Digital Dependence: Online Game Addiction to Mobile App Purchase Intention Feature

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Abstract

Online mobile gaming in Indonesia is growing rapidly, driving purchase intention towards premium features such as virtual items and exclusive in-game access. This study aims to analyse online mobile game addiction on mobile app feature purchase intention. This type of research uses a quantitative approach, with 426 respondents through an online survey and analysed using Partial least squares structural equation modeling (PLS-SEM). The results indicate that addiction has a significant impact on loyalty and purchase intention, while loyalty has no impact on purchase intention, as well as satisfaction on loyalty, and addiction weakens the relationship between satisfaction and loyalty. This study makes an important contribution to understanding the dynamics of online game addiction, player loyalty, and purchase intention of app features in the context of the mobile game market in Indonesia.

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1. Introduction

The proliferation of online gaming has transformed the digital entertainment landscape, particularly in emerging markets such as Indonesia. With the rapid expansion of internet accessibility and the ubiquitous use of mobile devices, online gaming has become pervasive among diverse demographic groups (Syahrivar et al., 2021). This surge in online gaming participation has not only reshaped leisure activities but also introduced complex behavioral patterns, including the phenomenon of online game addiction. Online game addiction, characterized by excessive and compulsive gaming behaviors that interfere with daily life, has garnered significant attention from both scholars and practitioners due to its multifaceted impacts (Velthoven et al., 2018). Indonesia presents a compelling case study for examining online game addiction due to its large and youthful population and increasing internet penetration rates (Wıjaya, 2022). The Indonesian gaming market has witnessed exponential growth, with mobile games constituting a substantial segment driven by accessibility and affordability (Yasir & Agus, 2021). As more individuals engage in online gaming, understanding the underlying factors that contribute to addictive behaviors and their subsequent effects on consumer behavior becomes imperative. This study explores the intricate relationship between online game addiction, player loyalty, and the intention to purchase mobile app features within the Indonesian context.

Loyalty in online gaming is often manifested through sustained engagement with specific games, communities, and in-game ecosystems. Loyal players tend to exhibit higher levels of commitment, frequently investing time and resources to enhance their gaming experience (Hua et al., 2017). This loyalty is not merely a reflection of preference but also serves as a critical determinant of consumer behavior, particularly in the realm of in-app purchases. Premium features, such as advanced levels, exclusive items, and enhanced functionalities, are pivotal revenue streams for mobile game developers and are directly influenced by player loyalty (Molinillo et al., 2020). Consequently, exploring how addiction influences loyalty and, in turn, affects purchasing intentions is essential for both academic understanding and practical applications in the gaming industry.

The intersection of addiction and loyalty presents a unique dynamic with significant implications for consumer economics. Online game addiction can lead to heightened emotional and psychological investment in gaming activities, which may translate into increased willingness to spend on in-app features (Rapp, 2021). This behavior aligns with the broader trends in digital economies, where virtual interactions and entertainment drive substantial financial transactions (Tkachenko, 2020). However, while the relationship between addiction and consumer spending is acknowledged, there remains a paucity of research explicitly addressing how loyalty mediates this relationship within the Indonesian mobile gaming sector. This gap highlights the need for a nuanced examination of the factors that influence purchasing intentions among addicted gamers.

Existing literature underscores the importance of psychological factors such as satisfaction, engagement, and perceived value in fostering loyalty and driving purchase intentions (G. A. Singh, 2023). Satisfaction with a game can enhance loyalty, leading to a greater propensity to invest in premium features (Yang et al.,

2009). However, the role of addiction introduces additional layers of complexity. Addiction may amplify the positive effects of satisfaction on loyalty and alter the dynamics of how satisfaction influences purchasing behavior (Li et al., 2020). Understanding whether addiction acts as a facilitator or a moderator in these relationships is crucial for developing comprehensive models that accurately predict consumer behavior in the gaming context.

The current study examines the factors influencing the relationship between online gaming addiction, player loyalty, and intention to purchase game app features. Specifically, it seeks to determine how addiction impacts loyalty, how both addiction and loyalty influence purchase intentions and how satisfaction interacts with these variables. By formulating and testing a series of hypotheses, this research aims to elucidate the pathways through which addiction affects consumer behavior in mobile gaming. The hypotheses posit that addiction positively influences both loyalty and purchase intentions, that loyalty itself is a significant predictor of purchase intentions. That satisfaction enhances loyalty while addiction may moderate the relationship between satisfaction and loyalty. The significance of this study lies in its potential to contribute to multiple academic domains, including computer human behavior, marketing, and psychology. By integrating concepts from these fields, the research offers a holistic perspective on the behavioral drivers of in-app purchases among addicted gamers. Furthermore, the focus on the Indonesian market provides valuable insights into a rapidly growing and culturally unique segment of the global gaming industry. The findings are expected to inform game developers and marketers about the behavioral patterns that underpin consumer spending, enabling the design of more effective strategies to engage and monetize loyal players.

2. Literature review and hypotheses development

2.1 Addiction towards online mobile games

The relationship between addiction and loyalty in the context of online mobile games has garnered significant attention in recent research. Addiction, characterized by excessive and compulsive engagement in gaming activities, has been shown to foster a strong sense of attachment and commitment to specific games (Masrek et al., 2022; Putra & Wahyudi, 2022). Studies indicate that individuals exhibiting higher levels of gaming addiction are more likely to develop sustained loyalty towards their preferred games, as the immersive and rewarding nature of these games reinforces continuous engagement (Hua et al., 2017). This loyalty is manifested through repeated gameplay, participation in game communities, and investment in in-game resources, all of which are driven by the addictive aspects of the gaming experience (Rosyid et al., 2019). Furthermore, addiction can enhance emotional bonds with the game, making players more resistant to switching to alternative games despite the availability of new options in the market (Ravoniarison & Benito, 2019). The psychological investment and time commitment associated with addiction contribute to a heightened loyalty, as players seek to maximize their gaming experience and maintain their status within the game

environment (Li et al., 2020). Empirical evidence supports the notion that addictive behaviors are significant predictors of loyalty in online gaming, highlighting the importance of understanding this dynamic for both game developers and marketers aiming to retain their user base (Yasir & Agus, 2021).

Addiction to online mobile games profoundly impacts consumers' purchasing behaviors within these platforms. Research indicates that addicted gamers are more inclined to spend money on in-app purchases to enhance their gaming experience, acquire exclusive items, and gain competitive advantages (Chuang, 2020). The compulsive nature of addiction drives players to seek constant rewards and improvements, which in turn increases their willingness to invest financially in mobile app features (Silaban et al., 2021). Moreover, addiction often leads to a higher perceived value of in-app purchases, as addicted players associate these expenditures with enhanced gameplay and social status within the game community (Jiang et al., 2014). The continuous engagement and emotional investment characteristic of addiction create a strong motivation to support and sustain their gaming activities through financial means (Hawi et al., 2019). Additionally, the immediate gratification derived from in-app purchases can satisfy the urgent needs of addicted gamers, further reinforcing their intention to make such purchases (Leménager et al., 2020). Consequently, addiction serves as a crucial driver for the intention to purchase mobile app features, underlining the interplay between psychological dependence and consumer spending in the mobile gaming industry (Cemelli et al., 2016).

The interplay between addiction and satisfaction introduces a complex dynamic in understanding player loyalty towards online mobile games. While satisfaction typically fosters loyalty, addiction can alter this relationship by introducing additional psychological factors that influence loyalty independently of satisfaction levels. Specifically, addiction may moderate the negative relationship between satisfaction and loyalty, such that even if satisfaction levels are low, addicted players might still exhibit high loyalty due to their compulsive engagement with the game (Balakrishnan & Griffiths, 2018). Research suggests that addiction can weaken the traditional positive correlation between satisfaction and loyalty by introducing elements of dependency that drive loyalty beyond mere satisfaction (Yang et al., 2009). Addicted players may remain loyal to a game not because they are satisfied, but because their addictive behaviors compel them to continue playing regardless of their actual satisfaction levels (Erevik et al., 2019). This moderation effect implies that addiction can sustain loyalty in scenarios where satisfaction alone would not be sufficient, potentially leading to prolonged engagement despite negative experiences or decreased satisfaction (Minian et al., 2022).

Furthermore, addiction can create a scenario where players feel unable to disengage from the game, thereby maintaining their loyalty through compulsion rather than genuine preference or satisfaction (Liao et al., 2021). This nuanced relationship highlights the importance of considering addiction as a moderating variable when examining the factors that drive loyalty in online mobile gaming. Understanding this moderation effect is crucial for developing comprehensive models that

accurately capture the motivations behind player loyalty and inform strategies that promote healthy gaming behaviors while maintaining user engagement (Yasir & Agus, 2021). Therefore, we hypothesize:

H1: Addiction towards online mobile games positively affects loyalty.
H2: Addiction towards online mobile games positively affects intention to purchase.
H3: Addiction moderates the negative relationship between satisfaction and loyalty.

2.2   Online game satisfaction on loyalty

Satisfaction is a critical determinant of loyalty in online mobile games. When players are satisfied with their gaming experience, characterized by engaging gameplay, high-quality graphics, and responsive customer support, they are more likely to develop a lasting loyalty to the game (Oliver, 1999). Satisfaction serves as a foundation for positive emotional responses, fostering a strong commitment to continue playing and supporting the game over time (Prott & Ebner, 2020). Empirical studies have consistently shown that higher levels of satisfaction lead to increased loyalty, as satisfied players are motivated to remain engaged and invest further in the game (Yang et al., 2009). Satisfaction influences loyalty by enhancing the overall perceived value of the game, making players more willing to overlook minor inconveniences and remain committed despite the availability of alternative options (B. K. Singh et al., 2023). Furthermore, satisfied players are more likely to engage in positive word-of-mouth, recommending the game to peers and contributing to its sustained popularity and user base (Guping et al., 2021). Therefore, satisfaction acts as a pivotal factor in cultivating loyalty, highlighting the need for game developers to prioritize user satisfaction to ensure long-term player retention (Liao et al., 2021). Therefore, we hypothesize:

H4: Satisfaction towards online mobile games positively affects loyalty.

2.3   Online game loyalty to purchase intention

Loyalty towards online mobile games significantly shapes players' intentions to purchase mobile app features. Loyal players, who consistently engage with a particular game, are more likely to invest in in-app purchases to enhance their gaming experience and maintain their status within the game (Cemelli et al., 2016). This sustained commitment fosters a sense of trust and satisfaction with the game, making players more receptive to additional monetization opportunities developers offer (Huo et al., 2024). Studies have demonstrated that loyalty strongly predicts purchase intentions, as loyal customers are more inclined to support the games they are dedicated to through financial contributions (Putra & Wahyudi, 2022). The emotional attachment and positive experiences associated with loyalty increase the perceived value of in-app purchases, encouraging players to spend more on features that contribute to their overall satisfaction and enjoyment (Syahrivar et al., 2021). Additionally, loyal players often act as brand ambassadors, recommending the game to others and thereby indirectly influencing their purchasing behaviors (Balakrishnan & Griffiths, 2018). This relationship underscores the importance of

cultivating loyalty as a strategic approach to drive in-app purchases and sustain revenue streams in the competitive mobile gaming market (Ilham & Siregar, 2021). Therefore, we hypothesize:

H5: Loyalty towards online mobile games positively affects purchase intention

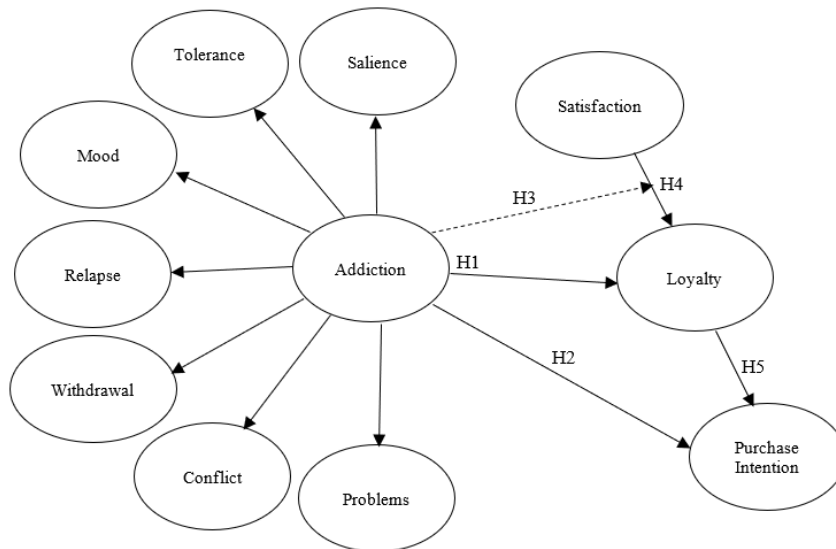Based on the literature study above, the following is the theoretical framework (Figure 1) in this study:

Figure 1: Theoretical Thinking Framework

3. Main Results

3.1   Research design

This study aims to investigate how the attitude dimension moderates the relationship between satisfaction and student loyalty, the direct relationship with loyalty and purchase intention, as well as the relationship between satisfaction and loyalty and loyalty to purchase intention, through structural equation modelling (SEM) with participants of online mobile game users over 18 years old. The research design is a purposive sampling survey with cross-sectional data type through distributing questionnaires, then analysing the data statistically to determine the response style given and investigate research questions or research hypotheses (Creswell, 2014). In this study, a questionnaire was developed with 10 variables namely salience, tolerance, mood modification, relapse, withdrawal, conflict, problems, loyalty, satisfaction, and purchase intention which were then used to collect data from participating students.

3.2 Data collected and participant

A closed questionnaire design consisting of four sections: a brief survey introduction, screening questions, key measurement questions, and demographic questions. We implemented specific protocols in the questionnaire to reduce potential common method bias (CMB) and non-response bias. To control for CMB, we ensured the questionnaire was short, placed demographic questions at the end, allowed respondents to answer anonymously, used diverse scale types, and conducted a pilot test (Podsakoff et al., 2003; Reio, 2010). Data collection was conducted via a self-administered questionnaire comprising 71 items, employing a 5-point Likert scale with response options ranging from 1 to 5. A rating of 1 indicates a negative response, while a rating of 5 indicates a positive response. The questionnaire was created using Google Forms and distributed online via social media and WhatsApp. The target population is mobile game users who have been playing mobile apps for more than 2 years, and are over 18 years old. These criteria were determined on the grounds that the respondents obtained already had experience in playing and were mature enough to think. The sample obtained from the distribution of social media has resulted in 428 respondents.

3.3 Data analysis

Attitude in this study refers to Lemmens et al., (2009), which is measured through seven dimensions, namely salience (3 items), tolerance (3 items), mood modification (3 items), relapse (3 items), withdrawal (3 items), conflict (4 items) and problems (3 items). Meanwhile, the dimensions of loyalty (2 items), satisfaction (3 items), and purchase intention (5 items) refer to research conducted by Oliver, (1999). The analysis technique uses the Partial Least Square -Structural Equation Model (PLS-SEM), a method suitable for complex structural models with latent variables (Hair et al., 2019), and this study develops a structural model where attitude acts as a moderating variable. The research variables consist of several categories, namely demographic variables, which include basic characteristics of respondents such as gender, age, academic level, job and salary; exogenous latent variables, namely salience, tolerance, mood modification, relapse, withdrawal, conflict, problems, and satisfaction; endogenous latent variables, namely loyalty, purchase intention and moderating variables namely attitude which is hypothesized to strengthen the relationship between latent variables. Data analysis using SmartPLS 4 to evaluate the model in PLS consists of a measurement model, a structural model, and a goodness and fit model.

4. Results and analysis

4.1 Respondent characteristic

There were 428 respondents with more than two years of experience playing online mobile games, 86.7% of whom were male out of the total sample. The largest group represented in the survey were those working as civil servants (37.6%), followed by students (27.8%), private employees (26.9%), professionals (6.3%) and others

(1.4%). In terms of income (in rupiah), the highest range is around 2 - 7 million (52.6%), which is included in the middle class, then below 2 million (27.8%), which is included in the low class, then 7-15 million (16.8%) is included in the middle class and the upper class in the range of 15 million and above (2.8%). From the education group, the largest is bachelor's (65.2%), master (28.5%), doctorate (5.4%) others (0.9%). This is in line with the age distribution of participants, the largest group is individuals aged between 25-34 years (44.9%) in the young adult category, then 18-24 years (29.4%) in the late adolescence/early adulthood category, 35-44 years (17.3%) in the middle adulthood category and the rest above 55 years (0.9%). Meanwhile, based on location distribution, the three highest islands are Java (59.3%), followed by Bali (18%) and Kalimantan (9.6%).

4.2   Measurement model analysis

This research model uses second-order with the embedded two-stage variable approach. The first stage is a dimension-level measurement model, and the second stage is a variable-level evaluation, which includes a measurement model, structural model, and evaluation of the model's goodness of fit. This research model uses a second-order approach with an embedded two-stage variable approach. In the first stage is a dimension-level measurement model and in the second stage a variable-level evaluation which includes a measurement model, structural model and evaluation of the model's goodness of fit. Hair et al., (2021) state that assessing the reflective measurement model involves determining the reliability of indicators with factor load values exceeding 0.7. Internal consistency includes composite reliability (rho_c), Cronbach's alpha (α), and reliability coefficient (rho_a), all of which exceed 0.7. In the first stage, our evaluation showed that these statistics were consistently above this threshold. The average variance extracted (AVE) exceeds 0.5, indicating the constructs' establishment of convergent validity. Table 1 presents the estimated values of factor loadings, reliability, and convergent validity. Table 2 presents the Fornell-Lacker results for assessing discriminant validity among the reflective constructs of the addictive variables, including salience, tolerance, mood modification, relapse, withdrawal, conflict, and problem. If each construct's AVE square root value is greater than the correlation value between constructs and other constructs in the model, it has a good discriminant validity value (Henseler et al., 2015). For the Fornell lacker value, each construct (in this case, dimensions) has lower correlation values between the construct and other constructs in the model. With this, it can be said that according to the test with the AVE root, the model does not have good discriminant validity. Based on the Discriminant validity test, using the cross-loading value has shown promising results. The validity test results have obtained feasible items. The reliability test has demonstrated satisfactory results, and the AVE value has met the requirements; the PLS-SEM analysis is still attainable to continue.

Table 1: Factor Loading, Reliability, and Convergent Validity Estimates First Stage

Construct and scale items		Loading	CR (rho_c)	CR (rho_a)	AVE	CA (α)
Salience			0.881	0.798	0.712	0.798
SL1	Are you thinking about playing online mobile games all day?	0.840				
SL2	Do you spend a lot of your free time playing online mobile games?	0.858				
SL3	Have you ever felt addicted to online mobile games?	0.834				
Tolerance			0.883	0.803	0.716	0.801
TL1	Are you playing online mobile games longer than intended?	0.884				
TL2	Do you spend more time playing online mobile games?	0.829				
TL3	Are you unable to stop once you start playing online mobile games?	0.824				
Mood Modification			0.832	0.710	0.624	0.699
MM1	Do you play online mobile games to forget about real life?	0.833				
MM2	Do you play online mobile games to release stress?	0.786				
MM3	Do you play online mobile games to feel better?	0.748				
Relapse			0.930	0.887	0.816	0.887
RL1	Are you unable to reduce your time playing online mobile games?	0.915				
RL2	Do others unsuccessfully try to reduce the time you spend playing online mobile games?	0.905				
RL3	Do you fail when trying to reduce the amount of time you play online mobile games?	0.889				
Withdrawal			0.879	0.793	0.707	0.793
WD1	Do you feel bad when you can't play mobile games online?	0.843				
WD2	Do you become angry when you are unable to play mobile games online?	0.860				
WD3	Do you become stressed when you are unable to play online mobile games?	0.819				
Conflict			0.863	0.768	0.677	0.761
CF1	Do you get into fights with others (e.g., family, friends) during the time you spend playing online mobile games?	0.816				
CF2	Do you ignore others (e.g., family, friends) because you are playing online mobile games?	0.796				
CF3	Do you lie about the time spent playing online mobile games?	0.854				
Problems			0.894	0.823	0.738	0.822
PB1	Is your time playing online mobile games causing sleep deprivation?	0.855				
PB2	Do you neglect other important activities (e.g., school, work, sports) to play online mobile games?	0.825				
PB3	Do you feel bad after playing online mobile games for a long time?	0.895				

Table 2: Fornell Lacker First Stage

Variable	Fornell Lacker						
	Conflict	**Mood**	**Problem**	**Relapse**	**Saliance**	**Tolerance**	**Withdrawal**
Conflict	0.823						
Mood	0.717	0.790					
Problem	0.803	0.789	0.859				
Relapse	0.800	0.746	0.851	0.903			
Saliance	0.718	0.732	0.753	0.816	0.844		
Tolerance	0.788	0.772	0.827	0.841	0.799	0.846	
Withdrawal	0.811	0.767	0.836	0.835	0.761	0.830	0.841

In the second stage, the measurement was carried out again by including the variables in the first stage as indicators of attitude; based on Table 3, our evaluation shows that it is consistently above the specified threshold. Likewise, the discriminant validity value is presented in Table 4 fornell-lacker second stage.

Table 3: Factor Loading, Reliability, and Convergent Validity Estimates Second Stage

	Construct and scale items	Loading	CR (rho_c)	CR (rho_a)	AVE	CA (α)
	Attitude		**0.970**	**0.964**	**0.821**	**0.963**
	LV scores - Conflict	0.889				
	LV scores - Mood	0.868				
	LV scores - Problem	0.924				
	LV scores - Relapse	0.930				
	LV scores - Salience	0.881				
	LV scores - Tolerance	0.925				
	LV scores - Withdrawal	0.922				
	Satisfaction		**0.896**	**0.846**	**0.742**	**0.827**
SF1	How satisfied were you with the overall gaming experience?	0.899				
SF2	How likely are you to recommend this game to your friends?	0.839				
SF3	What do you think about the graphics and sound quality of this game?	0.846				
	Loyalty		**0.834**	**0.602**	**0.716**	**0.602**
LY1	The online game is overall satisfactory enough to be reused later on	0.848				
LY2	I will reuse this online game the next time I want to play an online game	0.844				

Purchase Intention			0.900	0.867	0.643	0.861
PI1	I intend to continue purchasing the online mobile in-game gaming app	0.787				
PI2	I strongly recommend that others purchase the online mobile gaming app.	0.822				
PI3	I find purchasing online mobile gaming apps to be beneficial?	0.848				
PI4	I am likely to purchase online mobile gaming apps frequently in the future?	0.756				
PI5	I plan to spend more on purchasing online mobile gaming apps?	0.792				
Addiction x Satisfaction		1.000				

Table 4: Fornell Lacker Second Stage

Variable	Fornell Lacker			
	Addiction	Loyalty	Purchase Intention	Satisfaction
Addiction	0.918			
Loyalty	0.820	0.846		
Purchase Intention	0.906	0.742	0.845	
Satisfaction	0.898	0.735	0.802	0.861

4.3 Structural model analysis

Structural model evaluation is the process of testing hypotheses concerning the influence of research variables and is conducted in three stages (Hair et al., 2021). Firstly, multicollinearity among variables is assessed using the Inner VIF (Variance Inflated Factor) measure. Values under five on the Inner VIF scale suggest the absence of multicollinearity. The second stage involves hypothesis testing between variables by examining the t-statistical value or p-value. If the t statistic calculated is greater than 1.96 (t table), or the p-value of the test results is less than 0.05, there is a significant influence between the variables. Additionally, it is essential to convey the results and 95% confidence interval of the estimated path coefficient parameter. The third is the f^2 value, namely the effect of variables at the structural level with criteria (f^2 0.02 is low, 0.15 is moderate, and 0.35 is high).

The structural model analysis in Table 5 yielded several significant and non-significant relationships between the variables tested, including addiction, loyalty, purchase intention and satisfaction. The relationship between addiction and loyalty exhibited a strong and positive effect, with a path coefficient of 0.768. The confidence interval at the 95% level ([0.549, 0.965]), indicating a significant relationship. The p-value of 0.000 and t-statistic of 6.071 support the significance of this finding, and with an f^2 value of 0.346, this effect can be categorised as a medium effect according to Hair et al., (2019) criteria. Furthermore, the relationship between Addiction and Purchase Intention was highly significant, with a path

coefficient of 0.945 and a confidence interval at the 95% level ([0.837, 1.056]). The p-value of 0.000 and t-statistic of 14.246 indicate an extremely high level of significance. This effect is further substantiated by the f^2 value of 1.876, which signifies that addiction substantially influences purchase intention. Therefore, it can be inferred that hypothesis 1 and 2 are accepted. However, the relationship between loyalty and purchase intention demonstrates no statistical significance, as evidenced by the path coefficient of -0.032 and a confidence interval that does not include zero (95% confidence interval: [-0.166, 0.098]). This is further substantiated by the p-value of 0.345 and the t-statistic of 0.398, which provide additional evidence against the hypothesis of a significant relationship between these two variables. The negligible effect size, evidenced by f^2 of 0.002 further substantiates the conclusion that Loyalty does not serve as a substantial predictor of Purchase Intention within this model. In addition, the relationship between Satisfaction and Loyalty is not significant, with a path coefficient of -0.020, a confidence interval ([-0.244, 0.209]) that includes zero, a p-value of 0.442, and a t-statistic of 0.145. With f^2 of 0.000, the effect of Satisfaction on Loyalty is negligible.

Table 5: Structural model

Hypothesis	Path Coefficient	PCI		p value	t statistic	f^2	Sig
	(β)	5%	95%				
H1: Addiction → Loyalty	0.768	0.549	0.965	0.000	6.071	0.346	Yes
H2: Addiction → Purchase Intention	0.945	0.837	1.056	0.000	14.246	1.876	Yes
H4: Loyalty → Purchase Intention	-0.032	-0.166	0.098	0.345	0.398	0.002	No
H5: Satisfaction → Loyalty	-0.020	-0.244	0.209	0.442	0.145	0.000	No
H3: Addiction x Satisfaction → Loyalty	-0.241	-0.454	-0.014	0.035	1.810	0.038	Yes, Negative
	R^2	$Q^2predict$					
Loyalty	0.684	0.617					
Purchase Intention	0.844	0.839					

Conversely, the interaction between Addiction and Satisfaction with Loyalty demonstrates a significant yet negative relationship, with a path coefficient of -0.241 and a confidence interval ([-0.454, -0.014]) that does not include zero. The p-value of 0.035 and t-statistic of 1.810 indicate moderate significance. The f^2 value of 0.038 indicates a small effect, but this negative relationship is of interest to observe.

5. Evaluation of goodness and fit of the model

PLS is a variance-based SEM analysis with the aim of testing model theory that focuses on prediction studies. Therefore, several measures were developed to declare the proposed model acceptable, such as R^2, Q^2, and SRMR (Hair et al., 2019). The R^2 statistical measure illustrates the variation in endogenous variables that can be explained by other exogenous/endogenous variables in the model. According to Chin (1998), the qualitative interpretation value of R^2 is 0.19 (low influence), 0.33 (moderate influence), and 0.66 (high influence). Based on Table 5, the R^2 value for the Loyalty variable (0.684) demonstrates that 68.4% of the variance in Loyalty can be explained by the model, thereby indicating strong predictive ability. Similarly, the R^2 value for Purchase Intention (0.844) demonstrates that 84.4% of the variance in Purchase Intention is explained by the relevant constructs in this model.

Q^2 describes a measure of predictive accuracy, namely how well each change in exogenous/endogenous variables can predict endogenous variables. This measure is a form of validation in PLS to state the suitability of model predictions (predictive relevance). The Q^2 value above zero states that the model has predictive relevance, but in Hair et al. (2019) the qualitative Q^2 interpretation value is 0 (low influence), 0.25 (moderate influence), and 0.50 (high influence). Based on Table 5, the Q^2 values of 0.617 for Loyalty and 0.839 for Purchase Intention further support the predictive relevance of the model, with values indicating excellent predictive ability. Figure 2 shows the path coefficient diagram, t statistics, and R^2 values of the endogenous constructs within the model.

Furthermore, the cross-validated predictive ability test (CVPAT) measure validates the predictive power of the proposed PLS model, demonstrating acceptable predictive capability (Liengaard et al., 2021). SEM PLS necessitates validation to establish the acceptability of the proposed model within a predictive framework. The model demonstrates high predictive capability when the prediction error is negative and statistically significant, as indicated by the average loss difference (Sharma et al., 2023). Table 6 presents the results of the average loss difference value calculation for the PLS model comparison, indicating that the average indicator (IA) is negative for both endogenous variables. The integration of Q2 and CVPAT enhances the assessment of the model's goodness of fit (Shmueli et al., 2016).

Table 6: CVPAT

Variable	PLS SEM VS IA			PLS SEM VS LM		
	ΔL	t value	p value	ΔL	t value	p value
Loyalty	-0.460	7.768	0.000	-0.008	0.209	0.002
Purchase Intention	-0.427	11.191	0.000	-0.046	3.583	0.031
Overall	-0.436	12.751	0.000	-0.031	2.213	0.015

The interaction between addiction and satisfaction shows a significant effect on loyalty. Based on Figure 3, simple slope graphs indicate that the better the satisfaction, the stronger the impact of addiction in increasing satisfaction and loyalty. This effect is seen to be consistent across different levels of addiction, with the effect being greatest at higher levels of perceived cost (+1 SD). This pattern indicates that satisfaction weakens the effect of Addiction on Loyalty, especially at high levels of addiction, which supports the previous result that this interaction is negatively significant.
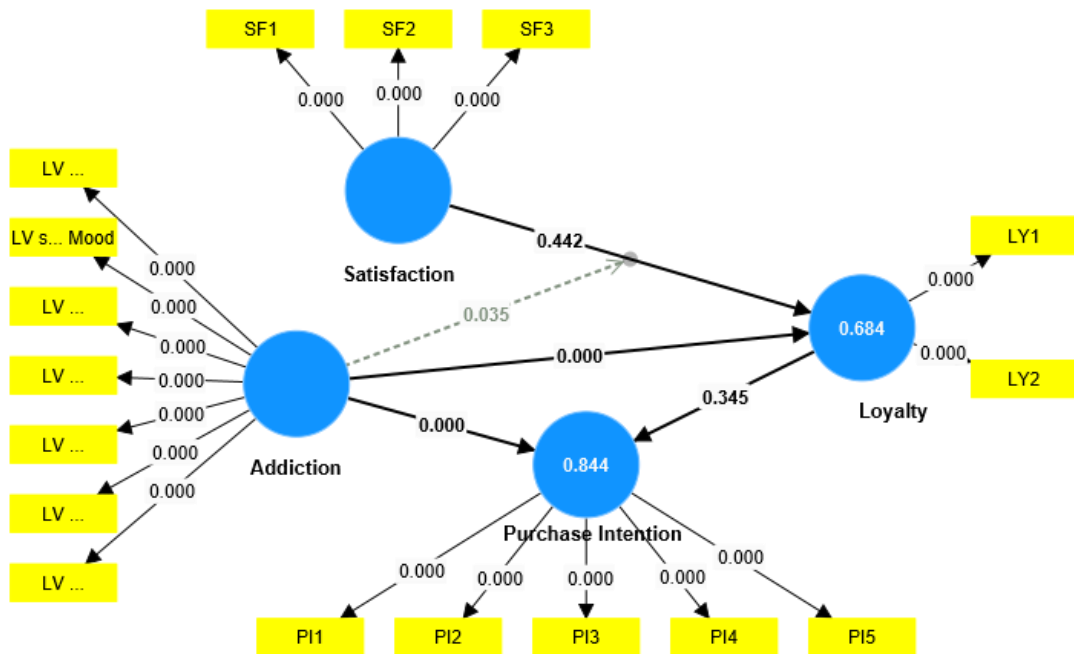
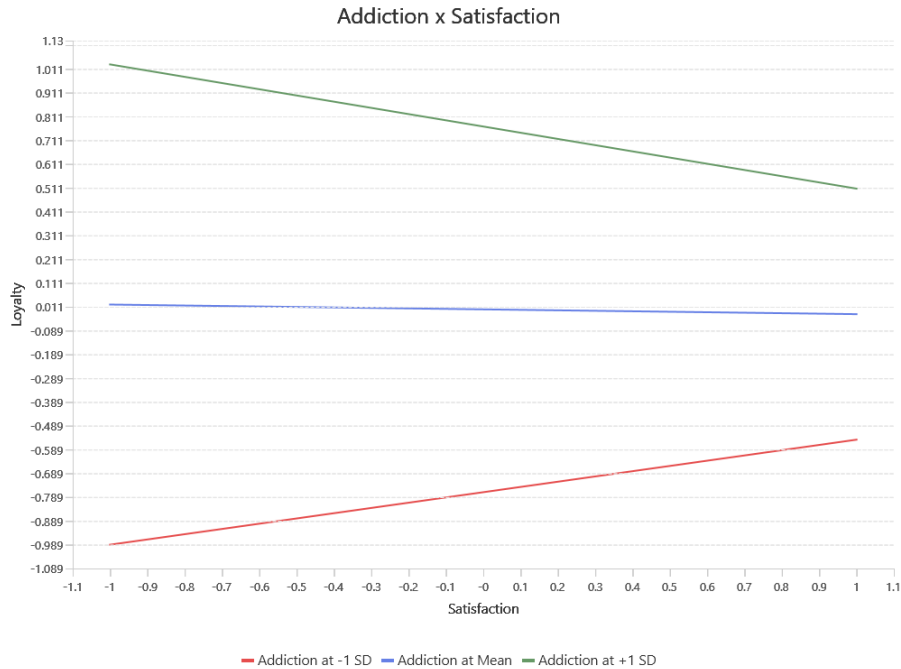**Figure 2: Diagram Path Coefficient and P-value**

Figure 3: Slope analysis

6. Discussion and conclusion

6.1 Discussion

This study aims to identify factors influencing the relationship between online game addiction, player loyalty, and purchase intention for game app features among mobile game users in Indonesia. Five hypotheses were tested based on the data analysis conducted to understand the dynamics between these variables. The results provide valuable insights into the influence of online game addiction on loyalty, app feature purchase intentions, and the moderating role of addiction in the relationship between player satisfaction and loyalty.

The first hypothesis (H1) states that addiction to mobile online games positively and significantly affects player loyalty. The results of the study support H1, showing that a high level of addiction is positively correlated with player loyalty to the game being played. This finding is in line with research conducted by (Li et al., 2020), which found that online game addiction increases players' emotional attachment and commitment to a particular game. This loyalty is reflected in the player's desire to continue using the game and recommending it to others, which can increase user retention for game developers. The second hypothesis (H2) states that addiction to mobile online games positively and significantly affects the intention to purchase game application features. The results also support H2, indicating that high addiction increases players' intention to purchase premium features in-game apps. This finding is consistent with a study by Cemelli et al., (2016), which showed that

game addiction is positively correlated with in-game micro-spending, such as the purchase of virtual items or feature upgrades. This suggests that addiction not only affects play behavior but also drives consumer actions to enhance the play experience through the purchase of additional features.

The third hypothesis (H3) proposed that loyalty towards mobile online games positively affects the purchase intention of game app features. However, the results showed that this effect was not significant. This finding contradicts existing literature, such as research by Minian et al., (2022), which states that player loyalty typically increases the intention to make in-game purchases to support and enhance the gaming experience. One potential reason why this result is not significant could be due to external factors such as the price of premium features being perceived as high by players or the lack of a clear perception of added value from such features. In addition, loyalty may have more to do with game usage retention than purchase intentions, which needs to be further explored in future research.

The fourth hypothesis (H4) stated that satisfaction with mobile online games positively affects player loyalty. However, the results show that this effect is not significant. This finding differs from the theory proposed by Oliver, (1999), which emphasizes that satisfaction is a key predictor of consumer loyalty. One possible cause of this non-significance is that the addictive factor that is dominant in online gaming might shift the role of satisfaction as a determinant of loyalty. In a highly addictive gaming environment, player loyalty may be influenced more by aspects of addiction, such as the need to avoid a sense of loss or fulfill psychological needs rather than satisfaction with the gaming experience itself.

The fifth hypothesis (H5) tested the moderating role of addiction in the relationship between satisfaction with mobile online games and player loyalty. The results showed that addiction moderated the relationship negatively and significantly; high levels of addiction can weaken the positive relationship between satisfaction and player loyalty. This finding can be explained by the internal conflict in highly addicted players, where satisfaction with the game may not be enough to maintain loyalty if the level of addiction brings negative impacts such as stress or fatigue. This is in line with research by (Balakrishnan & Griffiths, 2018), which showed that although satisfaction increases loyalty, high levels of addiction can reduce the effectiveness of satisfaction in building sustainable loyalty.This study makes an important contribution to understanding the dynamics of online game addiction, player loyalty, and app feature purchase intentions in the context of the mobile gaming market in Indonesia. Theoretically, the results confirm the significant role of addiction in shaping loyalty and purchase intentions, while suggesting that players' level of addiction may influence the relationship between satisfaction and loyalty. This highlights the importance of considering psychological factors such as addiction in models of consumer behaviour in the online gaming industry. Practically, these findings have implications for game developers and marketers in designing effective strategies to increase loyalty and revenue. Game developers need to realize that creating addictive games can increase loyalty and purchase intentions for premium features, but they should also consider the potential negative

impact of addiction. A marketing strategy that balances creating emotional attachment and safeguarding player well-being can help maintain a loyal user base without encouraging excessive consumption behaviour. While providing valuable insights, this study has some limitations that need to be noted. Firstly, this study uses a cross-sectional survey method, which limits the ability to identify causal relationships between variables. Future longitudinal research may provide a more in-depth understanding of how the relationships between addiction, loyalty, and purchase intentions evolve. Secondly, this study focused on mobile game users in Indonesia, so the results may not be generalizable to other geographic or demographic contexts. Further research across international markets may help understand cultural and economic differences in online gaming consumer behavior. Third, the variables measured in this study are limited to addiction, loyalty, satisfaction, and purchase intention. Other factors such as motivation to play, social aspects, and demographic characteristics of players may also influence the relationship between variables and need to be explored in future research.

6.2   Conclusion

This study confirms that addiction to mobile online games has a positive and significant influence on player loyalty as well as purchase intention for game app features. However, loyalty to the game does not significantly influence purchase intentions, nor does satisfaction with the game significantly influence loyalty, especially when players' addiction levels are high. These findings underscore the importance of considering psychological factors such as addiction in understanding consumer behavior in the online gaming industry. As such, game developers and marketers need to design strategies that not only increase players' emotional attachment but also maintain a balance to prevent the negative impact of addiction.

Data availability statement
The data supporting this study's findings are fully available from the corresponding author upon reasonable request.

Declaration
Generative AI in scientific writing. During the preparation of this work, the authors used Grammarly, Quillbot, DeepL, and ChatGPT to check the quality of our language and improve its clarity and readability. After using these tools, the authors reviewed and edited the content as needed and took full responsibility for the content of the publication.
Conflict of interest. On behalf of all authors, the corresponding author declares that there are no conflicts of interest.

References

[1] Balakrishnan, J., & Griffiths, M. D. (2018). Loyalty towards online games, gaming addiction, and purchase intention towards online mobile in-game features. *Computers in Human Behavior*, *87*(June), 238–246. https://doi.org/10.1016/j.chb.2018.06.002

[2] Cemelli, C., Burris, J., & Woolf, K. (2016). Video Games Impact Lifestyle Behaviors in Adults. *Topics in Clinical Nutrition*. https://doi.org/10.1097/tin.0000000000000062

[3] Chin, W. W. (1998). The partial least squares approach for structural equation modeling. In *Modern methods for business research.* (pp. 295–336). Lawrence Erlbaum Associates Publishers.

[4] Chuang, Y.-W. (2020). Promoting Consumer Engagement in Online Communities Through Virtual Experience and Social Identity. *Sustainability*. https://doi.org/10.3390/su12030855

[5] Creswell, J. W. (2014). *Research Design: Qualitative, Quantitative and Mixed Methods Approaches (4th ed.)*. SAGE Publications.

[6] Erevik, E. K., Torsheim, T., Andreassen, C. S., Krossbakken, E., Vedaa, Ø., & Pallesen, S. (2019). The Associations Between Low-Level Gaming, High-Level Gaming and Problematic Alcohol Use. *Addictive Behaviors Reports*. https://doi.org/10.1016/j.abrep.2019.100186

[7] Guping, C., Cherian, J., Sial, M. S., Mentel, G., Wan, P., Otero, S. Á., & Saleem, U. (2021). The Relationship Between CSR Communication on Social Media, Purchase Intention, and E-Wom in the Banking Sector of an Emerging Economy. *Journal of Theoretical and Applied Electronic Commerce Research*. https://doi.org/10.3390/jtaer16040058

[8] Hair, J. F., Hult, G. T. M., Ringle, C. M., Sarstedt, M., Danks, N. P., & Ray, S. (2021). Partial Least Squares Structural Equation Modeling (PLS-SEM) Using R. In *Practical Assessment, Research and Evaluation* (Vol. 21, Issue 1). http://www.

[9] Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2019). When to use and how to report the results of PLS-SEM. In *European Business Review* (Vol. 31, Issue 1). https://doi.org/10.1108/EBR-11-2018-0203

[10] Hawi, N. S., Samaha, M., & Griffiths, M. D. (2019). The Digital Addiction Scale for Children: Development and Validation. *Cyberpsychology Behavior and Social Networking*. https://doi.org/10.1089/cyber.2019.0132

[11] Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the Academy of Marketing Science*, *43*(1), 115–135. https://doi.org/10.1007/s11747-014-0403-8

[12] Hua, W., Wu, N., Wang, T., Zhou, Z., Cui, N., Xu, L., & Yang, X. (2017). Be Loyal but Not Addicted: Effect of Online Game Social Migration on Game Loyalty and Addiction. *Journal of Consumer Behaviour*. https://doi.org/10.1002/cb.1637

[13] Huo, S., Abas, W. A. W., & Waheed, M. (2024). Gamers' Reasons for Purchasing Gaming Virtual Products: A Systematic Review. *Studies in Media and Communication*, *12*(1), 254–267. https://doi.org/10.11114/smc.v12i1.6532

[14] Ilham, R., & Siregar, C. S. (2021). Can Instagram convince information to users? *Jurnal Manajemen Teknologi*, *20*(2), 117–133. https://doi.org/10.12695/jmt.2021.20.2.2

[15] Jiang, G., Ma, F., Shang, J., & Chau, P. Y. K. (2014). Evolution of knowledge sharing behavior in social commerce: An agent-based computational approach. *Information Sciences*, *278*, 250–266. https://doi.org/10.1016/j.ins.2014.03.051

[16] Leménager, T., Neissner, M., Sabo, T., Mann, K., & Kiefer, F. (2020). "Who Am I" and "How Should I Be": A Systematic Review on Self-Concept and Avatar Identification in Gaming Disorder. *Current Addiction Reports*. https://doi.org/10.1007/s40429-020-00307-x

[17] Lemmens, J. S., Valkenburg, P. M., & Peter, J. (2009). Development and Validation of a Game Addiction Scale for Adolescents. *Media Psychology*, *12*(1), 77–95. https://doi.org/10.1080/15213260802669458

[18] Li, Y., Wang, C., & Liu, J. (2020). A Systematic Review of Literature on User Behavior in Video Game Live Streaming. *International Journal of Environmental Research and Public Health*. https://doi.org/10.3390/ijerph17093328

[19] Liao, G.-Y., Pham, T. T. L., Huang, T.-L., Cheng, T. C. E., & Teng, C.-I. (2021). Impact of Workplace Frustration on Online Gamer Loyalty. *Industrial Management &Amp; Data Systems*. https://doi.org/10.1108/imds-08-2020-0504

[20] Liengaard, B. D., Sharma, P. N., Hult, G. T. M., Jensen, M. B., Sarstedt, M., Hair, J. F., & Ringle, C. M. (2021). Prediction: Coveted, Yet Forsaken? Introducing a Cross-Validated Predictive Ability Test in Partial Least Squares Path Modeling. *Decision Sciences*, *52*(2), 362–392. https://doi.org/10.1111/deci.12445

[21] Masrek, M. N., Ahmed, W., Jalil, A., & Baharuddin, M. F. (2022). Mobile Game Addiction and Social Interaction Anxiety of Malaysian Youth. *Environment-Behaviour Proceedings Journal*. https://doi.org/10.21834/ebpj.v7isi10.4094

[22] Minian, N., Saiva, A., Gayapersad, A., Dragonetti, R., Proulx, C., Debergue, P., Lecce, J., Hussain, S., Desjardins, E., & Selby, P. (2022). Video Game to Attenuate Pandemic-Related Stress From an Equity Lens: Development and Usability Study. *Jmir Formative Research*. https://doi.org/10.2196/36820

[23] Molinillo, S., Japutra, A., & Liébana-Cabanillas, F. (2020). Impact of Perceived Value on Casual Mobile Game Loyalty: The Moderating Effect of Intensity of Playing. *Journal of Consumer Behaviour*. https://doi.org/10.1002/cb.1831

[24] Oliver, R. L. (1999). Whence Consumer Loyalty? *Journal of Marketing*, *63*, 33. https://doi.org/10.2307/1252099

[25] Podsakoff, P. M., MacKenzie, S. B., Lee, J.-Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology*, *88*(5), 879–903. https://doi.org/10.1037/0021-9010.88.5.879

[26] Prott, D., & Ebner, M. (2020). The use of gamification in gastronomic questionnaires. *International Journal of Interactive Mobile Technologies*, *14*(2), 101–118. https://doi.org/10.3991/ijim.v14i02.11695

[27] Putra, R. Y., & Wahyudi, L. (2022). What Drives Online Gaming Addiction? Loyalty Check and in-App Purchase Intention. *Journal of Economics Finance and Management Studies*. https://doi.org/10.47191/jefms/v5-i4-22

[28] Rapp, A. (2021). Time, Engagement and Video Games: How Game Design Elements Shape the Temporalities of Play in Massively Multiplayer Online Role-playing Games. *Information Systems Journal*. https://doi.org/10.1111/isj.12328

[29] Ravoniarison, A., & Benito, C. (2019). Mobile Games: Players' Experiences With in-App Purchases. *Journal of Research in Interactive Marketing*. https://doi.org/10.1108/jrim-06-2016-0060

[30] Reio, T. G. (2010). The Threat of Common Method Variance Bias to Theory Building. *Human Resource Development Review*, *9*(4), 405–411. https://doi.org/10.1177/1534484310380331

[31] Rosyid, H. A., Prawidya, D. M., Amalia, A., Fajariani, E., Adhilaga, H., & Shi, P. (2019). The Online Game Addiction, Psychology and Interpersonal Relationship of the Engineering Students. *Bulletin of Social Informatics Theory and Application*. https://doi.org/10.31763/businta.v3i2.88

[32] Sharma, P. N., Liengaard, B. D., Hair, J. F., Sarstedt, M., & Ringle, C. M. (2023). Predictive model assessment and selection in composite-based modeling using PLS-SEM: extensions and guidelines for using CVPAT. *European Journal of Marketing*, *57*(6), 1662–1677. https://doi.org/10.1108/EJM-08-2020-0636

[33] Shmueli, G., Ray, S., Velasquez Estrada, J. M., & Chatla, S. B. (2016). The elephant in the room: Predictive performance of PLS models. *Journal of Business Research*, *69*(10), 4552–4564. https://doi.org/10.1016/j.jbusres.2016.03.049

[34] Silaban, P. H., Silalahi, A. D. K., & Octoyuda, E. (2021). Understanding Consumers' Addiction to Online Mobile Games and in Apps Purchase Intention: Players Stickiness as the Mediation. *Jurnal Manajemen Dan Pemasaran Jasa*. https://doi.org/10.25105/jmpj.v14i2.9342

[35] Singh, B. K., Maurya, P. K., Baveja, V. S., Tomar, J. S., & Chauhan, M. (2023). Asphyxiophilic Death Due to Masochistic Behaviour in a Video Game Addict Teen: A Case Report and Reviews. *Medico-Legal Journal*. https://doi.org/10.1177/00258172221141250

[36] Singh, G. A. (2023). Consumers' Willingness to Pay for Corporate Social Responsibility: Theory and Evidence. *International Journal of Consumer Studies*. https://doi.org/10.1111/ijcs.12910

[37] Syahrivar, J., Chairy, C., Juwono, I. D., & Gyulavári, T. (2021). Pay to Play in Freemium Mobile Games: A Compensatory Mechanism. *International Journal of Retail &Amp; Distribution Management*. https://doi.org/10.1108/ijrdm-09-2020-0358

[38] Tkachenko, O. (2020). Mission of the Virtual Bank in Digitalized Space. *Social Economics*. https://doi.org/10.26565/2524-2547-2020-60-18

[39] Velthoven, M. H. van, Powell, J., & Powell, G. (2018). Problematic Smartphone Use: Digital Approaches to an Emerging Public Health Problem. *Digital Health*. https://doi.org/10.1177/2055207618759167

[40] Wıjaya, T. (2022). Perceived Values and Purchase Behavior of Online Game Attribute Products: Gender Overview. *Business Informatics*. https://doi.org/10.17323/2587-814x.2022.3.68.84

[41] Yang, H. E., Wu, C. C., & Wang, K. C. (2009). An empirical analysis of online game service satisfaction and loyalty. *Expert Systems with Applications*, *36*(2 PART 1), 1816–1825. https://doi.org/10.1016/j.eswa.2007.12.005

[42] Yasir, J. A., & Agus, A. A. (2021). Effect of Gaming Addiction, Game Loyalty, and Gamer Motivation on Intention to Purchase Online Mobile In-Game Features: Case Study of PUBG Mobile. *2021 International Conference on Advanced Computer Science and Information Systems, ICACSIS 2021*, 1–9. https://doi.org/10.1109/ICACSIS53237.2021.9631341