative.
Leclercq *et al*. (2018)	Aspects of the game like cooperation and competition	Customer satisfaction, contest loss, and previous customer engagement level	Engagement of customers with the community and co-creation process (awareness, eager participation, and social connection)	Experiment	Decisions about wins and losses undermine the gamification's advantages. Customer experience and engagement are negatively impacted by losing a competition.
Eisingerich *et al*. (2019)	Features of gamification include goals, progress monitoring, social interaction, a sense of control, incentives, and prompts.	Compulsion, hope, and customer engagement	Purchases	Interviews and survey	Hope acts as a positive mediator in the link between gamification principles and customer engagement. A client is less likely to interact when they are under pressure.
Ahmad *et al*. (2020)	Type of video content (educational vs. non-educational)	Viewership engagement (likes, dislikes, comments, views/day)	Viewer interaction and engagement	Quantitative analysis	Viewer interaction (likes, dislikes, comments) serves as a useful metric for assessing the credibility and merit of educational videos.
Qian *et al*. (2023)	achievement (e.g., level system, predictions), immersion (e.g., badges, viewing tools), and socialization (e.g., community forum, chat).	Platform choice	Platform Royalty	Quantitative Survey	Gender, age, and other demographic variables influenced the interaction with gamification features and platform loyalty.
Di Fant *et al*. (2024)	Various degrees of user engagement, including dialogue-based engagement, information distribution, co-production, and co-creation.	Providers' understanding and perception of user engagement	User satisfaction and engagement	Qualitative analysis	To increase user engagement in climate services, precise and widely accepted concepts of co-production and co-creation are require
Liu *et al*. (2024)	Gamification-enabled customer experience includes aspects such as entertainment, challenges, economic rewards, and social interactions experienced by users.	The relationship between gamification-enabled customer experience and the intention to stick with the Digital Public Education and Governance (DPEG) platform is mediated by motivation.	Based on their experiences and driving forces, users' intention to stick with DPEG (Digital Public Engagement Games) is gauged by their Continuance Intention.	Surveys	The association between gamification-enabled customer experience and continuance intention is somewhat mediated by both inner and extrinsic motivations.

Table 1: Continued

Brand Engagement					
Citation	Independent Variables	Mediators	Dependent Variables	Study Design	Main Results
Berger *et al*. (2018)	High levels of interaction and the ideal level of difficulty	Time constraints, forced play, and emotional and cognitive brand engagement	Self-brand connection	Experiment	Highly engaged and optimally demanding gamified encounters facilitate the development of relationships with their own brands through emotional and cognitive brand engagement. Mandatory play reduces emotional brand engagement, whereas time limits reduce cognitive brand engagement.
Högberg *et al*. (2019)	Gamification	Positive affect, reward satisfaction, hedonic value, and intention to continue engaging	Brand engagement	Experiment	Gamification encourages persistent engagement intention by providing hedonic value and rewards. There is a correlation between brand engagement and the intention to continue engaging.
Syrjälä *et al*. (2020)	Gamification		Customer benefits and brand involvement (functional, hedonistic, social, and educational)	Interviews	The utilitarian, hedonistic, social, and educational advantages that gamified packaging offers are associated with the cognitive, emotional, and behavioral aspects of brand involvement.
Xi & Hamari (2020)	Features of gamification that are connected to immersion, achievement, and society	Brand engagement (cognitive, behavioral and emotional)	Brand loyalty and awareness	Survey	Gamification characteristics connected to social interaction and achievement have a beneficial impact on all three types of brand engagement. Only social brand engagement is favorably correlated with characteristics of gamification linked to immersion. Brand loyalty and awareness are raised by brand interaction.
Huang *et al*. (2024)	Trendiness: Measures the perceived trendiness or modern appeal of the app.	a healthy balance between customer-brand interaction and personalization.	Consumer-Brand Engagement	Quantitative Survey	Word-of-mouth, trendiness, entertainment, and personalization all significantly increase consumer-brand engagement.
User Engagement					
Citation	Independent Variables	Mediators	Dependent Variables	Study Design	Main Results
Suh *et al*. (2018)	Rewards, rivalry, self-expression, and benevolence are examples of game dynamics.	Competence, autonomy, relatedness and pleasure	User engagement(vigor, commitment, and absorption) in a gamified information system	Survey	Gamification boosts user engagement by balancing fun with the satisfying of psychological outcomes (autonomy, competence, and relatedness).
Featherstone & Habgood (2019)	Features of the game like leaderboards and competitiveness		Use of an application (objective metric)	Experiment	Gamification makes the software more engaging.
Feng *et al*. (2020)	Points and likes are examples of commensurate and incommensurate game features.		Competence, relatedness, autonomy, loyalty, intrinsic motivation, and engagement behavior as measured by objective standards	Experiment	Compared to users who deal with incommensurate game aspects, those who interact with commensurate game features are more likely to be intrinsically motivated, engage in physical activity more frequently, and be more committed to the fitness app.
Kamboj *et al*. (2020)	Perceived usefulness, perceived ease of use, convenience and enjoyment	Usage of mobile applications	With the intention of using	Survey	Engagement is heavily influenced by perceived utility, enjoyment, and ease of use, which in turn influences users' purpose.
García-Jurado *et al*. (2021)	Gamification features(points,badges,leaderboards,etc)	Engagement acts as a mediator in the relationship between gamification and other outcomes such as user satisfaction and purchase intention.	User Satisfaction: Overall satisfaction of users with the gamified experience.	Survey	Gamification Influences Engagement: Confirmation that gamification positively impacts the main components of user engagement.

Gamification has gained significant popularity in recent years, leading to the creation of many gamified applications and increased research on the concept (Koivisto & Hamari, 2019). This trend has notably impacted how knowledge is shared and utilized within organizations (Schacht *et al.*, 2014). The connection between gamification and different forms of engagement has also been examined in recent research, with an emphasis on how students participate in academic activities (Balalle, 2024).

Gamification integrates video game elements into non-game products and services to boost user engagement and motivate behaviors that contribute to value creation (Darejeh & Salim, 2016). By using rewards, points, levels, and challenges, gamification aims to create motivating experiences in areas like education, healthcare, and business (Chou, 2019). It goes beyond just badges and points, incorporating game-like thinking to sustain engagement (Xu *et al.*, 2017). Recent studies also show that gamification can enhance market effectiveness through referral programs and incentivizing product reviews (Valentini & Zammit, 2017).

Engagement has been defined in various ways across academic disciplines, with terms like customer engagement, brand engagement, and user engagement describing different subjects and objects of engagement (Pansari & Kumar, 2017). Earlier research has examined the connections between gamification and user engagement, including brand engagement (Huang *et al.*, 2024; Syrjälä *et al.*, 2020; Xi & Hamari, 2020), user engagement (Featherstone & Habgood, 2019; Feng *et al.*, 2020; Kamboj *et al.*, 2020), and customer engagement (Di Fant *et al.*, 2024; Liu *et al.*, 2024; Qian *et al.*, 2023).

In order to develop an engaging experience, O'Brien *et al.* (2018) investigated user-system characteristics, which led to the development of multiple self-reported questionnaires. One of the most widely used tools is the User Engagement Scale (UES), which was developed by O'Brien & Toms (2010). It initially had 31 items covering six dimensions: felt involvement, focused attention, perceived usability, aesthetic appeal, novelty, and endurability. Because of its length, researchers hardly ever use the entire scale, even though observational studies have called into doubt the validity of these six characteristics (O'Brien *et al.*, 2018).

O'Brien *et al.* (2018) reassessed the dimensions of the original User Engagement Scale (UES) in order to remedy its shortcomings and found four elements that better capture its structure. They unveiled the UES-SF, a condensed version that incorporates four dimensions: reward, perceived usability, aesthetic appeal, and focused attention. The feeling of absorption during interaction is known as focused attention, and users' opinions about the system's usability, effort, and feelings are mirrored in perceived usefulness throughout interaction. The term "aesthetic appeal" describes how appealing the interface looks. Reward is related to the results obtained, such as endurability, novelty, and felt involvement.

Conceptual Framework and Study Hypotheses

The Self-System Model of Motivational Development (SSMMD)

Based on Self-Determination Theory (SDT) (Deci, 1975), the Self-System Model of Motivational Development (SSMMD) describes how social and contextual elements affect engagement and motivation (Connell, 1990; Connell & Welborn, 1991). It identifies three core psychological outcomes: Competence, autonomy, and relatedness serve as key drivers of engagement in gamified systems. Competence is supported through progression elements such as levelling and achievement badges, which reinforce a user's sense of accomplishment. Autonomy is facilitated by personalized experiences, allowing users to make independent choices regarding travel plans and ticketing preferences. Relatedness is fostered through social-oriented elements, such as leaderboards, referral programs, and community features that strengthen user connections. Our study tests the extent to which these psychological needs, when fulfilled, contribute to increased user engagement.

Study Model and Proposed Hypotheses

According to the study model (Figure 1), psychological outcomes including competence, autonomy, and relatedness are satisfied by motivating components of gamified systems, such as achievement and progression orientation, social orientation, and immersion orientation. These components also affect other system behaviors and user engagement.

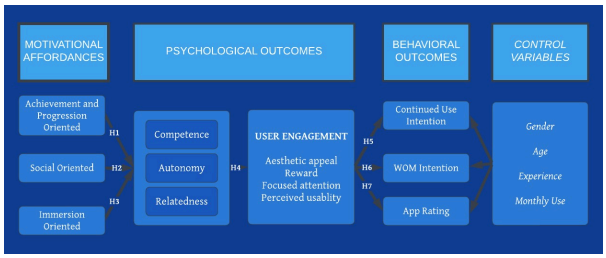

Fig. 1: Proposed Model

The study categorizes gamification elements into three groups: Achievement orientation elements include game features like reward points, leveling, badges, challanges, (Bitrián *et al.*, 2021; Wirth *et al.*, 2024). Through ongoing feedback, these components improve users' perceptions of their own ability (Hassan *et al.*, 2019). Furthermore, it has been shown that features like social sharing, referral programs, reviews, and ratings increase users' sense of autonomy by evoking a sense of freedom in them (Grech *et al.*, 2024).

Social orientation elements such as social sharing, referral program, review and rating (Grech *et al.*, 2024) fulfill the need for social relationships by enhancing social connections and user group identity. (Koivisto &

Hamari, 2019) Social network features also facilitate information exchange that enhances social relationships within the gamified system (Wee & Choong, 2019).

Immersion orientation elements include features that allow users to engage in personalization, stories and narratives, interactive features (Bitrián *et al.*, 2024). That enhance competence by breaking down complex goals into manageable steps (Koivisto & Hamari, 2019).

In general, gamified systems make advantage of these motivating components to meet users' psychological outcomes for autonomy, competence, and relatedness, which raises engagement and influences systemic behaviors. (Connell & Welborn, 1991).

The study tests the following hypotheses:

H1. The user's interaction with the achievement and progression orientation elements of the app satisfies their needs for (a) competence, (b) autonomy and (c) relatedness.

H2. The user's interaction with the social orientation elements of the app satisfies their needs for (a) competence, (b) autonomy, and (c) relatedness.

H3. The user's interaction with the immersion orientation element of the app satisfies their needs for (a) competence, (b) autonomy and (c) relatedness.

According to the SSMMD, settings that satisfy users' psychological outcomes for relatedness, competence, and autonomy improve user engagement (Connell, 1990; Connell & Welborn, 1991). Numerous situations have validated the link between engagement and self-system processes. For instance, cognitive, emotional, and behavioral engagement have been linked to students' views of competence, autonomy, and relatedness (Buil *et al.*, 2020; Dupont *et al.*, 2017). Similarly, in the workplace, meeting these needs results in higher engagement levels and reduced intentions to quit (Kovjanic *et al.*, 2013; Schreurs *et al.*, 2014). Furthermore, studies have shown that brand innovation initiatives that improve relatedness and competence increase individual engagement. Finally, research has demonstrated that gamified information systems that satisfy users' fundamental psychological outcomes leverage hedonic value to effectively engage users. As a result, we propose the following theory:

H4a. User engagement is positively impacted when the need for competence is met

H4b. User engagement is positively impacted when the need for autonomy is met

H4c. User engagement is positively impacted when the need for relatedness is met

According to Koivisto & Hamari (2019), mobile applications' motivational affordances have a major impact on users' psychological and behavioral consequences. App rating, WOM intention, and users' intention to continue using the app are the three primary findings of this study. According to Kim & Baek (2018), highly engaged users often develop close relationships with mobile apps and incorporate them into their sense of self. According to earlier studies, users' intention to keep using applications is positively correlated with engagement (Suzianti *et al.*, 2019; Tarute *et al.*, 2017). Additionally, Algesheimer *et al.* (2005) found that engagement within brand communities predicts sustained participation intentions, and in online communities, customers that are actively involved are more likely to refer others to the community.(Algesheimer *et al.*, 2005; Ray *et al.*, 2014; Wu *et al.*, 2018). Engagement also enhances knowledge sharing and boosts online review ratings.

H5. Continued use intention are positively impacted by users' engagement with the app.

H6. WOM intention are positively impacted by users' engagement with the app.

H7. App rating are positively impacted by users' engagement with the app.

Materials and Methodology

Research Context

There is a popular ticket booking app in Indonesia. A survey by Rakuten Insight in June 2023, with 6,055 respondents, showed that 64.43% (3,901 respondents) had used the application (Statista, 2023). This app has three main tabs as shown in (Fig. 2): Home, Your Orders, and Account. The Home tab is the main display, offering services like flight and train ticket searches, hotel bookings, event tickets, promotions, discounts, and personalized travel recommendations. The Your Orders tab lists all user orders, including order status, details, history, and customer support options.

The Account tab on the app allows users to manage personal information and preferences. This includes updating their user profile (name, address, email, phone number), adjusting app settings (notifications, language preferences), managing payment methods (adding, editing, or removing linked payment methods), accessing loyalty program details (points and rewards), viewing payment history, and enhancing security (changing passwords or enabling two-step verification). After thoroughly analyzing the application, there are 10 game elements that will be categorized into 3 categories: achievement and progression-oriented elements (Reward Points, Leveling, Badges, Challenges), social-oriented elements (Social Sharing, Referral Program, Review and Rating), and immersion-oriented elements (Personalization, Stories and Narratives, Interactive Features).

Data Collection and Participants

The study used online questionnaires distributed via Google Forms to collect data. The Cochran formula was

chosen for its suitability for large, diverse, and indeterminate populations (e.g. Jakarta), which has a significant and varied digital user base aged 19-54 (APJII, 2024). This formula is ideal for adjusting confidence levels and margins of error in large-scale surveys, unlike the Lemeshow formula, typically used in health research. User satisfaction was measured by evaluating whether the application met users' expectations, assessing quality, and examining gaps between expectations and outcomes. Indicators of satisfaction were based on Moriuchi & Takahashi (2016) and included Product Choice, Purchase Satisfaction, and Experience Satisfaction. Using an 80% satisfaction rate from a previous study by Nurjannah *et al.* (2018) and a 10% margin of error, the study aimed to account for variations. While initially 61 respondents were obtained, the study ultimately included data from around 100 respondents.

Measures

Unlike traditional performance indicators (e.g., click-through rates or session duration), the User Engagement Scale Short Form (UES-SF) UES-SF scale, which was created by O'Brien *et al.* (2018), captures a multidimensional perspective of user engagement, including aesthetic appeal, focused attention, perceived usability, and reward. This method enables a deeper understanding of user motivation and experiences, addressing a limitation in prior studies that relied solely on behavioral metrics. Items from Hamari & Koivisto (2015) were used to measure word-of-mouth (WOM), and the scale from Tu *et al.* (2019) was modified to assess continuing usage intention. Monthly use was chosen as a control variable for the application user survey, as it provides a more stable and representative measure of platform usage than weekly use. This is due to the less frequent nature of travel or accommodation bookings. In Jakarta, where business and personal travel often follow monthly cycles, monthly use better reflects user behavior and planned activities. It also reduces variability and offers a consistent measure of long-term usage patterns, making it more suitable for understanding user behavior.

Assessment of Common Method Bias

Since the data was self-reported and gathered via a single survey, both procedural and statistical techniques were employed to assess potential common method bias (Podsakoff *et al.*, 2003). Initially, participants voluntarily contributed to the study with responses kept anonymous. Furthermore, to mitigate respondents' ability to discern causal relationships among variables, dependent and independent variables were segmented into distinct portions of the survey. A thorough analysis was also conducted on the Variance Inflation Factor (VIF) values. Findings showed that there was no common technique bias in this study, because all values were below the threshold of 3.3 (Kock, 2015).

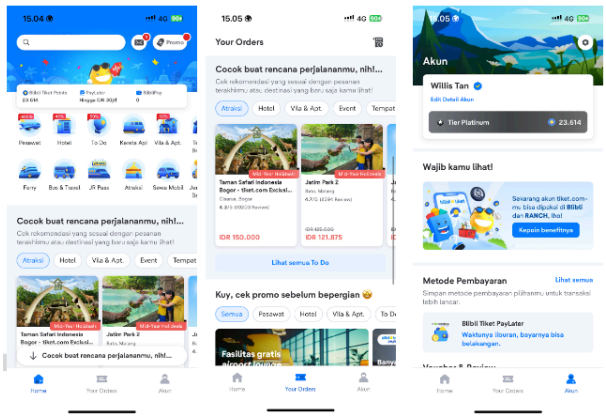

Fig. 2: Screenshots of the ticketing system application

Results

Using SmartPLS 4.0 for Partial Least Squares (PLS) structural equation modeling, we investigated the hypotheses (Cheah *et al.*, 2024). Due to its ability to evaluate measurement and structural models simultaneously, PLS is perfect for complex models that have both formative and reflective indicators (Chin, 2010; Hair *et al.*, 2011), as it allows for simultaneous evaluation of measurement and structural models. This approach is particularly suited for predicting variables, which is the focus of this study. In examining word-of-mouth (WOM) intention, we used factor loading to determine how well indicators measure the expected factors. Indicators with factor loadings below 0.7 were considered invalid and removed, ensuring that only valid indicators were include. This process enhances the reliability of the research model in measuring WOM intention.

Analysis of the Measurement Model

The proposed paradigm incorporates both reflecting and formative elements. Sarstedt *et al.* (2022) recommendations were used to evaluate the reflective measurement model for the first-order dimensions (Table 2). Cronbach's alpha and Composite Reliability (CR) values for every construct were higher than the 0.7 threshold, confirming internal consistency reliability. Factor loadings (all over 0.70 and statistically significant at the 1% level) and average variance extracted (AVE) values (above 0.5) were examined in order to evaluate convergent validity (Fornell & Larcker, 1981). By making sure the square roots of AVEs were larger than inter-construct correlations and that the outer loadings of indicators on their particular constructs were higher than any cross-loadings on other constructs, discriminant validity was validated. (Fornell & Larcker, 1981) (Table 3).

The formative measuring model's assessment for the first-order dimensions. (Table 4). By measuring how the user interacts with each app game elements (e.g., reward points, leveling, badges, challenges, social sharing,

referral program, review and rating, personalization, stories and narratives and interactive features) using three indicators: frequency of interaction, the importance of the interaction, and the usability of the game elements. VIF values ranging from 1.140 to 2.288 were used to evaluate collinearity; all of them were below the 5-point threshold, suggesting that there were no collinearity problems (Hair *et al.*, 2011). All indicator weights were statistically significant, confirming the formative indicators' relevance and significance.

Table 2: Results of a reflective measurement model

Construct	Indicator	Mean	Standard Deviation	Factor loading	AVE	Cronbach's alpha	CR
Competence	COM1	4.390	0.546	0.794	0.650	0.933	0.944
	COM2	4.470	0.556	0.810			
	COM3	4.440	0.554	0.753			
	COM4	4.470	0.556	0.805			
	COM5	4.430	0.552	0.768			
	COM6	4.410	0.549	0.829			
	COM7	4.420	0.551	0.834			
	COM8	4.460	0.555	0.813			
	COM9	4.460	0.555	0.846			
Autonomy	AUT1	4.510	0.608	0.811	0.658	0.935	0.945
	AUT2	4.430	0.587	0.803			
	AUT3	4.500	0.700	0.873			
	AUT4	4.460	0.655	0.767			
	AUT5	4.470	0.608	0.874			
	AUT6	4.490	0.592	0.770			
	AUT7	4.550	0.555	0.710			
	AUT8	4.540	0.655	0.895			
	AUT9	4.520	0.591	0.777			
Relatedness	REL1	4.440	0.637	0.795	0.624	0.926	0.937
	REL2	4.390	0.662	0.720			
	REL3	4.340	0.696	0.756			
	REL4	4.290	0.791	0.784			
	REL5	4.340	0.724	0.775			
	REL6	4.390	0.677	0.825			
	REL7	4.360	0.728	0.829			
	REL8	4.350	0.766	0.822			
	REL9	4.300	0.819	0.799			
Aesthetic appeal	AES1	4.530	0.574	0.883	0.795	0.871	0.921
	AES2	4.430	0.570	0.892			
	AES3	4.500	0.574	0.900			
Reward	REW1	4.500	0.608	0.891	0.794	0.870	0.920
	REW2	4.420	0.619	0.885			
	REW3	4.390	0.615	0.897			
Focused attention	FOC1	4.480	0.574	0.881	0.808	0.881	0.927
	FOC2	4.460	0.573	0.894			
	FOC3	4.370	0.560	0.922			
Perceived usability	PUS1	4.450	0.669	0.907	0.842	0.906	0.941
	PUS2	4.410	0.634	0.907			
	PUS3	4.370	0.658	0.938			
Continued use Intention	CUI1	4.450	0.517	0.771	0.613	0.874	0.905
	CUI2	4.470	0.519	0.730			
	CUI3	4.470	0.519	0.792			
	CUI4	4.460	0.518	0.805			
	CUI5	4.470	0.519	0.828			
	CUI6	4.510	0.538	0.770			
WOM Intention	WOM1	4.480	0.519	0.721	0.633	0.854	0.896
	WOM2	4.410	0.512	0.722			
	WOM4	4.430	0.570	0.827			
	WOM5	4.370	0.577	0.861			
	WOM6	4.410	0.512	0.836			
App Rating	RAT1	4.370	0.658	0.764	0.681	0.769	0.864
	RAT2	4.320	0.527	0.885			
	RAT3	4.310	0.523	0.821			

Table 3: Fornell-Larcker test

	1	2	3	4	5	6	7	8	9	10
1. Competence	0.806									
2. Autonomy	0.640	0.811								
3. Relatedness	0.515	0.521	0.790							
4. Aesthetic Appeal	0.447	0.384	0.403	0.892						
5. Reward	0.491	0.412	0.436	0.733	0.891					
6. Focused attention	0.502	0.396	0.420	0.720	0.732	0.899				
7. Perceived usability	0.506	0.454	0.432	0.730	0.749	0.726	0.917			
8. Continued use Intention	0.431	0.458	0.397	0.513	0.540	0.579	0.550	0.783		
9. WOM Intention	0.400	0.410	0.363	0.391	0.409	0.487	0.409	0.608	0.796	
10. App Rating	0.241	0.267	0.231	0.344	0.383	0.419	0.346	0.505	0.571	0.825

Table 4: First-order constructs from the formative measurement model

Construct	Items	Mean	SD	Loading	t-value	Weight	t-value	VIF
Reward Points	Frequency	4.430	0.652	0.894	4.887	0.537	1.327	1.856
	Importance	4.430	0.696	0.910	6.133	0.584	1.865	2.035
	Usability	4.320	0.691	0.687	3.312	-0.017	0.047	1.943
Leveling	Frequency	4.290	0.864	0.714	6.566	0.282	1.301	1.876
	Importance	4.230	0.835	0.978	23.323	0.877	5.500	1.781
	Usability	4.350	0.753	0.653	4.927	-0.089	0.331	2.161
Badges	Frequency	4.200	0.883	0.650	4.804	-0.006	0.026	1.979
	Importance	4.440	0.622	0.746	5.448	0.514	2.631	1.140
	Usability	4.250	0.876	0.875	9.012	0.709	3.470	2.004
Challenges	Frequency	4.360	0.794	0.721	5.895	0.121	0.485	1.860
	Importance	4.250	0.853	0.981	15.544	0.768	2.600	2.216
	Usability	4.330	0.775	0.815	7.273	0.195	0.728	2.288
Social Sharing	Frequency	4.270	0.719	0.941	9.365	0.729	2.110	1.825
	Importance	4.250	0.805	0.700	4.512	0.029	0.100	1.881
	Usability	4.410	0.634	0.766	4.873	0.384	1.644	1.474
Referral Program	Frequency	4.500	0.574	0.897	10.445	0.572	2.745	1.545
	Importance	4.480	0.574	0.818	11.090	0.368	2.476	1.660
	Usability	4.420	0.635	0.735	7.219	0.253	1.914	1.540
Review and rating	Frequency	4.560	0.516	0.740	6.546	0.232	1.140	1.586
	Importance	4.550	0.517	0.858	9.864	0.481	2.516	1.542
	Usability	4.570	0.515	0.872	11.096	0.476	2.181	1.719
Personalization	Frequency	4.520	0.519	0.798	9.152	0.441	3.537	1.376
	Importance	4.520	0.519	0.780	7.771	0.271	1.483	1.677
	Usability	4.540	0.555	0.863	13.372	0.506	3.314	1.613
Stories and narratives	Frequency	4.440	0.622	0.739	8.006	0.312	2.156	1.654
	Importance	4.440	0.622	0.755	8.295	0.353	2.541	1.654
	Usability	4.450	0.606	0.835	10.357	0.602	4.470	1.180
Interactive features	Frequency	4.410	0.634	0.815	9.685	0.268	1.431	1.967
	Importance	4.350	0.766	0.761	8.196	0.330	2.375	1.630
	Usability	4.430	0.604	0.897	13.567	0.591	3.569	1.552

Table 5: Heterotrait-monotrait (HTMT) ratios

	Competence	Autonomy	Relatedness	Continued Use Intention	WOM Intention
Autonomy	0.681				
	[0.814, 0.832]				
Relatedness	0.549	0.561			
	[0.751, 0.788]	[0.756, 0.779]			
Continued Use Intention	0.474	0.510	0.432		
	[0.685, 0.699]	[0.678, 0.707]	[0.655, 0.698]		
WOM Intention	0.452	0.471	0.408	0.699	
	[0.623, 0.646]	[0.632, 0.665]	[0.649, 0.703]	[0.844, 0.861]	
App Rating	0.274	0.300	0.279	0.612	0.706
	[0.475, 0.507]	[0.482, 0.520]	[0.493, 0.569]	[0.763, 0.781]	[0.838, 0.845]

Note: The 95% bias-corrected and accelerated confidence interval of the HTMT values is shown by the values in brackets

Table 6: Second-order constructs from the formative measurement model

Construct	Items	Loading	t-Value	Weight	t-Value	VIF
Achievement and progression elements	Reward Points	0.566	4.490	0.287	1.827	1.294
	Leveling	0.882	9.490	0.534	1.807	2.172
	Badges	0.838	8.543	0.216	0.797	2.406
	Challenges	0.838	8.046	0.222	0.660	2.444
Social Orientation elements	Social Sharing	0.752	9.199	0.076	0.479	2.053
	Referral Program	0.961	17.994	0.720	3.599	2.190
	Review and rating	0.785	6.204	0.320	1.587	1.622
Immersion Orientation elements	Personalization	0.776	8.321	0.375	2.443	1.507
	Stories and narratives	0.894	20.389	0.328	2.630	2.674
	Interactive features	0.882	17.930	0.471	3.649	2.225
User Engagement	Aesthetic Appeal	0.812	11.210	0.070	0.413	2.646
	Reward	0.880	17.054	0.238	1.495	2.983
	Focused Attention	0.945	24.467	0.513	2.881	2.901
	Perceived Usability	0.880	18.158	0.283	2.086	2.831

After the first-order constructions were evaluated, a two-stage method was used to build the second-order constructs. (Sarstedt *et al.*, 2022). Aesthetic appeal, reward, focused attention, and perceived usability were the four first-order components that made up the second-order formative construct that was utilized to model engagement. likewise, second-order formative constructs were used to represent interaction with various gaming element types, including (achievement and progression, social, and immersion-oriented elements) was modeled as second-order formative constructs. These included reward points, leveling, badges, and challenges for achievement and progression elements; social sharing, referral program, review and rating for social elements; and personalization, stories and interactive features for immersion elements.

To guarantee validity, the model was re-estimated and re-evaluated (Henseler *et al.*, 2015). As shown in Table 5, HTMT values were verified to be below the 0.90 threshold, and bootstrap confidence intervals did not contain 1, suggesting that discriminant validity was unaffected. VIF values, which were all below the 5 threshold, were used to check for collinearity (Hair *et al.*, 2011). Confirming no multicollinearity. The study also included control variables (gender, age, payment, and monthly use) to address potential endogeneity (Papies *et al.*, 2017). VIF readings after re-estimation showed no problems, ranging from 1.294 to 2.983 (Table 6). By analyzing the statistical significance of indicator weights and loadings, external validity was evaluated.

Analysis of Structural Model

Table 7 presents the results of the structural model. Interaction with achievement and progression game elements in the app improves relatedness (β = 0.198, t = 2.072) and competence needs (β = 0.235, t = 1.892), according to evidence supporting H1a and H1c. H1b was rejected because there was no discernible impact on autonomy satisfaction (β = -0.104, t = 0.775). Likewise, engagement with the app's social-oriented elements is positively associated with relatedness (β = 0.202, t = 1.666) and autonomy satisfaction (β = 0.401, t = 2.525), supporting H2b and H2c. H2a was rejected since there was no discernible relationship between competence satisfaction and social-oriented elements (β = 0.258, t = 1.582).

Table 7: Structural model results

Hypotheses	β	t-Value	Supported
H1a: Achievement and progression elements → Competence	0.235	1.892**	Yes
H1b: Achievement and progression elements → Autonomy	-0.104	0.775	No
H1c: Achievement and progression elements → Relatedness	0.198	2.072**	Yes
H2a: Social Orientation elements → Competence	0.258	1.582	No
H2b: Social Orientation elements → Autonomy	0.401	2.525**	Yes
H2c: Social Orientation elements → Relatedness	0.202	1.666**	Yes
H3a: Immersion Orientation elements → Competence	0.263	1.792**	Yes
H3b: Immersion Orientation elements → Autonomy	0.406	2.556**	Yes
H3c: Immersion Orientation elements → Relatedness	0.313	2.621**	Yes
H4a: Competence → User Engagement	0.377	1.971**	Yes
H4b: Autonomy → User Engagement	0.093	0.537	No
H4c: Relatedness → User Engagement	0.219	1.397	No
H5: User Engagement → Continued use intention	0.628	7.130***	Yes
H6: User Engagement → WOM intention	0.488	4.332***	Yes
H7: User Engagement → App rating	0.497	4.603***	Yes
Control variables:			
Experience → Continued use intention	0.019	0.212	
Experience → WOM intention	-0.018	0.160	
Experience → App rating	-0.124	1.039	
Monthly use → Continued use intention	-0.075	0.907	
Monthly use → WOM intention	-0.001	0.016	
Monthly use → App rating	-0.085	0.975	
Gender → Continued use intention	-0.029	0.164	
Gender → WOM intention	-0.082	0.438	
Gender → App rating	0.025	0.120	
Age → Continued use intention	-0.021	0.235	
Age → WOM intention	0.037	0.389	
Age → App rating	-0.018	0.154	

*Note: ***p < 0.01; **p < 0.05*

Results for interactions with immersion-oriented elements show that these elements enhance H3a, H3b, and H3c by increasing satisfaction across all needs: relatedness (β = 0.313, t = 2.621), autonomy (β = 0.401, t = 2.525), and competence (β = 0.263, t = 1.792). Furthermore, it was discovered that user engagement in the gamified app was positively impacted by competence need satisfaction (β = 0.377, t = 1.971), although relatedness (β = 0.219, t = 1.397) and autonomy (β = 0.093, t = 0.537) did not exhibit significant effects, resulting in the rejection of H4b and H4c. Lastly, to support H5, H6, and H7, the results show that user engagement with the gamified app significantly increases app rating (β = 0.497, t = 4.603), WOM intention (β = 0.488, t = 4.332), and continued use intention (β = 0.628, t = 7.130).

Results indicate that immersion-oriented elements had the strongest impact on engagement, followed by achievement elements. Social-oriented elements contributed to engagement but did not significantly impact competence. Achievement and progression elements positively influenced competence and relatedness, but did not significantly affect autonomy. This suggests that while users feel more skilled, they may not perceive increased control over their choices. User engagement was found to Significantly improve continued use intention (β = 0.628, t = 7.130). Increase WOM intention (β = 0.488, t = 4.332). Enhance app rating (β = 0.497, t = 4.603).

Discussion

Practical Applications

The findings of this study highlight several strategies to enhance user engagement in mobile ticketing applications. First, achievement elements can be improved by introducing milestone-based rewards, such as travel badges for frequent users, to encourage continued usage. Additionally, personalization features should be enhanced by allowing users to customize travel recommendations based on their preferences and past behavior, creating a more tailored experience. Strengthening social features is also crucial, with referral-based incentives and interactive community spaces helping to boost user retention. Lastly, optimizing engagement mechanisms through real-time notifications and gamified prompts can sustain user interest and participation, ensuring long-term app engagement.

Recommended Enhancements

Based on user feedback and study results, the following enhancements are suggested (Table 8). (COM1) Provide monthly reports on how much users have grown in planning their trip, the report can be such as: You have planned 8 trips with 15% budget efficiency (Jaramillo-Mediavilla *et al.*, 2024). (COM6) Offer simple games that are accessed after users leave a review, such as wheel of fortune spin for small rewards, such as additional discounts (Abril *et al.*, 2024). (AUT2) Add a feature where users can input the budget they have then the system can provide suggestions for flight, hotel and tourist attraction options that fit that budget (Avril *et al.*, 2024). (AUT4) Add a challenge feature where users must perform tasks like planning a trip and completing it, this rewards the user points and achievements so user will be likely to plan another trip in the distant future (Vranesic *et al.*, 2019). (REL4) Provides special sub-communities based on interests such as holidays, travel to make it easier for users to find tips and information that is most relevant to their interests (Li & Hu, 2024). (REL9) Add a leaderboard feature where user can compete with other user to compare their ranks. Rewarding users with more usable points as they rank up and gain more achievement (Hamari *et al.*, 2014a). (AES2) Add features that let users personalize the appearance of the app with themes or avatars based on their achievements. For example, users who frequently travel to the beach can open the “Beach Vibes” theme (González-González *et al.*, 2023). (REW3) Provide an easier way to earn bigger rewards so that user think that the application values them, this method could retain user and motivate them to earn rewards (Law *et al.*, 2011). (FOC3) Provide recommendat-ions for nearby activities or restaurants that users can visit when they have free time, such as during transit or breaks between activities to help users make efficient use of their time during travel. (Bani-Doumi *et al.*, 2024). (PUS3) Add theme or language setting options that allow users to customize the appearance according to their preferences so as to increase comfort and ease in accessing the application (Briazu *et al.*, 2024). (CUI1) Adding a destination wishlist feature so users can create a list of places they want to visit; user can also rack up their ranks as they visit these destination to improve their point rewards. This feature can also remind users about special events happening at those attractions (Hamari *et al.*, 2014b). (WOM5) Adding a ‘Nearby Recommendations’ feature. If the user is a local, the app can provide recommendations for nearby places or activities similar to popular tourist destinations that are further away. This feature helps locals discover similar experiences close to home, based on popular attractions. This Feature also rewards points to user that leave a good and upvoted review on the attractions (Kartevoll, 2017), (RAT3) Adding a Daily/Weekly Missions and Challenges Feature. The application could offer missions like “Leave 5 reviews this week” or “Rate recently visited places.” Completing these missions can reward users with additional points or redeemable prizes, motivating them to stay engaged and actively participate (Vranesic *et al.*, 2019).

To create a successful gamification experience, developers should balance fun with functional utility by incorporating engaging challenges and rewarding achievements while ensuring ease of booking and relevant recommendations, offer customization options that adapt to diverse user preferences without

overwhelming the interface, and regularly update gamified elements based on user behavior and feedback. The gamification principles identified in this study can be applied across various sectors, such as healthcare through reward-based engagement for healthy habits and wellness tracking, education with progression and challenge-based learning platforms, and e-commerce via incentive-based loyalty programs featuring social sharing and referral bonuses, ultimately enhancing motivation and engagement across different digital environments. The lack of impact of social elements on competence may be attributed to the perceived passivity of these features. Unlike achievement or immersion elements, social interactions may not provide direct skill-building experiences, explaining the weaker association with competence.

Table 8: Construct Statement

Construct		Statement
Competence	COM1	I feel increasingly proficient in planning trips by frequently using the application
		I am pleased that the the application cares about user feedback
Autonomy	AUT2	I can choose flights, hotels, and tourist attractions that fit my budget
	AUT4	I have full control over my trip planning with the application
Relatedness	REL4	I can join the community on the application to share tips and information about travel
	REL9	I am motivated to continue using the application because I receive recognition for my achievements
Aesthetic Appeal	AES2	I find the user interface design of the application enjoyable to use
Reward	REW3	I am motivated to continue using the application because of the attractive rewards
Focused Attention	FOC3	I feel more productive in planning my trips by using the application
Perceived Usability	PUS3	I feel comfortable using the application because it is not confusing
Continued Use Intention	CUI1	I have a goal to visit more tourist attractions around the world
WOM Intention	WOM5	I use the application to share my travel experiences with friends
App Rating	RAT3	I often receive badges and rewards as an active user who provides ratings and reviews on the application, which further motivates me

Study Limitations and Future Research

Future research should integrate real-time engagement tracking to assess how user behavior changes over time in response to gamification strategies, identify engagement patterns that contribute to long-term retention, and provide dynamic adjustments for continuous optimization, while also utilizing longitudinal data to track long-term engagement trends, conducting studies across different app categories for more generalizable insights, and exploring usability as a distinct factor in gamification design.

Conclusion

This study underscores the significant role of gamification in improving user engagement in ticketing applications, particularly within the context of Indonesia. With the increasing challenges of user retention post-download, gamification offers a promising solution by tapping into users' psychological needs, such as competence, autonomy, and relatedness, as outlined in the Self-System Model of Motivational Development (SSMMD). By aligning game elements like rewards, challenges, and social interactions with these core motivators, ticketing apps can foster deeper, more sustained user engagement. Moreover, this research aims to fill the gap in existing literature by exploring user engagement through psychological factors, using the User Engagement Scale Short Form (UES-SF) as a more nuanced approach compared to performance indicators. The findings of this study are expected to provide actionable insights for Indonesian developers, enabling them to design more effective user interfaces and marketing strategies that enhance user retention and satisfaction. Ultimately, this research contributes to the broader understanding of gamification's impact on user engagement, specifically within the local ticketing app market, and advocates for its strategic integration to create more satisfying, long-term user experiences.

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Data Availability

Data supporting this study are openly available from the Zenodo Repository.

Author's Contributions

Willis Tan: Responsible for compiling SmartPLS Data into a table and explaining about Cochran formula and how it is implemented in the research.

Fernandez: Responsible for gathering the data from sources such as Science Direct and gathering user opinion by spreading questionnaires, as well as revise manuscript.

Steven Lie: Responsible for data gathering and spreading questionnaires, and also helped in implementing data into a table.

Sugiarto Hartono: Provided expert guidance, methodological oversight, and critical feedback throughout the research process.

Ethics

This article is unique and hasn't been released before. The corresponding author verifies that all authors have thoroughly reviewed and approved of the work. Additionally, we affirm that the data presented in this article is accurate and has not been falsified. Our research strictly adheres to the principles of scientific ethics and integrity.

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