Determinants of Users' Intention to Purchase Probability-Based Items in Mobile Social Network Games: A Case of South Korea

JAEYOUNG LEE [ID]**[1], EUIHO SUH[1], HOOYOUNG PARK[2], AND SUCHUL LEE[3]**
[1]Department of Industrial and Management Engineering, Pohang University of Science and Technology, Pohang 37673, South Korea
[2]Strategic Planning Team, Device Solution, Samsung Electronics, Gyeonggi-Do 17113, South Korea
[3]Department of Business Administration, Mokpo National University, Muan 1666, South Korea

Corresponding author: Suchul Lee (suchullee@mokpo.ac.kr)

ABSTRACT The goal of this paper was to identify factors that influence the purchase of probability-based items (PBIs) in mobile social network games (MSNGs). This paper introduces an extended research model based on the technology acceptance model. Statistical results from a survey of MSNG users find that factors that influence the purchase of PBIs include perceived enjoyment, perceived usefulness, perceived number of users, and perceived number of friends which are factors attributed to mobile game and social network characteristics, and also perceived desire for jackpot that is one of the major features of PBIs. We also analyzed the research model by gender to provide MSNG companies with a reference that may guide the development of PBI strategies that are targeted at genders. Males responded differently than females to some factors.

INDEX TERMS Mobile social network games (MSNGs), technology acceptance model (TAM), motivation theory, network externality, probability-based items (PBIs), structural equation modeling (SEM), confirmatory factor analysis (CFA), gambling motivation, gender difference in response.

I. INTRODUCTION

Social network services (SNSs) enable users to interact with other people electronically [1]–[4]. Because mobile technology has been improved dramatically, SNSs users can easily use their smartphones to access SNSs [5], [6]. For this reason, mobile game providers have started to develop and provide ''mobile social network games (MSNGs)'', which constitute a new type of mobile game that combines the characteristics of SNSs and mobile games [7]. These games have increased their numbers of subscribers by exploiting players' social relationships in the SNSs [7]. For example, Farm Ville of Zynga, one of the most famous MSNGs, has more than 10 million players worldwide. Moreover, in the Korean Google play store, nine of the top ten applications in the game category enable users to connect with SNSs to play the games.

In the early stage of mobile game development, users had to purchase the application to play most of the games. However, the most important success point in mobile business is to exploit network externality [8], [9], so to increase the number of users, most MSNG companies now provide free-to-play games. Therefore, to survive, game providers need a new revenue model. A widely-adopted solution is to sell virtual items within the game. As a result, sixty percent of MSNGs' revenue is obtained from the sale of virtual items [10] and nine of the top ten MSNGs that have the greatest revenue in the Korean Google play store are free-to-play.[1] Sales of virtual items in MSNGs make an important contribution to the profits of providers [11].

MSNGs usually contain two types of virtual items: probability-based items (PBIs) and non-PBIs. Users can purchase both types of virtual item in cash. The main difference between PBIs and non-PBIs is the predictability of expected value. Non-PBIs' value is usually equal to the amount paid for it, whereas the value of PBIs can be smaller or larger than the amount paid. Non-PBIs are a traditional type of virtual item, whereas PBIs are a new type of virtual item for users who want big rewards with little money.

This characteristic of PBIs has raised concerns that purchasing PBIs may be a form of gambling. For example, some Korean lawmakers have proposed legislation to restrict the sale of these items by presenting evidence that some young players have purchased PBIs with huge amounts of money until they obtain virtual items they want. Nevertheless, MSNG providers have adopted PBIs as a new revenue model and have developed several strategies to

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[1]Access date: Nov. 2nd 2017 (https://www.appannie.com)

maximize the profits. For instance, the providers sell some unique items only in PBIs. Therefore, MSNGs users must purchase PBIs to get particular unique items that provide an advantage when playing the games. MSNG providers also focus on that MSNGs have social networking characteristics. MSNG users might pay an additional fee to compete with friends, which is a main goal of MSNGs.

The purpose of this study is to empirically identify the factors that affect a user's intention to purchase PBIs. Several prior studies (e.g., [7], [15], [16]) have identified determinants of intention to use mobile games and SNS, but few studies examined intention to purchase PBIs. Thus, this study identified factors that affect a user's intention to purchase PBIs. Because research on PBIs is lacking, we first identified factors that affect users' intention to use mobile games and SNS by exploiting the observation that users tend to purchase a virtual item when they use a core service continuously [17], [18]. We also identified determinants of gambling motivation to investigate empirically whether purchasing PBIs could be a form of gambling. Furthermore, because male and female users measure benefits differently [19], [20], we also tested whether the genders have different motivations for purchasing PBIs.

The research model proposed in this study considers three dimensions: mobile game, SNS, and gambling motivation. This study considered perceived desire for jackpot related to gambling motivation as a determinant of users' decisions to purchase PBIs as well as perceived enjoyment and perceived usefulness (mobile game), perceived number of users and perceived number of friends (SNS) that have used widely in prior studies. The research model is an extended model of technology acceptance model (TAM), mainly because TAM is suitable to explain users' acceptance of Information Technology (IT) and systems [21]–[23]. Even though TAM is a popular model, it may lack the ability to explain other factors that can support an individual's behavior about system usage [24], [25]. For instance, Legris *et al.* [26] suggested that TAM needed to utilize more variables for a stronger model. In fact, many researchers have used an extended version of TAM to explain a user's behavior in various IT industries (e.g., [27]–[29]). Thus, in this study, based on TAM, determinants of intrinsic motivation, network externality, and gambling motivation are also applied to examine characteristics of mobile game, SNS and PBI.

The findings of this study may be valuable practically and academically. For MSNG providers, the results can provide new insights to guide the development of strategies to sell PBIs effectively. The results can also be a starting point for researchers who study PBIs in MSNGs.

II. RESEARCH MODEL AND HYPOTHESES
A. INTENTION TO USE MSNGs
Previous research has suggested that the likelihood that a user will purchase augmenting products increases with increase in time the user spends on core service [30]; i.e., when deciding whether to purchase augmenting products, consumers consider the time for which they will use core services in the future [17]. Thus, we should see a continuity from intention to continue usage to intention to purchase virtual items. Prior empirical studies on various electronic channels have identified a relationship between intention to use and intention to purchase virtual goods on websites [30], in social virtual worlds [18], and in free-to-play online games [17], [31]. Therefore, we posit that if users who play MSNGs continuously may most likely to purchase PBIs. Thus, we hypothesized

- H1: "Intention to use MSNGs" increases "intention to purchase PBIs".

B. PERCEIVED DESIRE FOR JACKPOT
Purchasing a PBI is similar to purchasing a lottery ticket: the action is risky because it can yield a valuable reward or a useless item. Therefore, we considered gambling motivation as a possible driver of intention to purchase PBIs. Many studies have identified that excitement, socialization, winning money, and escape from routine are critical factors of gambling motivation (e.g., [32]–[36]). Among those factors, winning money might be a determinant of intention to purchase PBIs in that it is a way to get a reward easily with high risk. Several prior studies have indicated that people participate in gambling to hit the jackpot, i.e., to win big money with a small outlay (e.g., [33], [37], [38]). Therefore, we proposed that "perceived desire for jackpot", i.e., the degree of which wish to win rare items, may be related to the gambling motive in MSNGs. This study posits that an MSNG user's likelihood of buying a PBI increases with the user's desire to win a jackpot. Thus, we formulated hypothesis two:

- H2: "Perceived desire for jackpot" increases "intention to purchase PBIs".

C. PERCEIVED NUMBER OF USERS AND FRIENDS
Network externality is defined as an effect of a product or service by one agent that increases the value of this product to other agents [39]. For example, in the telecommunication industry, the value of a telephone increases as the number of people who use telephones increases [40], [41]. Initially, many researchers studied the relationship between network externality and product (e.g., [41], [42]); subsequently many investigated the effect of network externality in diverse technologies (e.g., [8], [15], [43]). Because internet technology has developed rapidly, the amount of research on network externality in SNS industry has increased.

Network externality theory has been used to test the hypothesis that 'critical mass' affects people's intention to use SNSs. Lin and Lu [43] used network externality and motivation theory to identify that network externality and perceived benefit are significant to continued intention to use SNS. Sledgianowski and Kulviwat [44] argued that people intend to participate in SNS once the number of users reaches a significant number. Wei and Lu [15] applied network externality

theory to examine what factors affect intention to play SNGs. Lin and Bhattacherjee [45] applied network externality theory to identify determinants of intention to IT usage. The authors used referent network size and network benefit factors and found that they influenced intention to IT usage positively. Consequently, we formulate hypotheses three and four:

- H3: "Perceived number of users" increases "intention to use MSNGs".
- H4: "Perceived number of friends" increases "intention to use MSNGs".

Prior research also identified socialization as a gambling motive [33], [46], [47]. Many people gamble not only to make friends or to strengthen their relationships but also compete against others [46]–[49]. In MSNGs, the value of the rare items increases as the number of people playing the games increases. We concluded that network externality might affect perceived desire for jackpot, i.e., users' desire for a jackpot might increase as the number of players increases; therefore, we formulated hypotheses five and six:

- H5: "Perceived number of users" increases "perceived desire for jackpot".
- H6: "Perceived number of friends" increases "perceived desire for jackpot".

D. PERCEIVED ENJOYMENT

Prior research (e.g., [50], [51]) has used motivation theory to identify users' acceptance on information systems. Motivations, which refer to "an activated internal need state leading to goal-directed behavior to satisfy that need", have considered as a key factor of adoption of information system [52]. Davis *et al.* [53] classified users' motivation for using information systems into two categories: extrinsic motivation and intrinsic motivation. Extrinsic motivation is defined as "the performance of an activity because it is perceived to be instrumental in achieving valued outcomes that are distinct from the activity itself", whereas intrinsic motivation is defined as "the performance of an activity for no apparent reinforcement other than the process of performing the activity per se" [53]. Perceived enjoyment is an example of intrinsic motivation, whereas perceived usefulness is an example of extrinsic motivation. These determinants have also used to examine users' acceptance of hedonic systems such as mobile games (e.g., [22], [54], [55]).

MSNGs constitute a hedonic system that provides entertaining contents and services; therefore perceived enjoyment has been postulated to be a significant motivation for using hedonic systems [16]. Perceived enjoyment, which is an intrinsic motivation to use information system, is defined as "the extent to which the activity of using a specific system is perceived to be enjoyable in its own right, aside from any performance consequences resulting from system use" [53], [56]. Many prior studies have focused on the relationship between perceived enjoyment and user's continuous intention to use information systems and services. Perceived enjoyment affects intention to use e-learning systems [57], Internet services [58], mobile games [23],

entertainment based on mobile devices [59], and SNGs [16]. Considering the purpose of this study, we defined perceived enjoyment as "extent to which the activity of using the MSNG is perceived to be enjoyable in its own right, regardless of gaming results" so consistent with previous research, hypothesized:

- H7: "Perceived enjoyment" increases "intention to use MSNGs".

Enjoyment has also been cited as a determinant of gambling motivation. Prior studies have attempted to identify why people gamble, and have found that enjoyment is a main driver of gambling. College students may participate in gambling to win money, for enjoyment, for social reasons, and for excitement [46]. Lee *et al.* [33] proposed a five-factor gambling motivation model and found that the amusement motive, which represents gaining fun, enjoyment, and pleasure from gambling, influenced gambling behavior mediated by monetary motive, which is a determinant of gamblers' motivation that represents hitting the jackpot to make big and easy money. In short, people gamble for enjoyment, and their perceived desire to win a jackpot is affected by their enjoyment. Therefore, consistent with prior studies, we posit that perceived enjoyment may affect intention to purchase PBIs indirectly, and that this intent is mediated by perceived desire for jackpot. Therefore, we formulated

- H8: "Perceived enjoyment" increases "perceived desire for jackpot".

E. PERCEIVED USEFULNESS

TAM was coined by Davis [60] and is a popular model to identify why people accept new IT. One purpose of TAM is to provide the impact of external variables on internal variables such as attitude and intention ([26], [29]). TAM shows that perceived usefulness is one of the most important factors to explain a user's adoption of a system (e.g., [19], [28], [59], [60]). Perceived usefulness, defined as "the degree to which a person believes that using a particular system would enhance his or her job performance", has been used as a determinant of extrinsic motivation in motivation theory [60].

Many studies have found that perceived usefulness positively affects the likelihood that user will adopt an information system and technology; Internet [58], SNS [43], [44], mobile entertainment [59], mobile games [22], [23], and SNGs [16]. In particular, as the mobile game industry expanded rapidly, usefulness has been used as a key driver of intention to use mobile games, because playing mobile games enables users to increase their job performance with less stress [7], [59], [61]. Therefore, we concluded that playing MSNGs is useful for users to increase their effectiveness and productivity in their job. In addition, because MSNGs can help users interact with friends and other people, users may perceive that playing MSNGs is useful and beneficial. Thus, we also developed

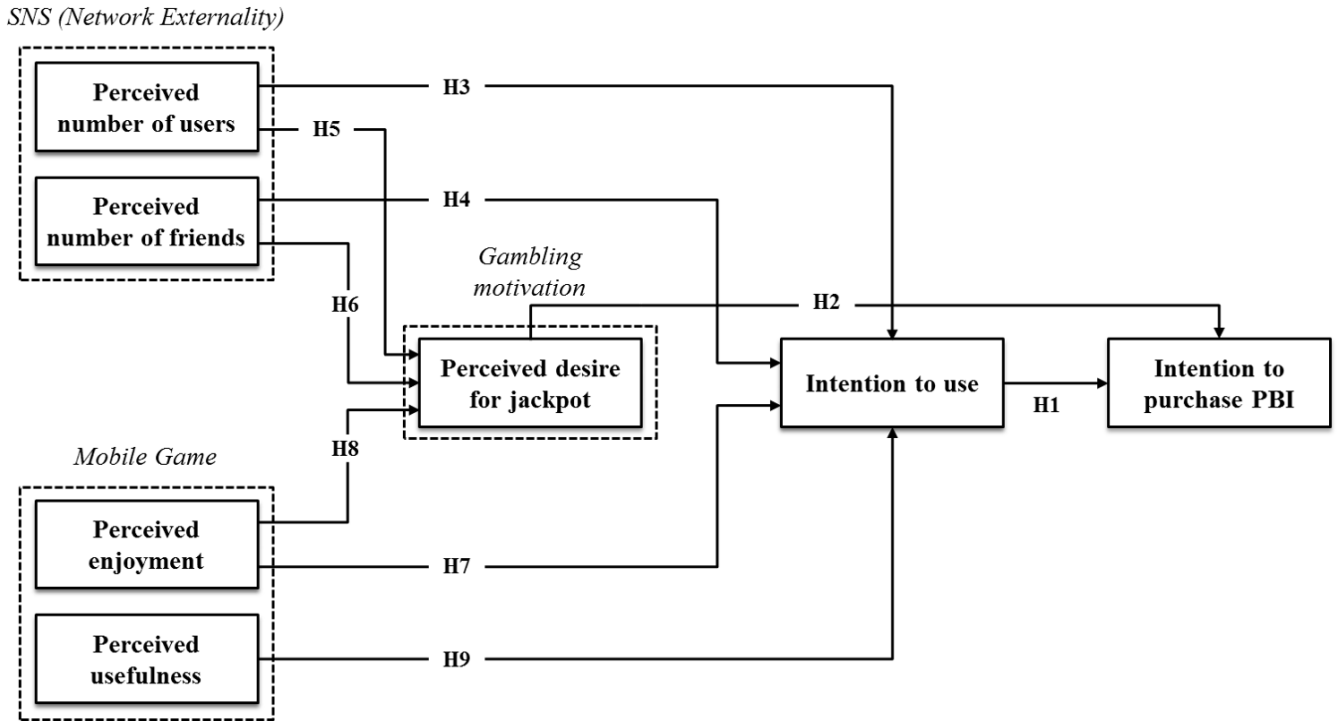- H9: "Perceived usefulness" increases "intention to use MSNGs".

SNS (Network Externality)

FIGURE 1. Research model.

Because IT has been improved dramatically, users can easily use IT systems. Thus, several prior studies in IT filed argued that perceived ease of use which is defined as "the degree to which a person believes that using a particular system would be free of effort [60]" decreases the validity of the research model (e.g., [45], [62], [63]). For this reason, consistent with previous research, this study excluded perceived ease of use from the research model.

F. RESEARCH MODEL
The proposed research model (Fig. 1) was developed to identify the factors that affect a user's intention to purchase PBIs in MSNGs. The model shows that SNS (perceived number of users and perceived number of friends), mobile game (perceived enjoyment and perceived usefulness), and gambling motivation (perceived desire for jackpot) are key factors to intention to purchase a PBI.

III. RESEARCH METHODOLOGY
A. DATA COLLECTION
We developed a survey to collect data from Google Docs. The data were collected randomly from various online communities that use MSNGs; e.g., Hungry App (http://www.hungryapp.co.kr/), which is one of the largest mobile game forums in Korea. Therefore, we could ensure that most of the respondents know what PBIs are.

B. MEASUREMENT DEVELOPMENT
Based on the validated and confirmed survey questionnaires, we revised them, considering the purpose of this study (Table 1).

Participants (Table 2) answered all questionnaire items on a 7-point Likert scale (1: strongly disagree, 7: strongly agree); 348 responses were received and 320 valid samples were chosen using data filtering.

IV. RESULT
A. ANALYSIS METHODS
We used AMOS 21.0 and SPSS Statistics 21.0 to perform structural equation modeling (SEM) and confirmatory factor analysis (CFA) to analyze the proposed research model. Previous studies [64]–[66] recommended that sample size should be >200 for accurate use of SEM; our sample meets this criterion.

B. VALIDITY AND RELIABILITY OF THE MEASUREMENTS
CFA was conducted to examine the measurement model. The model met the goodness-of-fit criteria for ratio of χ^2/degree of freedom (d.f.), adjusted goodness-of-fit (AGFI), normed fit index (NFI), comparative fit index (CFI) and root mean square error of approximation (RMSEA), but not the goodness of fit index (GFI) (Table 3) [67], [68]. All indices except GFI met the recommended value; therefore, we concluded that the model had the acceptable goodness of fit.

Furthermore, convergent validity was tested to validate the research model (Table 4). For all items, the standardized path loadings of all items were >0.7, the average variance extracted (AVE) were >0.5, and the composite reliability (CR) and Cronbach's α for all constructs were >0.7 [66]. Therefore, all constructs and measurements in the research model had convergent validity.

TABLE 1. Questionnaire items.

Constructs	Items	Description	Source
Perceived number of users	PNOU1	I think most people download MSNGs.	[43]
	PNOU2	I think most people are playing MSNGs.	
	PNOU3	I think there will still be many people joining MSNGs.	
Perceived number of friends	PNOF1	I think most of my friends download MSNGs.	[43]
	PNOF2	I think most of my friends are playing MSNG.	
	PNOF3	I anticipate many friends will play MSNGs in the future.	
Perceived enjoyment	PE1	I enjoy playing MSNGs.	[76], [77]
	PE2	I find MSNGs enjoyable and fascinating.	
	PE3	I do not enjoy doing other things when I play MSNGs.	
Perceived usefulness	PU1	Using MSNGs improves my efficiency connecting with others.	[60], [78]
	PU2	I think MSNGs are useful for my work.	
	PU3	Playing MSNGs enables me to enhance the relationship with my friends and make new friends.	
Perceived desire for jackpot	PDFJ1	I want to get the best item easily in risk.	[33], [47], [48]
	PDFJ2	I need the best item in risk.	
	PDFJ3	I have fun in risk taking.	
	PDFJ4	I want to enjoy uncertainty.	
Intention to use	ITU1	I intend to play MSNGs as much as possible.	[60], [78]
	ITU2	I intend to continue playing MSNGs in the future.	
	ITU3	I would rather play MSNGs than other kinds of games.	
Intention to purchase PBI	ITPP1	I intend to purchase PBIs shortly.	[79], [80]
	ITPP2	I predict I will purchase PBIs.	
	ITPP3	I will frequently purchase PBIs.	

Lastly, discriminant validity was evaluated (Table 5). All correlations between constructs show that the discriminant validity is acceptable for all constructs. The square root of AVE for each construct with correlations between constructs was used to evaluate the discriminant validity. Because the square roots of AVE were all greater than correlations between the construct and all others [66], the discriminant validity of all constructs was accepted.

C. HYPOTHESIS TESTING

The research model was assessed using AMOS 21.0. The indices and standards were used to evaluate a model fit as follows: χ^2 to d.f. <3.0, GFI, NFI and CFI >0.9, AGFI >0.8, and RMSEA <0.08 (Table 6). All indices except GFI met the recommended value. Thus, the structural model explained the data adequately and could use the standardized path coefficients to test the hypotheses.

The result of hypotheses testing is as follows (Table 7; Fig. 2). Intention to use is a determinant of intention to purchase PBIs. All hypotheses except H5 were supported. Perceived number of users and perceived enjoyment affected perceived desire for jackpot significantly. Perceived number of users, perceived number of friends, perceived enjoyment, and perceived usefulness influenced intention to use and

affected intention to purchase PBIs indirectly. In addition, the results show that perceived desire for a jackpot is a driver of intention to purchase PBIs.

D. MODERATING EFFECTS OF GENDER

An analysis of gender differences is often used to identify users' acceptance behavior of information and hedonic system because male and female users measure values and benefits differently [19], [20]. Prior studies conducted gender differences analysis on SNSs [18], [43], online game [69], and mobile game [23]. Thus, consistent with previous research, this study analyzed the research model by gender to examine the moderating effect of gender.

The multiple group analysis was carried out with AMOS 21.0 to find out the differences between male and female groups (Table 8). The analysis was conducted using procedure suggested by Joreskog and Sorbom [70]. First, the data set was divided into two groups: male and female. Second, we developed the constrained model with a constraint that the regression weights for each path were equal across both groups, and analyzed the constrained model. Third, the unconstrained model was analyzed without any constraints. Finally, the difference in chi-square values between unconstrained model and constrained model

TABLE 2. Sample demographics.

Measure	Item	Frequency	Percentage (%)
Gender	Male	200	62.5
	Female	120	37.5
Age (Year)	Less than 20	19	5.9
	20 - 25	138	43.1
	26 - 30	153	47.8
	Over 30	10	3.2
Profession	Middle/high school	4	1.2
	University	116	36.3
	Graduate school	64	20.0
	Professional	126	39.4
	Others	10	3.1
Period of player experience	Less than 1 month	4	1.2
	1 month - 3 months	159	49.7
	4 months - 6 months	82	25.6
	7 months - 9 months	4	1.3
	10 months - 1 year	37	11.6
	Over 1 year	34	10.6
Name of MSNG	Everybody's Marble for Kakao	71	22.2
	Friends Pop for Kakao	46	14.4
	Seven Knights for Kakao	38	11.9
	Friends Run for Kakao	33	10.3
	Anypang for Kakao	33	10.3
	Others	99	30.9
Total		320	100.0

TABLE 3. Fit indices for the measurement model.

Fit indices	Measurement model	Recommended value
χ^2/d.f.	2.23*	<3.00
GFI	0.89	>0.90
AGFI	0.85*	>0.80
NFI	0.92*	>0.90
CFI	0.95*	>0.90
RMSEA	0.06*	<0.08

was obtained. The moderating effects occur if the difference of value is greater than the value of chi-square with 1 d.f., which is 3.84.

Table 8 shows that there is a significant moderating effect of gender on the paths of perceived number of users → intention to use, perceived number of friends → perceived desire for jackpot, perceived enjoyment → intention to use, and perceived enjoyment → perceived desire for jackpot. In other words, there are differences statistically between male and female groups in the four paths. In addition, the result of comparison analysis at the model level between unconstrained

model and constrained model showed that the difference in chi-square value (49.20) was greater than 34.56 with 9 d.f. (49.20 > 34.56 = 9 × 3.84) at the 1% level. Thus, we concluded that gender has a moderating effect on the research model.

SEM analysis detected a significant gender effect on H4, H5, H7, and H8 (Fig. 3, 4). Perceived number of friends and perceived enjoyment affected perceived desire for jackpot in male groups, whereas perceived number of users and perceived number of friends influenced on perceived desire for jackpot in female groups.

TABLE 4. Results of convergent validity testing.

Item	Factor loading	AVE	CR	Alpha
PNOU1	0.820	0.629	0.835	0.903
PNOU2	0.898			
PNOU3	0.902			
PNOF1	0.817	0.645	0.845	0.904
PNOF2	0.907			
PNOF3	0.887			
PE1	0.820	0.596	0.815	0.886
PE2	0.847			
PE3	0.883			
PU1	0.799	0.530	0.772	0.855
PU2	0.796			
PU3	0.854			
PDFJ 1	0.796	0.590	0.852	0.888
PDFJ 2	0.865			
PDFJ 3	0.834			
PDFJ 4	0.779			
ITU1	0.803	0.611	0.825	0.845
ITU2	0.819			
ITU3	0.797			
ITPP1	0.863	0.669	0.858	0.845
ITPP2	0.762			
ITPP3	0.783			

Notes: *PNOU: Perceived number of users, PNOF: Perceived number of friends, PE: Perceived Enjoyment, PU: Perceived usefulness, PDFJ: Perceived desire for Jackpot, ITU: Intention to use, ITPP: Intention to purchase PBI*

TABLE 5. Correlations between constructs

	Construct						
	PNOU	PNOF	PE	PU	PDFJ	ITU	ITPP
PNOU	0.793						
PNOF	0.187	0.803					
PE	0.230	0.223	0.772				
PU	0.907	0.265	0.204	0.728			
PDFJ	0.200	0.454	0.150	0.150	0.768		
ITU	0.379	0.342	0.301	0.536	0.312	0.782	
ITPP	0.292	0.269	0.286	0.242	0.570	0.446	0.818

Note: Each construct's square root of AVE is represented in the leading diagonal.

TABLE 6. Fit indices for the research model.

Fit indices	Measurement model	Recommended value
χ^2/d.f.	2.24*	<3.00
GFI	0.88	>0.90
AGFI	0.85*	>0.80
NFI	0.92*	>0.90
CFI	0.95*	>0.90
RMSEA	0.06*	<0.08

Perceived number of users and perceived enjoyment affected intention to use by males but not by females. Perceived number of users influenced perceived desire for jackpot in females but not in males. Perceived number of friends increased intention to use for females but not for males. Perceived enjoyment had a significant effect on perceived desire for jackpot in males but not in females.

TABLE 7. Results of the hypotheses tests.

| Hypothesis	Standardized coefficient	S.E.	CR	Results
H1. ITU → ITPP	0.36 ***	0.058	6.129	Supported
H2. PDFJ → ITPP	0.55 ***	0.061	8.758	Supported
H3. PNOU → ITU	0.21 ***	0.041	3.578	Supported
H4. PNOF → ITU	0.18 **	0.040	3.210	Supported
H5. PNOU → PDJF	0.04	0.036	0.692	Not supported
H6. PNOF → PDJF	0.42 ***	0.039	7.570	Supported
H7. PE → ITU	0.16 **	0.040	2.774	Supported
H8. PE → PDFJ	0.48 ***	0.043	8.022	Supported
H9. PU → ITU	0.45 ***	0.044	6.751	Supported
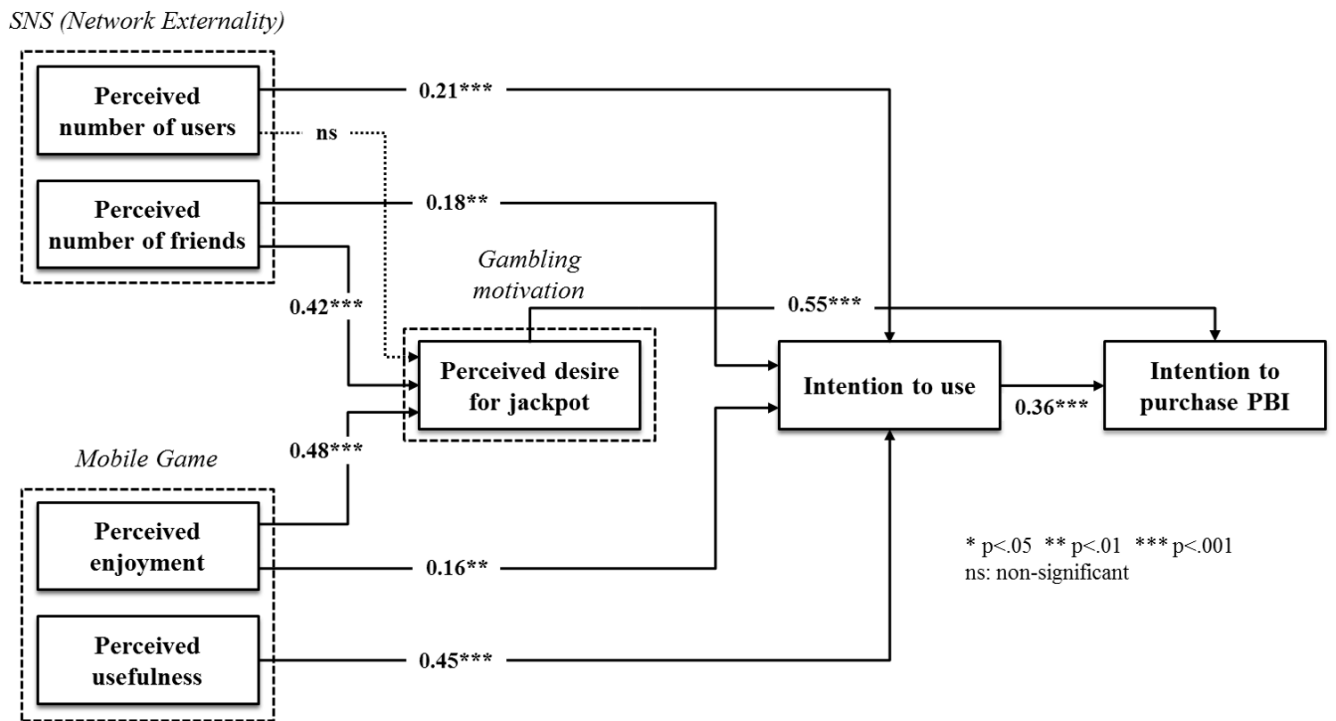
FIGURE 2. Summary of hypothesis test.

V. DISCUSSION

A. OVERALL RESEARCH MODEL ANALYSIS

This current study developed a theoretical framework that describes users' motivations to purchase PBIs in MSNGs. The major findings of our study were that determinants of both intention to use MSNG and gambling motive (i.e., perceived desire for jackpot) affected intention to purchase PBI directly, and that other determinants also influenced intention to purchase PBIs indirectly. The proposed measurement and structural model were validated and supported by statistical methods and good fit indices. Therefore, we concluded that our research model could accurately describe and predict users' intention to purchase PBIs in MSNGs.

Perceived number of friends affected the gambling motive in MSNGs. This result concurs with previous studies that identified socialization as an important motivation for casino gambling [34], [46], [48]. However, although perceived number of users also might be related to socialization, this number did not influence the gambling motivation to purchase PBIs. The differences between casino gambling and motivation to purchase PBI may be related to the difference in the social arrangements in casinos and MSNGs: in a casino, players usually compete or cooperate with friends or strangers, but in MSNGs players usually compete or cooperate only with their friends; thus, the gambling motive in MSNGs may be affected by perceived number of friends, but by not perceived number of users (i.e., strangers).

TABLE 8. Results of multiple group analysis (the moderating effects of gender).

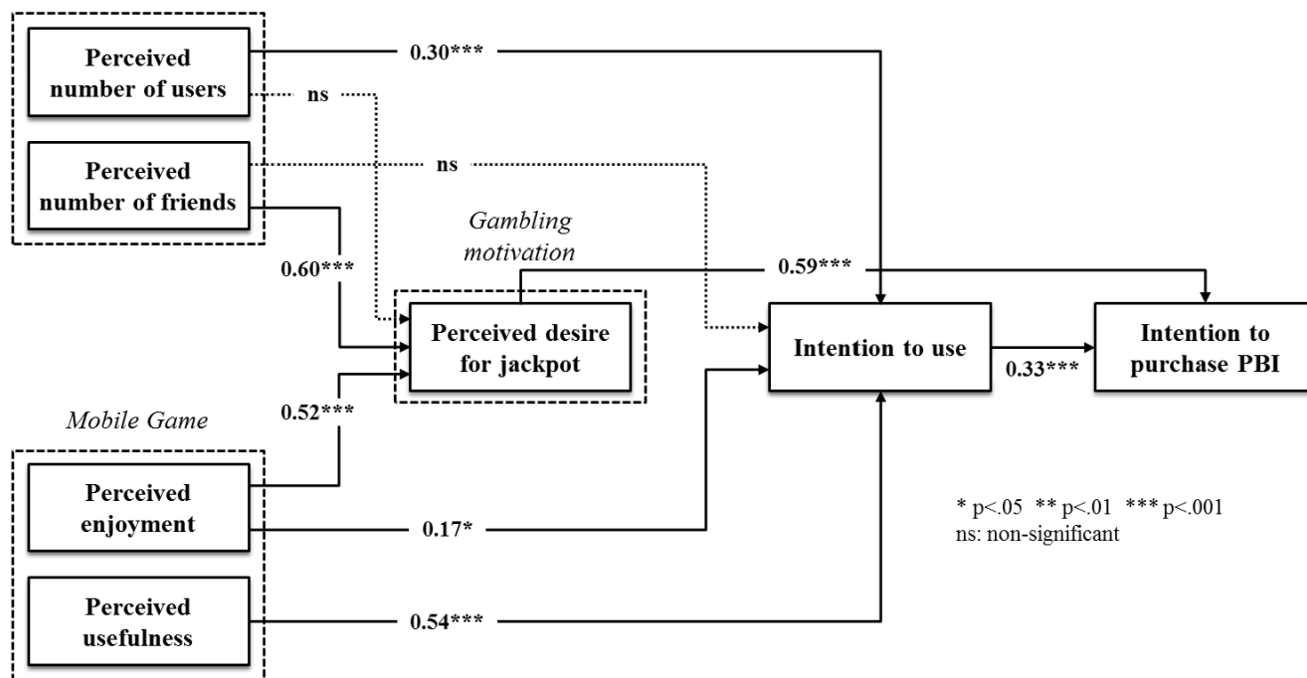| Hypothesis	Standardized coefficient		Chi-square difference	p-value	Significance
	Male	Female			
H1. ITU → ITPP	0.33 ***	0.38 *	0.24	0.625	No
H2. PDFJ → ITPP	0.59 ***	0.52 **	0.12	0.726	No
H3. PNOU → ITU	0.30 ***	−0.04	1.99	0.159	No
H4. PNOF → ITU	0.13	0.66 **	**4.59**	**0.032**	**Yes**
H5. PNOU → PDJF	−0.03	0.41 ***	**9.46**	**0.002**	**Yes**
H6. PNOF → PDJF	0.60 ***	0.56 ***	0.06	0.808	No
H7. PE → ITU	0.17 *	−0.18	**4.12**	**0.042**	**Yes**
H8. PE → PDFJ	0.52 ***	−0.03	**16.21**	**0.000**	**Yes**
H9. PU → ITU	0.54 ***	0.34 *	1.09	0.296	No

FIGURE 3. Summary of hypothesis test in the male group.

Perceived enjoyment influenced the intention to use and gambling motive in MSNGs. Perceived enjoyment has been a key determinant of various games; therefore, consistent with prior studies, this result is reasonable [16], [23], [59]. Enjoyment also has been identified as a major gambling motivation [46], [47]. Therefore, perceived enjoyment clearly influences the gambling motivation in MSNGs because the factor perceived desire for jackpot has the features of gambling.

Perceived usefulness affected the intention to use MSNGs. MSNGs enable users to interact with their friends and release stress. In other words, users play MSNGs continuously when they perceive that playing MSNGs is useful to improve job performance and their relationships. This finding is consistent with previous research related to mobile games and SNSs [16], [22], [23], [59].

The gambling motivation that represents the perceived desire for jackpot in MSNGs affected user's intention to purchase PBIs. This result concurs with previous studies of gambling motives [33], [47], [48], so the conclusion that PBI has the features of gambling is reasonable.

The user's intention to use MSNGs affected the user's intention to purchase PBI; this result concurs with Hamari [17]. Thus, it is reasonable that the intention to use MSNGs also affects the intention to purchase PBIs.
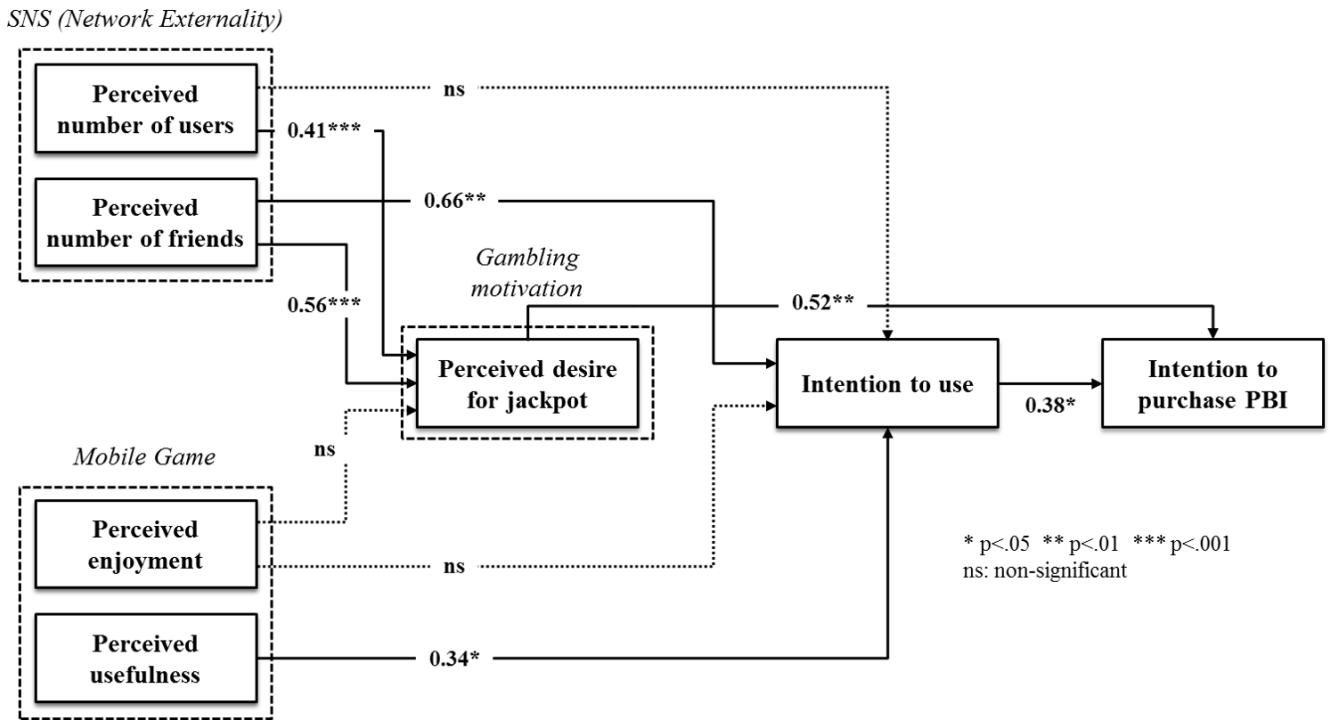
FIGURE 4. Summary of hypothesis test in the female group.

B. ANALYSIS BETWEEN GENDERS

For men, the influence of perceived number of friends on perceived desire for jackpot was the most important (standardized effect: 0.60). Previous research has found that men more than women prefer to compete with friends in games [71]; i.e., that in competitions, men prefer to defeat their friends, rather than general in gambling even though it includes a high risk.

Among the paths of influences on intention to use, perceived number of users was significant for men (standardized effect: 0.30), whereas perceived number of friends was significant for women (standardized effect: 0.66). Prior studies have indicated that women are more sensitive to their friends' opinions than are men [19], [43]. Thus, the probability that women will play MSNGs increases with increase in the number of their friends that play it.

Perceived enjoyment affected intention to use by males but not by females. Previous research revealed that males enjoyed video games more than females do [72], [73], and that males' rating of perceived enjoyment were higher than females' [69]. Thus, the perceived enjoyment is a key to encourage male users to play MSNGs continuously.

Moreover, among males but not among females, perceived enjoyment increased perceived desire for jackpot. Previous research has found that positive feelings, which represent excitement and fun in gambling, motivate gambling more in males than in females [32], [38], [47], [74]. Because perceived enjoyment had similar features to positive feelings, this observation that perceived enjoyment causes increases gambling motivations more in males than in females is reasonable.

Perceived usefulness increased intention to use in both genders. The direct effect was greater in males (standardized effect: 0.54) than in females (standardized effect: 0.34). However, the result of multiple group analysis showed that there is no significance between male and female groups on the path of perceived usefulness → intention to use. This finding means that perceived usefulness is a main driver of intention to use an MSNG for both male and female groups. Even though previous research revealed that males are more task-oriented than females; this conclusion has been supported by several studies in the context of IT (e.g., [20], [56]), in this study, no relationship was observed. This result concurs with the findings of prior research on hedonic systems such as mobile game [23] and mobile entertainment [59]. Therefore, we concluded that both male and female users perceive that it is useful and beneficial to play MSNGs that enables users to enhance their job performance and relationship.

VI. CONCLUSION

The goal of this study is to examine why people who play MSNGs purchase PBIs. The proposed research model is based on TAM mainly, and is extended by intrinsic motivation, network externality, and gambling motivation. This model was validated by statistical methods and good fit indices. In this study, we consider seven constructs: perceived number of users, perceived number of friends, perceived enjoyment, perceived usefulness, perceived desire for jackpot, intention to use, and intention to purchase.

Perceived number of friends and perceived enjoyment affected perceived desire for jackpot significantly, and

perceived desire for jackpot and intention to use influenced intention to purchase PBIs. Some differences in responses of genders were observed. The paths 'perceived number of users → intention to use', 'perceived enjoyment → intention to use' and 'perceived enjoyment → perceived desire for jackpot' were significant in males, but not females, whereas the paths 'perceived number of users → perceived desire for jackpot' and 'perceived number of friends → intention to use' were significant in females but not males. The results of this study suggest that our research model has good power to explain user's continued intention to purchase PBIs, and provide a reference that may guide the development of PBI strategies that are targeted at genders.

The results of this study provide implications for academic researchers and practitioners in the MSNG industry. From the theoretical point of view, this study provides a structural model that allows researchers to understand factors that influence intention to purchase PBIs in MSNGs. The proposed research model is the first that identifies users' acceptance of purchasing PBIs in MSNGs. In addition, because the research model based on TAM, motivation theory, and network externality theory was statistically validated, the results of this study can give researchers in the MSNG industry a theoretical foundation. We also confirmed a positive relationship between gambling motive and intention to purchase PBIs. Although many studies have proposed structural models to discover the factors that influence intention to use mobile games and SNGs, and to purchase virtual items, few studies have suggested structural models identifying factors that affect the intention to purchase PBIs in the context of gambling. Thus, our study can provide new insight to researchers who study PBIs in MSNGs.

From the practical point of view, knowledge of which constructs affect intention to purchase PBI can guide the development of strategies to sell PBIs. This study provides factors' total effect on intention to purchase PBIs, so, game companies that develop and manage MSNGs should consider these factors' total effect when developing strategies for their own MSNGs. For example, they can develop a strategy to encourage players to attract their friends to their games, rather than to just gather users randomly. The companies can also develop a marketing strategy to attract people who visit a casino because the result revealed that perceived desire for a jackpot is a main driver of intention to purchase PBIs. Furthermore, the observed gender differences suggest that companies should focus on the factors that are related to the gender of the target users. For example, if a company wants to increase its number of female users, it should focus on perceived number of friends and perceived usefulness. In contrast, if the company wants to increase its profit from sales of PBIs to male users, it should focus on perceived desire for jackpot as well as perceived number of friends and perceived enjoyment.

This study has several limitations. First, the users sampled were mainly aged 20-30, so, the results can be generalized by widening the ages considered. Second, the survey was conducted in Korea, and therefore cannot identify any cultural differences. Finally, adding more constructs might improve the structural model and the results.

Some directions for future research should be considered. In this study, the types of virtual item were categorized into PBIs and non-PBIs. However, PBIs can be classified into several types. Thus, various types of PBI should be considered, and MSNG companies should develop specific strategies for each type of PBI. In addition, future research should identify why people quit MSNGs in the context of the life cycle of MSNGs. In this study, survey results showed that 76.5% of users quit an MSNG within 6 months (Table 2). This observation is consistent with the result of a previous study [75]. Furthermore, future research should consider gambling motivation to identify how PBIs affect users' intention to quit MSNGs; the information would be useful for both researchers and developers of MSNGs.

REFERENCES

[1] T. Correa, A. W. Hinsley, and H. G. de Zuniga, "Who interacts on the Web?: The intersection of users' personality and social media use," *Comput. Human Behav.*, vol. 26, no. 2, pp. 247–253, 2010.

[2] K.-M. Lin, "Predicting Asian undergraduates' intention to continue using social network services from negative perspectives," *Behav. Inf. Technol.*, vol. 34, no. 9, pp. 882–892, 2015.

[3] S. Zhao, L. E. Yu, and B. O. Cheng, "Probabilistic community using link and content for social networks," *IEEE Access*, vol. 5, pp. 27189–27202, 2017.

[4] L. Shi, L. Liu, Y. Wu, L. Jiang, and J. Hardy, "Event detection and user interest discovering in social media data streams," *IEEE Access*, vol. 5, pp. 20953–20964, 2017.

[5] S.-F. Yap and S. S. Gaur, "Integrating functional, social, and psychological determinants to explain online social networking usage," *Behav. Inf. Technol.*, vol. 35, no. 3, pp. 166–183, 2016.

[6] R. Alharthi, B. Guthier, C. Guertin, and A. El Saddik, "A dataset for psychological human needs detection from social networks," *IEEE Access*, vol. 5, pp. 9109–9117, 2017.

[7] E. Park, S. Baek, J. Ohm, and H. J. Chang, "Determinants of player acceptance of mobile social network games: An application of extended technology acceptance model," *Telemat. Inform.*, vol. 31, no. 1, pp. 3–15, 2014.

[8] T. Zhou and Y. Lu, "Examining mobile instant messaging user loyalty from the perspectives of network externalities and flow experience," *Comput. Human Behav.*, vol. 27, no. 2, pp. 883–889, 2011.

[9] C. C. Chang, "Examining users' intention to continue using social network games: A flow experience perspective," *Telematics Informat.*, vol. 30, no. 4, pp. 311–321, 2013.

[10] *Social Network Games 2012 What are Social Network*, Casual Games Association, Smithfield, VA, USA, 2012.

[11] J. Jankowski, P. Bródka, and J. Hamari, "A picture is worth a thousand words: An empirical study on the influence of content visibility on diffusion processes within a virtual world," *Behav. Inf. Technol.*, vol. 35, no. 11, pp. 926–945, 2016.

[12] Y. Guo and S. Barnes, "Purchase behavior in virtual worlds: An empirical investigation in second life," *Inf. Manag.*, vol. 48, no. 7, pp. 303–312, 2011.

[13] H. Lin and C. T. Sun, "Cash trade in free-to-play online games," *Games Cult.*, vol. 6, no. 3, pp. 270–287, 2011.

[14] J. Zagal, M. Nussbaum, and R. Rosas, "A model to support the design of multiplayer games," *Presence*, vol. 9, no. 5, pp. 448–462, Oct. 2000.

[15] P.-S. Wei and H.-P. Lu, "Why do people play mobile social games? An examination of network externalities and of uses and gratifications," *Internet Res.*, vol. 24, no. 3, pp. 313–331, 2014.

[16] D. H. Shin and Y. J. Shin, "Why do people play social network games?" *Comput. Human Behav.*, vol. 27, no. 2, pp. 852–861, 2011.

[17] J. Hamari, "Why do people buy virtual goods? Attitude toward virtual good purchases versus game enjoyment," *Int. J. Inf. Manage.*, vol. 35, no. 3, pp. 299–308, 2015.

[18] M. Mäntymki and J. Salo, "Teenagers in social virtual worlds: Continuous use and purchasing behavior in Habbo Hotel," *Comput. Human Behav.*, vol. 27, no. 6, pp. 2088–2097, 2011.

[19] V. Venkatesh and M. G. Morris, "Why don't men ever stop to ask for directions? Gender, social influence, and their role in technology acceptance and usage behavior," *MIS Quart.*, vol. 24, no. 1, p. 115, Mar. 2000.

[20] C. S. Ong and J. Y. Lai, "Gender differences in perceptions and relationships among dominants of e-learning acceptance," *Comput. Human Behav.*, vol. 22, no. 5, pp. 816–829, 2006.

[21] T.-P. Liang and Y.-H. Yeh, "Effect of use contexts on the continuous use of mobile services: The case of mobile games," *Pers. Ubiquitous Comput.*, vol. 15, no. 2, pp. 187–196, 2011.

[22] Y. Liu and H. Li, "Exploring the impact of use context on mobile hedonic services adoption: An empirical study on mobile gaming in China," *Comput. Human Behav.*, vol. 27, no. 2, pp. 890–898, 2011.

[23] I. Ha, Y. Yoon, and M. Choi, "Determinants of adoption of mobile games under mobile broadband wireless access environment," *Inf. Manag.*, vol. 44, no. 3, pp. 276–286, 2007.

[24] M. Lee, "Understanding the behavioural intention to play online games," *Online Inf. Rev.*, vol. 33, no. 5, pp. 849–872, 2009.

[25] W. Lee, L. Xiong, and C. Hu, "The effect of Facebook users' arousal and valence on intention to go to the festival: Applying an extension of the technology acceptance mode," *Int. J. Hospitality Manag.*, vol. 31, no. 3, pp. 819–827, 2012.

[26] P. Legris, J. Ingham, and P. Collerette, "Why do people use information technology? A critical review of the technology acceptance model," *Inf. Manag.*, vol. 40, no. 3, pp. 191–204, 2003.

[27] J. V. Chen, D. C. Yen, and K. Chen, "The acceptance and diffusion of the innovative smart phone use: A case study of a delivery service company in logistics," *Inf. Manag.*, vol. 46, no. 4, pp. 241–248, 2009.

[28] J. H. Wu and S. C. Wang, "What drives mobile commerce? An empirical evaluation of the revised technology acceptance model," *Inf. Manag.*, vol. 42, no. 5, pp. 719–729, 2005.

[29] O. Kwon and Y. Wen, "An empirical study of the factors affecting social network service use," *Comput. Human Behav.*, vol. 26, no. 2, pp. 254–263, 2010.

[30] V. Venkatesh and R. Agarwal, "Turning visitors into customers: A usability-centric perspective on purchase behavior in electronic channels," *Manage. Sci.*, vol. 52, no. 3, pp. 367–382, 2006.

[31] N. Hanner and R. Zarnekow, "Purchasing behavior in free to play games: Concepts and empirical validation," in *Proc. Annu. Hawaii Int. Conf. Syst. Sci.*, Jan. 2015, pp. 3326–3335.

[32] D. S. McGrath, S. H. Stewart, R. M. Klein, and S. P. Barrett, "Self-generated motives for gambling in two population-based samples of gamblers," *Int. Gambling Stud.*, vol. 10, no. 2, pp. 117–138, 2010.

[33] H. P. Lee, P. K. Chae, H. S. Lee, and Y. K. Kim, "The five-factor gambling motivation model," *Psychiatry Res.*, vol. 150, no. 1, pp. 21–32, 2007.

[34] C.-K. Lee, B. Lee, B. J. Bernhard, and K. L. Tae, "A comparative study of involvement and motivation among casino gamblers," *Psychiatry Invest.*, vol. 6, no. 3, pp. 141–149, 2009.

[35] S. H. J. Chan, Y. K. P. Wan, and I. A. Wong, "Exploring the differences among Chinese casino gamblers' characteristics, motivations, and behaviors," *J. Vacation Marketing*, vol. 21, no. 1, pp. 23–36, 2014.

[36] K. J. Back, C. K. Lee, and R. Stinchfield, "Gambling motivation and passion: A comparison study of recreational and pathological gamblers," *J. Gambl. Stud.*, vol. 27, no. 3, pp. 355–370, 2011.

[37] D. L. King, S. M. Gainsbury, P. H. Delfabbro, N. Hing, and B. Abarbanel, "Distinguishing between gaming and gambling activities in addiction research.," *J. Behav. Addict.*, vol. 4, no. 4, pp. 215–220, 2015.

[38] J. Lloyd *et al.*, "How psychological symptoms relate to different motivations for gambling: An online study of Internet gamblers," *Biol. Psychiatry*, vol. 68, no. 8, pp. 733–740, 2010.

[39] M. L. Katz and C. Shapiro, "Network externalities, competition, and compatibility," *Amer. Econ. Rev.*, vol. 75, no. 3, pp. 424–440, 1985.

[40] R. Artle and C. Averous, "The telephone system as a public good: Static and dynamic aspects," *Bell J. Econ. Manag. Sci.*, vol. 4, no. 1, pp. 89–100, 1973.

[41] C. Matutes and P. Regibeau, "'Mix and match': Product compatibility without network externalities," *RAND J. Econ.*, vol. 19, no. 2, pp. 221–234, 1988.

[42] C.-F. Chou and O. Shy, "Network effect without network externalities," *Int. J. Ind. Organ.*, vol. 8, no. 2, p. 259, Jun. 1990.

[43] K.-Y. Lin and H.-P. Lu, "Why people use social networking sites: An empirical study integrating network externalities and motivation theory," *Comput. Hum. Behav.*, vol. 27, no. 3, pp. 1152–1161, 2011.

[44] D. Sledgianowski and S. Kulviwat, "Using social network sites: The effects of playfulness, critical mass and trust in a hedonic context," *J. Comput. Inf. Syst.*, vol. 49, no. 4, pp. 74–83, 2009.

[45] C.-P. Lin and A. Bhattacherjee, "Elucidating individual intention to use interactive information technologies: The role of network externalities," *Int. J. Electron. Commun.*, vol. 13, no. 1, pp. 85–108, 2008.

[46] C. Neighbors, T. W. Lostutter, J. M. Cronce, and M. E. Larimer, "Exploring college student gambling motivation," *J. Gambl. Stud.*, vol. 18, no. 4, pp. 361–370, 2002.

[47] K. L. Francis, N. A. Dowling, A. C. Jackson, D. R. Christensen, and H. Wardle, "Gambling motives: Application of the reasons for gambling questionnaire in an Australian population survey," *J. Gambl. Stud.*, vol. 31, no. 3, pp. 807–823, 2015.

[48] C.-K. Lee, Y.-K. Lee, B. J. Bernhard, and Y.-S. Yoon, "Segmenting casino gamblers by motivation: A cluster analysis of Korean gamblers," *Tourism Manag.*, vol. 27, no. 5, pp. 856–866, 2006.

[49] N. Canale, M. Santinello, and M. D. Griffiths, "Validation of the reasons for gambling questionnaire (RGQ) in a British population survey," *Addict. Behav.*, vol. 45, no. 5, pp. 276–280, Jun. 2015.

[50] T. Verhagen, F. Feldberg, B. Van Den Hooff, S. Meents, and J. Merikivi, "Understanding users' motivations to engage Virtual worlds: A multipurpose model empirical testing," *Comput. Human Behav.*, vol. 28, no. 2, pp. 484–495, 2012.

[51] M. J. Kim, C. K. Lee, and M. Bonn, "Obtaining a better understanding about travel-related purchase intentions among senior users of mobile social network sites," *Int. J. Inf. Manage.*, vol. 37, no. 5, pp. 484–496, 2017.

[52] G. P. Lantos, *Consumer Behavior in Action*. Armonk, NY, USA: M. E. Sharpe, 2010.

[53] F. D. Davis, R. P. Bagozzi, and P. R. Warshaw, "Extrinsic and intrinsic motivation to use computers in the workplace," *J. Appl. Soc. Psychol.*, vol. 22, no. 14, pp. 1111–1132, Jul. 1992.

[54] D. Nguyen, "Understanding perceived enjoyment and continuance intention in mobile games," M.S. thesis, Dept. Inf. Service Econ., Aalto Univ., Espoo, Finland, 2015.

[55] J. Merikivi, D. Nguyen, and V. K. Tuunainen, "Understanding perceived enjoyment in mobile game context," in *Proc. Annu. Hawaii Int. Conf. Syst. Sci.*, Mar. 2016, pp. 3801–3810.

[56] V. Venkatesh, "Determinants of perceived ease of use: Integrating control, intrinsic motivation, and emotion into the technology acceptance model," *Inf. Syst. Res.*, vol. 11, no. 4, pp. 342–365, 2000.

[57] F. Kanwal and M. Rehman, "Factors affecting e-learning adoption in developing countries–empirical evidence from Pakistan's higher education sector," *IEEE Access*, vol. 5, pp. 10968–10978, 2017.

[58] T. S. H. Teo, V. K. G. Lim, and R. Y. C. Lai, "Intrinsic and extrinsic motivation in Internet usage," *Omega*, vol. 27, no. 1, pp. 25–37, 1999.

[59] L. Y. Leong, K. B. Ooi, A. Y. L. Chong, and B. Lin, "Modeling the stimulators of the behavioral intention to use mobile entertainment: Does gender really matter?" *Comput. Human Behav.*, vol. 29, no. 5, pp. 2109–2121, 2013.

[60] F. D. Davis, "Perceived usefulness, perceived ease of use, and user acceptance of information technology," *MIS Quart.*, vol. 13, no. 3, pp. 319–340, 1989.

[61] D. Y. Wohn, C. Lampe, R. Wash, N. Ellison, and J. Vitak, "The 'S' in social network games: Initiating, maintaining, and enhancing relationships," in *Proc. 44th Hawaii Int. Conf. Syst. Sci.*, Jan. 2011, pp. 1–10.

[62] P. J. Kitchen, R. Martin, and N. Che-Ha, "Long term evolution mobile services and intention to adopt: A Malaysian perspective," *J. Strateg. Markerking*, vol. 23, no. 7, pp. 643–654, 2015.

[63] E. Park and A. P. Del Pobil, "Modeling the user acceptance of long-term evolution (LTE) services," *Ann. Des Telecommun. Telecommun.*, vol. 68, nos. 5–6, pp. 307–315, 2013.

[64] J. C. Anderson and D. W. Gerbing, "Structural equation modeling in practice: A review and recommended two-step approach," *Psychol. Bull.*, vol. 103, no. 3, pp. 411–423, 1988.

[65] R. L. Holbert and M. T. Stephenson, "Structural Equation Modeling in the Communication Sciences, 1995-2000," *Human Commun. Res.*, vol. 28, no. 4, pp. 531–551, 2002.

[66] C. Fornell and D. F. Larcker, "Evaluating structural equation models with unobservable variables and measurement error," *J. Markerking Res.*, vol. 18, no. 1, p. 39, Feb. 1981.

[67] R. P. Bagozzi and Y. Yi, "On the evaluation of structural equation models," *J. Acad. Markerking Sci.*, vol. 16, no. 1, pp. 74–94, 1988.

[68] P. M. Bentler and D. Bonett, "Significance tests and goodness of fit in the analysis of covariance structures.," *Psychol. Bull.*, vol. 88, no. 3, pp. 588–606, 1980.

[69] H. Y. Wang and Y. S. Wang, "Gender differences in the perception and acceptance of online games," *Br. J. Edu. Technol.*, vol. 39, no. 5, pp. 787–806, Jul. 2008.

[70] K. G. Joreskog and D. Sorbom, *LISREL 8: Structural Equation Modeling With the SIMPLIS Command Language*. Sci. Softw. Int., 1993, pp. 51–79.

[71] K. Lucas and J. L. Sherry, "Sex differences in video game play," *Commun. Res.*, vol. 31, no. 5, pp. 499–523, 2004.

[72] M. E. Lockheed, "Women, girls, and computers: A first look at the evidence," *Sex Roles*, vol. 13, nos. 3–4, pp. 115–122, 1985.

[73] C. R. Scott and S. C. Rockwell, "The effect of communication, writing, and technology apprehension on likelihood to use new communication technologies," *Commun. Edu.*, vol. 46, no. 1, pp. 44–62, 1997.

[74] N. A. Dowling, "The cognitive-behavioral treatment of female problem gambling," in *The Wiley-Blackwell Handbook Disordered Gambling*. Chichester, U.K.: Wiley, 2013, pp. 225–250.

[75] A. C. Valvi and D. C. West, "Mobile applications (Apps) in advertising: A grounded theory of effective uses and practices," in *Ideas in Marketing: Finding the New and Polishing the Old*, K. Kubacki, Ed. Cham, Switzerland: Springer, 2015, pp. 349–352.

[76] M. Koufaris, "Applying the technology acceptance model and flow theory to online consumer behavior," *Inf. Syst. Res.*, vol. 13, no. 2, pp. 205–223, 2002.

[77] M. Y. Yi and Y. Hwang, "Predicting the use of Web-based information systems: Self-efficacy, enjoyment, learning goal orientation, and the technology acceptance model," *Int. J. Human Comput. Stud.*, vol. 59, no. 4, pp. 431–449, 2003.

[78] F. D. Davis, "User acceptance of information technology: System characteristics, user perceptions and behavioral impacts," *Int. J. ManMach. Stud.*, vol. 38, no. 3, pp. 475–487, 1993.

[79] A. Bhattacherjee, "Understanding information systems continuance: An expectation-confirmation model," *MIS Quart.*, vol. 25, no. 3, pp. 351–370, 2001.

[80] V. Venkatesh and F. D. Davis, "A theoretical extension of the technology acceptance model: Four longitudinal field studies," *Manage. Sci.*, vol. 46, no. 2, pp. 186–205, 2000.

EUIHO SUH received the B.S. degree in industrial engineering from Seoul National University, South Korea, the two master's degrees in industrial engineering from the Korea Advanced Institute of Science and Technology and Stanford University, USA, and the Ph.D. degree in management information systems from the University of Illinois at Urbana–Champaign, USA. He is currently a Full Professor with the Department of Industrial and Management Engineering, Pohang University of Science and Technology. His research interests include management information systems, decision support systems, strategic management of information systems, information and knowledge management, and strategic management of technology.

HOOYOUNG PARK received the B.S. degree in industrial engineering from Hanyang University, and the M.S. degree in industrial and management engineering from the Pohang University of Science and Technology. He is currently with the Strategic Planning Team, Samsung Electronics, South Korea. His research interests include decision support system, management information systems, and strategic management of technology.

JAEYOUNG LEE received the B.S. degree in industrial engineering from Hanyang University. He is currently pursuing the Ph.D. degree in industrial and management engineering with the Pohang University of Science and Technology. His research interests include human behavior, decision support system, and strategic management of technology.

SUCHUL LEE received the Ph.D. degree in industrial and management engineering from the Pohang University of Science and Technology. He is currently an Assistant Professor with the Department of Business Administration, Mokpo National University. His primary research interests include management science, management information systems, knowledge management, decision support system, and strategic management of technology.

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