Ease of Use or Fun Perception? Factors Affecting Retention of Newly Registered Mobile Game Players Based on Flow Theory and The Technology Acceptance Model

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Abstract

The gaming market is experiencing remarkable growth, and enhancing the retention of newly registered users has emerged as a top priority for game operators. In this study, we innovatively expanded flow theory and the technology acceptance model to construct a structural equation model that investigates the factors influencing the retention of new mobile game players. By examining 1,375 valid questionnaires from new users of a gaming app, as well as analyzing their login, usage, and retention data, we uncovered unique pathways and characteristics that impact user retention. Our findings reveal that the ease of use perceived by new mobile game players significantly influences their perceived enjoyment and usage attitude, which in turn, indirectly affects retention. Moreover, we discovered that the fun perceived by registered players significantly impacts their usage attitude and retention, emphasizing the need to consider gaming control, challenge, in-game experience, and social engagement during game development. This study offers valuable theoretical implications for the application of flow theory in game development and equips game operators with strategic insights for retaining newly registered users.

Keywords: Mobile game, Newly registered users, Retention, Flow experience, Technology acceptance model

1 Introduction

In 2020, the global mobile gaming market grew significantly, with an overall increase of nearly 20 billion U.S. dollars. In addition to the normal development and growth trends of the market, the global pandemic has been the main catalyst. Residents in most countries around the world have decreased their number of social outings; therefore, gaming time has generally increased, which has greatly boosted the revenue growth of the mobile gaming market. In the field of mobile games, the growth has been even more significant. Based on data from NPD/Vturebeats, mobile game engagement has increased by 50%-70% in different regions in the first half of 2020, while per capita gaming time has increased more profoundly, posing rare profit opportunities as well as market competition challenges for game operators. For game developers, new players mean a huge profit market, but the development costs of new players are higher than the old players [1]. The acquisition and retention of new players become a critical part of the game's operation, and an important indicator of its success [2].

Although the mobile gaming market has great potential, there are still some deficiencies in current mobile game research. First, although user stickiness has been extensively studied, the willingness to use a game and the retention of newly registered game players have been rarely investigated. Polites et al. found that user experience is an important factor in creating user stickiness [3]. Li et al. showed that the flow experience promotes users' continuous use [4]. Zott defined website stickiness as the ability of a website to attract and retain consumers [5]. Koufaris found that the frequency of website revisits is determined by users' online shopping preferences and perceived usefulness [6]. Second, previous studies on games have mostly focused on designing game entertainment to enhance the fun experienced by gamers but have paid inadequate attention to the effect of ease of use. Alzahrani et al. explained that in a game system, man-made conflicts and competitive activities are offered to players who strive to obtain a sense of achievement, e.g., storylines are a factor that motivates and attracts players [7]. Badrinarayanan et al. argued that players' game performance depends not only on game skills but also on experience with the game; the more time a player invests in a game, the better the performance and the greater the progress or achievement [8]. Wiertz and De Ruyter found that in the era of online social media, people obtain a sense of achievement often by sharing their sense of accomplishment with friends [9]. Weibel et al. showed that online games can generate a high level of presence, flow experience, and pleasure. The technology acceptance model (TAM) is a process that can analyze newly registered game players when they must master new game skills to play a role in an unfamiliar mobile game and complete tasks [10]. Whether a new technology is accepted is indirectly or directly affected by usefulness and ease of use. Similarly, according to flow theory, when a program is too cumbersome or difficult to use, it will cause

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anxiety among the users. This study examines whether the ease of use affects mobile game players on attitudes and retention. Third, previous studies on customer stickiness were mostly performed through questionnaire surveys based on semantic analysis rather than actual measurement data of game operators, and the results thus obtained are slightly subjective. Based on the study of users' online shopping habits, Khalifa et al. defined user stickiness as a user's willingness to revisit a website [11]. Lin applied the concept of stickiness to the field of e-commerce and studied its influencing factors by integrating the relationship between consumers' willingness to reuse and stickiness [12]. Xu and Liu argued that user stickiness is a dependent behavior of users on a certain website and that such behavior will not change easily and will continue [13]. However, players' willingness to play a game cannot be classified as stickiness and should be reflected through more objective retention data.

In this study, we integrated flow theory and the TAM, categorized the factors that affect the willingness to use a game by newly registered mobile game players, conducted a questionnaire survey of a game APP with newly registered (first-day) users and retrieved the user login, use, and retention data from the game server to empirically study different influence paths and characteristics of these factors on retaining game players.

2 Relevant Research Bases and Hypotheses

2.1 TAM

The TAM was proposed by Davis in 1989 while studying user acceptance behavior of an information system, mainly aiming to predict new technology adoption among users and improve the design of an information system before introducing it to users, TAM explains the influencing factors of whether users accept the new technology: perceived usefulness, perceived ease of use and attitude [11, 14-16]. TAM has been widely used to understand and predict user behavior, such as voting, consumer buying behavior, and computer use [17]. How people will accept new technology is a common question facing both practitioners and researchers. Designers can develop an acceptable system only if they understand the factors that affect users when they decide whether to use a particular program [18]; furthermore, addressing such questions can help them better design, evaluate and predict user responses to new technology [19]. The acceptance and use of technology involve not only completing a task but also meeting users' emotional needs; therefore, some variables need to be added to the TAM as external variables to solve the intrinsic motivation problem so that a more consistent system usage prediction can be provided when the TAM is used to analyze user acceptance of online games [19-20].

2.2 Flow Theory

Flow explains that when a person is fully engaged in a task, he gradually filters out all the feelings he doesn't want to have and enters a state of immersion [20-22]. Such a flow state will make users experience enjoyment and excitement in an activity. When game players are not challenged enough, they will feel bored, but when a system is too difficult to use, players become anxious. When the challenge levels are too low, the player will become indifferent, but when the player's skills match the challenge level in the interaction or the situation, the player can have a flow experience. The flow itself is an end or benefit and not a means to an end [22]. Flow experience involves intrinsic motivation, and players spontaneously set goals, interact with the game, get results, and focus their attention on a specific experience while profoundly enjoying the interaction [21]. In such a participation experience, the challenge level of the task and the individual's skills are equally high. Some investigators have combined the TAM with flow theory. Lu et al. applied the Flow Theory in TAM to explain the interaction between intrinsic motivation and extrinsic motivation in the acceptance of new technologies [24]. It was found that in addition to a system's practicality and ease of use, users also desire an interesting and enjoyable flow experience. By integrating flow theory and the TAM, Chang and Wang found that flow affects users' behavioral intentions and attitudes toward use [23, 25]. Wang et al. combined flow theory with the TAM to analyze the components of motivation and concluded that flow experience is the cause of behavioral intention [26].

Previous studies indicate that flow theory and the TAM have some similarities and can be used to analyze an individual's exposure to new games: for the TAM, perceived ease of use is a significant factor for individuals to accept new technologies, while for flow theory, the premise for the individual to obtain an immersive experience is that the individual can concentrate effortlessly without being restricted by cumbersome systems. In online games, players' pursuit of the usefulness of the game manifests as perceived fun through the immersive experience brought by the game, i.e., the flow experience. Therefore, in this study, we combined the TAM with flow theory and used the perceived fun of flow theory to replace the perceived usefulness of the TAM to better reflect the inner pursuits of players regarding a game.

2.3 Perceived Fun

In this study, because the usefulness of mobile games for players produces internal motivation changes, we must redefine the perceived usefulness of the TAM. Players use mobile games to meet their inner needs and to experience fun. Weibel et al. found that when an online interaction is made only for its own sake, the entire online event becomes an automatic or intrinsic motivation. When comparing users' computer use behaviors and online gaming behaviors [10]. Swartout et al. found that, unlike operating computers, users interact with games, choose different roles, set up various configurations, and control various activities [27]. Novak built a model to study the user's experience on the Internet [28-29]. Skadberg examined the factors affecting the experiences of visitors when browsing websites; both groups found that compared with computer interactions, online games that are participated in and controlled by many individuals increase communication and interactivity,

bringing higher levels of presence, flow experience, and enjoyment [30]. Van Noort studied the flow experience of consumers during online activities and found that when interacting online, individuals can receive instant responses or feedback from websites, creating challenges that require the users to focus and apply their own set of skills [31]. Liu found that many performances and feelings of users who play online games showed the same performance as flow [32].

Csikszentmihalyi studied personal emotions in work and games and found that when playing online games, individuals receive instant responses, and the game interacts with the player through context and interaction. These activities create challenges that require the player to focus on the game and use some skill to complete the task at hand, otherwise, boredom and anxiety will occur. Different researchers study the influencing factors of flow in human-computer interaction, and found that all these controls, challenge, focused attention and interactivity induce a flow experience [28-33]. The actual survey of online game companies found that the social process is also an important part of fun knowing [34]. Trevino found the revisit of online games has a lot to do with the perceived usefulness of the website [35]. To induce a flow experience, online games need to stimulate users and respond to them.

Based on the above theoretical basis, we believe that, when users get their perceived fun enough in an online game, game satisfaction will increase. Perceived fun also has an impact on the retention of game players.

Hypothesis 1: Users' perceived fun has a significantly positive impact on their attitude toward use.

Hypothesis 2: Users' perceived fun has a significantly positive impact on their retention.

2.4 Perceived Ease of Use

In the TAM, perceived ease of use means the user feels the minimum effort required to use new technology [15]. Csikszentmihalyi investigated the mechanism of flow experience in life and found that in completing a task or achieving a goal that requires feedback, individuals experience flow when they can effortlessly concentrate and experience fun [22]. When studying the behavioral characteristics of users' human-computer interactions, Kaye and Hosseini et al. found that individuals can have fun only when they complete a certain task or goal by concentrating effortlessly [36-37]. When investigating human flow experience in online virtual environments, Hsu, Nah et al. and Bilgihan found that human-computer interactions are achieved through the interface of the device or site, which should be transparent, making users ignore the surrounding environment and the time and even lose self-awareness so that they focus on the interactive simulation and are immersed in the experience below [38-40]. Kaur et al. showed that barriers and multiple steps should be minimized in this type of participation, especially its level of interaction and functions, so that the engaged users become unaware of the surrounding environment and experience fun through immersive online activities [41]. When a player is immersed in a game and fully appreciates the feeling of enjoyment (like being a part of the virtual world), the interaction of all these feelings, emotions and cognitions leads to the flow experience [28-31]. In short, mobile games should try to improve perceived ease of use and reduce barriers for players so that they can focus on enjoying the challenge of the game and have fun and become so immersed in the experience that they forget the surrounding environment and time and even lose self-consciousness.

Based on the above analyses, we propose that only when a player perceives sufficient ease of use is he/she more willing to accept and use a mobile game.

Hypothesis 3: Users' perceived ease of use has a significantly positive impact on their perceived fun.

Hypothesis 4: Users' perceived ease of use has a significantly positive impact on their attitude toward use.

2.5 Attitude Toward Use

According to the TAM described by Davis, attitude toward use means an individual's feelings and evaluation of a certain behavior (positive/negative, positive/negative) being affected by use beliefs and evaluations [42]. It contains many subjective components, such as satisfaction, feelings during use, emotions after use, etc. Many investigators have noted that satisfaction can effectively increase users' preference for a particular brand, thereby enhancing their willingness to repeatedly purchase the brand. LaBarbara and Mazursky found that consumer satisfaction has an important influence on whether consumers will repeatedly purchase a product [43]. In the service field, some experiments confirmed that user satisfaction can directly and positively affect users' repurchase and willingness to use a product (service). When studying the healthcare industry, Woodside found that whether a patient is satisfied with the service attitude of nurses and the skills of doctors in a hospital also affects whether the patient continues to choose the hospital the next time when he/she falls ill. This conclusion is, to a certain extent, consistent with that for consumer satisfaction in the field of information systems, i.e., satisfaction affects a consumer's willingness to reuse [44]. Seo showed that users' perceived conversion costs, user satisfaction, and regional demographic characteristics are important factors for users' maintaining user behaviors. Therefore, a user's satisfaction after use has a close relationship with their retention intention (continuous use intention) [45].

When a player uses an online game, has interactions without barriers and is immersed in the game, the player will have fun resulting from the flow of the game, and the player's attitude toward the game will improve, thereby increasing the player's willingness to use the game.

Hypothesis 5: Users' attitude toward use has a significantly positive impact on their retention.

2.6 Model Assumptions

Structural equation models are often used to study the internal relationship between various influencing factors. According to the principle of structural equation models, we constructed an initial hypothesis model of causality paths for the retention of newly registered game players, as shown in Figure 1.

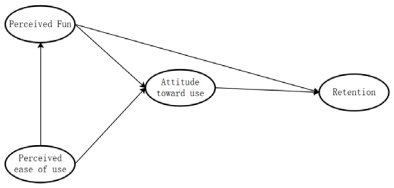

Figure 1. Schematic diagram of theoretical model paths

3 Research Design

3.1 Scale Design

The model proposed combined flow theory, the TAM, and game and user feature designs to establish a structural equation model to study the factors affecting mobile online game users' use and retention. Perceived fun was measured through four observation variables, i.e., control and skill, challenge and enjoyment, focused attention, and social fun. Among them, control and skill were measured through three items, challenge and enjoyment through five items, focused attention through four items, and social fun through three items. Perceived ease of use was measured through five observation variables, i.e., simple steps, ease of mastering game knowledge, simple operation, clear resources, and smooth use. Among them, simple steps were measured through three items, ease of mastering game knowledge through five items, ease of use through three items, clear resources through three items, and smooth use through four items. Attitude toward use was measured through three observation variables, i.e., game experience, friendly interface and satisfaction. Among them, game experience was measured through three items, friendly interface through three items, and satisfaction through five items. Retention was measured through two observation variables, i.e., server record of logins on three consecutive days and server record of total game time for three days. The data were obtained from the server records of game IDs accessing the server.

Table 1. Variables and measurement scale

Variable	Measurement item	Main reference
Perceived fun	Control and skill Challenge and enjoyment Focused attention Social fun	Novak (2003; 2000) et al., Agrawal et al. (2000), Trevino et al. (1992), Webster et al. (1993) [46]
Perceived ease of use	Simple steps Ease of mastering game knowledge Ease of use Clear resources Smooth use	Csikszentmihalyi (1997), Kaye (2016), Hosseini et al. (2014), Nah et al. (2012), Hsu (2010), Bilgihan (2016), Kaur et al. (2016)
Attitude toward use	Game experience User-friendly interface Satisfaction	Davis (1985, 1989; 1989) Zhang et al. (2008) [47]
Retention	Number of consecutive login days in three days The total game time recorded by the server	

Based on the objectives and characteristics of this study, the related literature, and the content and characteristics of a certain game, we determined a measurement scale of the variables. The composition and sources of the variables are shown in Table 1.

3.2 Data Collection

The survey questionnaire was designed so that responses were provided based on a Likert scale through an internal test platform of an online game, with five measurement levels: completely disagree (1 point), mostly disagree (2 points), neither agree nor disagree (3 points), mostly agree (4 points) and completely agree (5 points). The questionnaire was distributed through the mobile game APP to users registered on May 2 and 4, 2020, three hours after the APP was launched. Invalid questionnaires, such as those that had been completed too quickly, were excluded. Ultimately, 1,375 valid questionnaires were recovered. Based on the account information of the respondents, information about the respondents, such as whether the user logged in the next day, whether the user logged in for three consecutive days, and the total game time for three days, was retrieved from server records.

4 Results and Analysis

4.1 Reliability Analysis

Table 2. Variable statistics and reliability analysis results

Latent variable	Measurement item	Mean	Variance	Cronbach's α after deleting the item	Cronbach's α
Perceived fun	Focused attention	3.570	1.347	.667	.720
	Control and skill	3.298	1.236	.624	
	Social fun	3.390	1.444	.692	
	Challenge and enjoyment	2.900	1.581	.648	
Perceived ease of use	Simple steps	3.720	1.670	.840	.881
	Ease of mastering game knowledge	4.020	1.419	.849	
	Ease of use	3.650	1.838	.854	
	Clear resources	3.690	1.710	.850	
	Smooth use	4.170	1.248	.880	
Attitude toward use	Game experience	4.135	.633	.857	.828
	User-friendly interface	3.370	1.957	.681	
	Satisfaction	3.440	1.829	.679	
Retention	Number of consecutive login days in three days	1.780	.707	.477	.651
	Total game time recorded by the server	2.880	3.216	.646	

Reliability analysis is used to test the internal consistency, stability and reliability of survey results, among which reliability is commonly measured through Cronbach's α. In general, the minimum acceptable reliability range for Cronbach's α is 0.65-0.7; the reliability of an instrument with Cronbach's α between 0.7 and 0.8 is considered good, and that of an instrument with Cronbach's α between 0.8-0.9 is considered excellent. We performed the reliability test using SPSS 26.0 and found that Cronbach's α value for the overall scale was 0.856, indicating high overall reliability. Moreover, we also conducted a reliability test for each of the subscales and found that the Cronbach's α values for the subscales perceived fun, perceived ease of use, attitude toward use, and user retention were all greater than 0.65, the minimum acceptable value. Among them, the Cronbach's α value for the subscale perceived ease of use was 0.881. Therefore, the scale has high internal consistency and stability. The basic statistics and reliability analysis results for each variable of the questionnaire are provided in Table 2.

4.2 Confirmatory Factor Analysis

Table 3. Confirmatory factor analysis results

Latent variable	Measurement item	Normalized factor loading	P value	CR	AVE
Perceived fun	Focused attention	.601		.724	.400
	Control and skill	.729	***		
	Social fun	.528	***		
	Challenge and enjoyment	.656	***		
Perceived ease of use	Simple steps	.845		.882	.602
	Ease of mastering game knowledge	.785	***		
	Ease of use	.792	***		
	Clear resources	.800	***		
	Smooth use	.641	***		
Attitude toward use	Game experience	.686		.851	.657
	User-friendly interface	.872	***		
	Satisfaction	.861	***		
Retention	Number of consecutive login days in three days	.660		.796	.669
	Total game time recorded by the server	.950	***		

Confirmatory factor analysis is used to test the construct validity of latent variables, commonly through indicators such as factor loading, composite reliability (CR) and average variance extracted (AVE). In general, the construct validity of latent variables with a factor loading of above 0.6, a CR of above 0.7 and an AVE of above 0.5 is regarded as good. In this study, we performed confirmatory factor analysis on the latent variables of the questionnaire using Amos 24.0. In our CFA model, the P value for the first measurement item of each latent construct is not reported as the factor loading is fixed to 1 to ensure model identification. This fixed factor loading signifies that there is no estimated parameter for the first measurement item, rendering a significance test superfluous and explaining the absence of a P value. Table 3 presents the factor loadings, CR, and AVE values for the measurement items of each latent variable. The CR values for perceived fun, perceived ease of use, attitude toward use and user retention were 0.724, 0.882, 0.851 and 0.796, respectively, their AVE values were 0.400, 0.602, 0.657, and 0.669, and their factor loading values were all over 0.6, indicating that the measurement items for each latent variable of the scale can interpret the measured variables well, with good construct validity.

4.3 Model Analysis

The RMSEA, SRMR, GFI and AGFI were used to measure the absolute fit of the overall model, and the NFI, CFI, and TLI were used to measure the value-added fit of the model. The calculated fit indexes of the model and their judgment criteria are shown in Table 4. The RMSEA, SRMR, GFI and AGFI of the model were 0.067, 0.065, 0.944 and 0.920, respectively, and the NFI, CFI and TLI were 0.942, 0.949 and 0.929, respectively, which were all above the standards of acceptable fit, indicating that the theoretical model proposed in this study has a good fit with the actual data, with a good overall fitting effectiveness.

Table 4. Overall fit index of the structural model

Fit index	GFI	AGFI	RMSEA	SRMR	CFI	NFI	T LI
Statistics	.944	.920	.067	.065	.949	.942	.929
Judgment criteria	>.900	>.900	<.080	<.080	>.900	>.900	>.900

The path coefficients between latent variables of the theoretical model calculated based on the sample data are shown in Figure 2. The path coefficients of perceived fun attitude toward use, perceived fun use attitude toward use, and attitude toward use user retention were all significant (P<0.001).

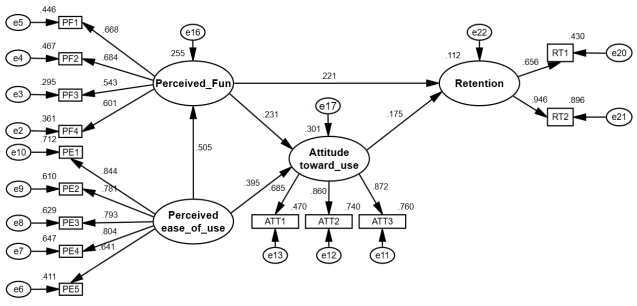

Figure 2. Path coefficients of the theoretical model

4.4 Hypothesis Testing and Discussion

The path coefficients of the theoretical model and hypothesis validation results are shown in Table 5.

Table 5. Path coefficients of the theoretical model and hypothesis validation

Relationship between variables	Standardized path coefficient	P value	Corresponding hypothesis	Test result
Perceived Fun→ Attitude toward use	.231	***	H1	Pass
Perceived Fun→ Retention	.221	***	H2	Pass
Perceived ease of use→ Perceived fun	.505	***	H3	Pass
Perceived ease of use→ Attitude toward use	.395	***	H4	Pass
Attitude toward use→ Retention	.175	***	H5	Pass

(1) Perceived fun had a positive impact on attitude toward use at the significance level of 1%, with an impact coefficient of 0.231, which validates H1. Players' perceived fun stems from reward feedback for completing specific tasks, self-challenges to improve their ability levels, and socialization when sharing game experiences. By enhancing the immersive experience in the game, players can experience greater perceived fun, and their user experience and satisfaction with the game also increase accordingly. Therefore, designing more challenging game mechanisms and enhancing a player's social experience in the game are important considerations for improving a player's attitude.

(2) Perceived fun had both direct and indirect effects on user retention, i.e., perceived fun had an indirect impact on user retention through attitude toward use. Therefore, the total effect of perceived fun on user retention is equal to the sum of direct and indirect effects. As shown in Figure 2 and Table 5, the direct effect of perceived fun on user retention was significantly positive (0.221), and the indirect effect was positive (0.039), with a significantly positive overall effect and an impact coefficient of 0.260. Therefore, H2 is validated. This result confirms that the higher a user's perceived fun, the higher the user's attitude toward use, and the higher is user retention. Therefore, game operators must pay attention to improving the user's perceived fun when formulating user retention strategies.

(3) Perceived ease of use has a positive impact on perceived fun at the significance level of 0.01, with an impact coefficient of 0.505, which validates H3. Perceived ease of use enables users to master game knowledge with as little time and effort as possible. As perceived ease of use improves, users can go through the steps of mastering game knowledge faster so that they can better immerse themselves in the game, concentrate on enjoying the challenges in the game and have fun. Therefore, game manufacturers should try to improve the interactive level and skill-teaching functions of games to improve a player's perceived ease of use.

(4) Perceived ease of use has a significantly positive direct effect (0.395) on attitude toward use and a positive indirect effect (0.117) on attitude toward use through perceived fun, with a significantly positive total effect and an impact coefficient of 0.512, which validates H4. On the one hand, improving perceived ease of use reduces the barriers and steps for users to experience the game, which directly improves users' satisfaction with the game and their attitude toward use accordingly. On the other hand, improving perceived ease of use allows users to focus on having fun and completing challenges in the game, which indirectly has a positive impact on users' attitudes toward use. Therefore, improving perceived ease of use is very important for improving users' attitudes toward use.

(5) Attitude toward use had a positive impact on user retention at the significance level of 0.01, with an impact coefficient of 0.175, which validates H5. This result confirms that improving players' perceived fun and perceived ease of use also improves their attitude toward use and enables them to engage in the interaction without any barriers and immerse themselves in the game experience, which in turn increases players' preference for the game and game retention.

5 Conclusion and Discussion

In this study, based on the literature and the results of a questionnaire survey of newly registered players and structural equation modeling, we examined the impact of online game players' perceived ease of use and perceived fun on their attitude toward use and retention and draw the following conclusions.

5.1 Theoretical Contribution

Based on TAM and flow theory, this study adopted an extended technology acceptance model to provide insight into the critical factors that promote player retention with respect to mobile games. The developed model was applied to examine the relationship between perceived enjoyment, perceived ease of use, attitude toward use and newly registered player retention. This study makes several theoretical contributions. First, although many previous studies have explored the antecedents of gamer retention, few investigations have been conducted on mobile gamers as opposed to on those who game on PCs or video game consoles. In particular, no systematic research has explored the influencing factors of retention for newly registered game players. This study investigates the factors that drive newly registered players' continuance intention to play a game and thus differs from most previous research.

Second, this study replaced perceived usefulness in TAM with perceived fun based on flow theory to fit the context of mobile games and found that this construct had a significant influence on other variables. At present, scholars have offered no clear conclusion on the impact of perceived fun on player retention. This study enriches the understanding of perceived fun based on flow theory and first proves that perceived fun can effectively improve the attitude toward use and retention of newly registered mobile game players. For newly registered players, the experience of perceived fun means that they have devoted enough attention to the game and obtained self-awareness by overcoming challenges with improved skills and obtained social satisfaction by becoming the focus of a community through game strategy sharing, which leads to gaming loyalty and dependence.

Finally, this study reveals the effects of ease of use on newly registered mobile game players for the first time. Ease of use significantly improves newly registered players' perceived enjoyment and attitude toward use, which is consistent with previous conclusions regarding veteran mobile gaming players, i.e., active players. However, it is worth noting that ease of use has a stronger influence on newly registered players than established players. The explanation may be that new players pay more attention to the difficulty of the game and the efficient mastery of game skills. For new players, obtaining enjoyment is the primary pursuit of playing the game, while ease of use directly determines how quickly one accomplishes this goal, which requires game designers to focus on how to guide players to improve their skills. Furthermore, this study also identifies that newly registered players' attitudes have substantial effects on the continuance intention to play mobile games.

5.2 Practical Contribution

The perceived ease of use of newly registered game players had a significantly positive influence on their perceived fun and attitude toward use, a finding that is consistent with the conclusions of previous studies on human-computer interactions using flow theory, i.e., individuals can have a high level of flow experience only when they can focus on the task effortlessly. For game developers, for players to experience the maximum amount of fun playing a game and develop an attitude toward use, the ease of use of the game should be maximized through simple steps, easy play, easy to master game knowledge, clear resources and smooth use, and players must be able to immerse themselves into the game design and interactive process without barriers, thus facilitating the flow experience. To increase user retention, game developers should fully consider the importance of players' perceived ease of use and optimize the game interface, game knowledge, and rules to provide users with a smooth game experience.

Players' perceived fun positively affects retention directly and indirectly through attitude toward use. Mobile games are highly entertaining and subjective. If they can provide players with sufficient fun experiences so that the users can fully focus on the game and enjoy the game play, challenges, and even online social interactions, the users' attitude will be positive and satisfied, thereby directly or indirectly increasing player retention for the game. When designing the content of mobile games, game developers should pay attention to gaming control, challenge and enjoyment of the gaming experience. High-quality mobile games can create an immersive virtual environment experience for users. Additionally, game developers should also attach importance to the social needs of game players because interactive social functions can enhance the sense of presence and accomplishment.

5.3 Limitations

First, the survey data was collected from just one game product, and user experience with different mobile game products may vary profoundly; therefore, the conclusions of this study may lack generality, which can be addressed by using more representative samples in the future. Second, in this study, the factors that affect the attitude toward use and retention of newly registered mobile game players were categorized as perceived fun and perceived ease of use, which were then measured through several specific observation variables. However, the effect of some specific observation variables on player retention was not examined. In a follow-up study, more samples will be selected to study various factors affecting the retention of newly registered players and to further reveal the factors and mechanisms that affect the attitude toward use and retention of mobile game players.

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