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Determinants of player acceptance of mobile social network games: An application of extended technology acceptance model

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ABSTRACT

In recent years, mobile devices and social network games (SNGs) have gained wide popularity among the mainstream users. The present study aims to investigate the psychological elements that may contribute to user behaviors regarding mobile-social network games (M-SNGs). This study introduces an integrated model for M-SNGs. Statistical results from an online survey of players of M-SNGs indicate that the proposed research model effectively demonstrates and examines player acceptance of and attitudes toward M-SNGs. This research model is valid, and illustrates not only perceived enjoyment and usefulness as determinant variables of intention to use among players, but also perceived mobility together with perceived control and skill as motivational factors for players. The results also describe that satisfaction has a moderate role, which in turn has significant effects on multiple connections in the research model. Both theoretical and practical implications are provided based on the findings.

1. Introduction

Online social networking technologies are being rapidly developed to meet recent user trends (Barker, 2009). Concurrent with these technologies, social network services (SNSs) have been distributed and utilized worldwide. In addition to the increased popularity of SNSs, social network games (SNGs) have become extremely popular in modern society (Järvinen, 2009). SNGs are online games that are distributed via SNSs or linked with SNSs. They are organized by asynchronous game mechanisms and multiplayer capacity. Convenient and entertaining, SNGs are the most accessible and popular social simulation games available in the market. Several well-known products, including 'Farm Ville' and 'City Ville', have attracted more than 10 million players worldwide.

These games have expanded and become established via the social connections of players provided by SNSs. Due to this association, SNS companies have included many SNGs in their services (Kleinman, 2009). As a result, game developers and programmers have moved to the field of mobile social network games (M-SNGs). The successful launch of M-SNGs is also shown in the case of Playfish, which is the developer and provider of Sims Social, Pet Society, and other internet social games. This company started in 2007 as a small venture company. With consistent and continual growth due to meeting the trends of the game industry, Playfish was bought by EA in November 2009 at a value of 400 million USD (Grossman, 2009).

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In terms of introducing a large number of M-SNGs, enjoyment of the games and usefulness of the game content – two of the most critical issues in all entertainment services and systems – have become the primary advantages of M-SNGs (Wohn et al., 2011; Yee, 2006). Considering the purpose of traditional games, the enjoyment issue is magnified when users want to have fun by playing the games (Klimmt et al., 2007). The usefulness aspect is paramount when users want to obtain some advantages from content provided by specific services or systems (Bourgonjon et al., 2010; Millar, 1984).

The majority of M-SNGs provide services based mainly on two parts. Similar to many other games, M-SNGs are based on enjoyable tasks, providing players with fun and entertainment (Ha et al., 2007; Shin and Shin, 2011). In terms of usefulness of games, M-SNGs effectively incorporate the background context of SNSs. Through use of these games by players, the players enhance their relationships with others and garner a sense of communication in virtual reality (Rau et al., 2008). This means that players can interact with other players anywhere when they play games via mobile devices. Accordingly, the current study demonstrates the perceptions of players regarding usefulness and enjoyment in playing M-SNGs, as well as player motivations and the effects on other psychological factors.

A large number of studies have attempted to examine the degrees of user perceptions of usefulness and enjoyment in diverse contexts (Venkatesh, 2000; Yi and Hwang, 2003). However, few studies have aimed to investigate the effects of multiple factors on the perceptions and acceptance of users in relation to M-SNGs. Therefore, the current study introduces a new model to explain user perspectives toward M-SNGs. Through examination of the integrated model, this study proposes two motivational groups defined by playful and useful characteristics to describe user acceptance of M-SNGs. This study employs a method of structural equation modeling (SEM) and related validity tests (convergent, discriminant, and internal) as statistical methods to identify the motivations and antecedents of user attitudes toward M-SNGs.

To examine the causal relationships in the proposed model of M-SNGs, this paper asks two questions. (1) What kinds of factors affect the intentions of players to play M-SNGs? (2) Can the original technology acceptance model (TAM) be applied to M-SNGs?

The purpose of this research is to investigate the main roles of enjoyment and usefulness in user adoption and intention to use M-SNGs. Shin and Shin found that perceived enjoyment and usefulness determine user intention to play SNGs, while these factors do not have significant effects on the attitudes of users (Shin and Shin, 2011). In addition, with the rapid improvement of mobile technologies and devices, the current study employs other factors as antecedents of perceived usefulness and enjoyment. Since the relationships in the integrated model are analyzed, the findings of the present study are valuable for both industrial practitioners and academic researchers.

This study identifies unique determinant factors of the use of SNGs in mobile environments. Consistent with the arguments of many other researchers, which assert that user behaviors change according to different environments and contexts in contrast to general situations, the academic and theoretical significance of the current study may be in highlighting the playful and useful motivations of users in employing specific games and services, and in identifying the core roles played by perceived usefulness and enjoyment in predicting user attitudes. Previous research on social technologies, including SNSs and internet games, has investigated possible antecedents to explain why people use social technologies and related services (Bourgonjon et al., 2010; Venkatesh, 2000). However, few studies have examined the unique determinants of the use of SNGs (Shin and Shin, 2011). Moreover, there have been no studies investigating the factors that affect the intentions of users to play SNGs in mobile environments.

Accordingly, the current study addresses this issue by investigating the feelings of players regarding the usefulness and enjoyment of M-SNGs. This study identifies new factors based on structural causal connections with other factors. Three factors (perceived ease of use, enjoyment, and usefulness), which were introduced in prior studies related to SNGs and the concept of technology acceptance, are used in this study together with new factors of perceived control and skill, perceived mobility, and connectedness to reveal unique features of SNGs in the increasingly ubiquitous environment of mobile devices.

The results of the present research can be a foundation for the social gaming industry to establish and implement guidelines for service evaluation of M-SNGs in mobile environments, which significantly affect potential user adoption of newly introduced services and user intention to use services. Companies specializing in M-SNGs are attempting to provide games that are more dynamic, enjoyable, and useful for players. Because the market for M-SNGs is complex, with overlapping multiple dimensions including mobile, social technologies, and game markets, analysis and evaluation by players are essential in order to ensure the success of games.

The integrated user acceptance model proposed in the current study may be well suited for establishing guidelines or a framework of user analysis. It may also be applied to numerous interactions between services and users. In particular, because quality and the ripple effects of services are factors that can predict the success or failure of services and businesses, these factors should be considered in the M-SNG industry. Hence, the M-SNG industry needs to make more enjoyable games and useful content to improve the quality and ripple effects of services. In the long term, the industry should prepare new services for web 3.0 systems to provide users with various services with diverse content (Shin, 2010). The results of the current study may be interesting to companies undertaking general attempts to increase the usage of M-SNGs and attempting to comprehend the factors that have significant effects on user attitudes and intention to play.

2. Acceptance model of M-SNGs

2.1. Attitude toward M-SNGs

Predicting individuals' behaviors and attitudes is one of the most important research topics in the fields of information services and systems (Aarts et al., 1998). The theory of reasoned action (TRA) describes the close relationship between specific behaviors and attitudes of an individual. Since the introduction of TRA, many studies have used this theory to confirm that an individual's behaviors can be predicted by the individual's intention to use a given service or system. This correlation is the psychological representation of an individual's will to engage in a specific behavior (Ajzen, 1991; Ajzen and Fisnbein, 1977; Sheppard et al., 1988). In TRA, an individual's attitude is referred to as "the perceived degree of positive and negative feelings about doing the target behavior". Ajzen and colleagues indicated that users' attitude toward a specific behavior is significantly determined by both their evaluations and cognitive beliefs (Ajzen, 1991; Ajzen and Fisnbein, 1977). This study employs the definition of attitude introduced by Ajzen (1991), which defines attitude as "the degree of positive feelings about playing M-SNG." This theory has been also used in TAM studies (Davis, 1989, 1993). Moreover, a large number of TRA and TAM studies have supported the findings of the relationship between attitude and intention to use. Based on this theoretical research, the causal connections between user attitudes and intentions to use can be applied to many areas related to M-SNGs. Indeed, some previous studies on SNGs and mobile environments have supported this relationship (Chang, 2012; Lee and Yvette, 2012; Paavilainen et al., 2012). This discussion leads to a first testable hypothesis for this paper:

H1. Attitude toward M-SNGs is positively related to user intention to use the games.

2.2. Perceived control & skill

Perceived control & skill was first introduced by Csikszentmihalyi (Csikszentmihalyi, 1988, 1990, 2000). Csikszentmihalyi (1988) pointed out users in flow state tend to show their intrinsic motivations while performing and completing specific tasks, and feel consistency between activities and self-awareness.

One of the possible approaches to understand flow state is to regard it as a particular function of skill and control which is deeply related to user perceptions and activities. Csikszentmihalyi (1988, 1990, 2000) defined perceived control & skill as "the user perception and behavior of how challenging it is to do a given activity and how skillful the user is when doing that activity". In the current study, perceived control & skill is defined as "the users' perception of how challenging it is to play M-SNG and how skillful the user is when playing the game."

With regard to flow state in mobile technologies, the higher level of being skillful in using mobile devices occurs the greater degree of controlling the mobile devices (Luarn and Lin, 2005). Therefore, this study considered these two factors into same construct. Previous studies showed that perceived control and skill is a core factor to determine perceived usability and enjoyment of specific technologies and services (Koufaris, 2002; Lu et al., 2009; Venkatesh, 2000; Venkatesh et al., 2003). It means that it can be easier and more enjoyable when the user feels higher flow-state and perceived control. Hence, the current study hypothesizes the following:

H2. Perceived control & skill of M-SNGs is positively related to perceived ease of use of the games.

H3. Perceived control & skill of M-SNGs is positively related to perceived enjoyment of the games.

2.3. Perceived ease of use

The original TAM proposed perceived ease of use as one of the constructs included the model. Perceived ease of use is defined as "the degree that using a specific technology will be free from effort" (Davis, 1989, 1993). Applying this definition to the current research, we define perceived ease of use as "the degree to which individuals feel free from engaging in mental and physical efforts". Prior studies have supported the notion that there are positive relationships between perceived ease of use and enjoyment, perceived ease of use and attitude. Zhu et al. (2003) found that perceived enjoyment is a notable determinant of perceived usefulness in using mobile devices. According to the theory of self-efficacy, there is a positive relationship between intrinsic motivation (i.e., enjoyment) and perceived ease of use (Bandura, 1977, 1982). In addition, a positive relationship between perceived ease of use and attitude has been confirmed in various contexts and in the original TAM. For example, this relationship has been supported in contexts of mobile services (Nysveen et al., 2005), mobile games (Ha et al., 2007), mobile banking systems (Pikkarainen et al., 2004), and internet services (Lee and Chung, 2009). Thus, consistent with previous studies, the current study hypothesizes the following:

H4. Perceived ease of use of M-SNGs is positively related to perceived enjoyment of the games.

H5. Perceived ease of use of M-SNGs is positively related to user attitude toward the games.

2.4. Perceived enjoyment

Because SNGs are complex hedonic systems that provide entertainment services and content delivered by the services (Shin and Shin, 2011), perceived enjoyment of the games can be a significant determinant of other psychological constructs. Davis and colleagues showed that perceived enjoyment is an intrinsic motivation for intention to use information services

and systems (Davis, 1989, 1993; Venkatesh et al., 2003). Venkatesh (2000) defined perceived enjoyment as "the extent to which the activity of using a particular system is perceived to be enjoyable in its own right, aside from any performance consequences resulting from system use". Taking into account this definition and the purpose of this study, the current study defines perceived enjoyment as "the extent to which the activity of using SNGs is perceived to be enjoyable in its own right aside from the instrumental value of the technology" (Shin, 2010).

With regard the purpose of games that users get enjoyment in playing the games, M-SNG could have same purpose of the general games. Therefore, previously proposed relationships related to the purpose of the games can be consistent in M-SNGs. A large number of previous studies related to perceived enjoyment have indicated that perceived enjoyment is one of the significant determinants of intention to use particular systems or services. Teo et al. (1999) found that perceived enjoyment is one of the significant determinants of behavioral intention to use internet services. In terms of studies related to mobile communications, Huang et al. (2007) confirmed that there is a positive causal connection between perceived enjoyment and attitude when people use mobile learning services. In addition, Ha et al. (2007) indicated that perceived enjoyment is the most significant factor in determining the attitudes of users toward mobile internet services. In terms of SNSs and games, there are positive relationships between perceived enjoyment and attitude and perceived enjoyment and intention to use SNSs and games (Shin, 2010; Shin and Kim, 2008; Shin and Shin, 2011). Therefore, consistent with previous studies related to these two fields, this paper hypothesizes the following:

H6. Perceived enjoyment of M-SNGs is positively related to user attitude toward the games.

H7. Perceived enjoyment of M-SNGs is positively related to user intention to use the games.

2.5. Perceived mobility

The current study uses perceived mobility as a determinant of both perceived connectedness and usefulness in the integrated model, as mobility is a core factor of wireless networked services and devices. Perceived mobility (portability) is defined as "the extent of user awareness of the mobility value of mobile services and systems" (Huang et al., 2007). With regard to the topic of this study and this definition, we define perceived mobility as "the degree to which users are aware of the values of M-SNGs." There have been several studies in the field of mobile communications that support causal connections between perceived mobility and perceived usefulness and perceived mobility and perceived connectedness. Siau and Shen (2003) showed that perceived mobility plays the most significant role in user perspectives of wireless communication networks. Huang et al. (2007) also found that perceived mobility is one of the significant factors to determine perceived usefulness in predicting user acceptance of mobile-based learning systems. Moreover, Wu et al. (2007) showed that greater mobility makes users remain with mobile services and systems for longer periods of time. This means that perceived mobility can enable a state of connection among people using the services. In addition, a large amount of prior research on mobile systems and services supports the idea that perceived mobility significantly impacts perceived usability and perspectives of users toward mobile services (Huang et al., 2007; Park and Kim, 2013; Wu et al., 2007). Therefore, consistent with previous studies related to perceived mobility, this study hypothesizes the following:

H8. Perceived mobility of M-SNGs is positively related to perceived connectedness of the games.

H9. Perceived mobility of M-SNGs is positively related to perceived usefulness of the games.

2.6. Perceived connectedness

People want to communicate with others as broadly as possible, rather than passively interact with contacts that are recommended and displayed by a system. Because social network systems connect users in ways beyond the communication provided online, social network systems may increase the perceived degree of connectedness among users. For example, online communities for groups of users enhance and establish connections and interactions among users (Shin, 2010; Shin and Kim, 2008). Although the connections and interactions are conducted in online environments, they tend to fulfill the need for social interactions. Shin (2010) defined perceived connectedness as "the degree that users are cognitively and emotionally connected with the world, its resources, and people". Taking into account this definition, this study defines perceived connectedness as "the level to which users are cognitively connected with SNGs or their systems". Because users feel comfortable when they connect in SNGs, this perception represents and defines perceived connectedness. Therefore, the current study hypothesizes the following:

H10. Perceived connectedness of M-SNGs is positively related to perceived usefulness of the games.

H11. Perceived connectedness of M-SNGs is positively related to user attitude toward the games.

2.7. Perceived usefulness

TAM employs two beliefs that strongly affect user behavior in using specific technologies: perceived ease of use and perceived usefulness of the technologies. When Davis first introduced perceived usefulness (PU) as one of the constructs in TAM, it was defined as "the perceived degree to which an individual believes that using a specific service or system improves his or her task performance" (Davis, 1989, 1993). That study focused on the aspect of an "individual's performance", meaning the concept of PU from the perspective of job and task performance to all kinds of performance, including personal productivity. Previous studies related to SNSs and games support the relationships between PU and attitude, and PU and intention to use.

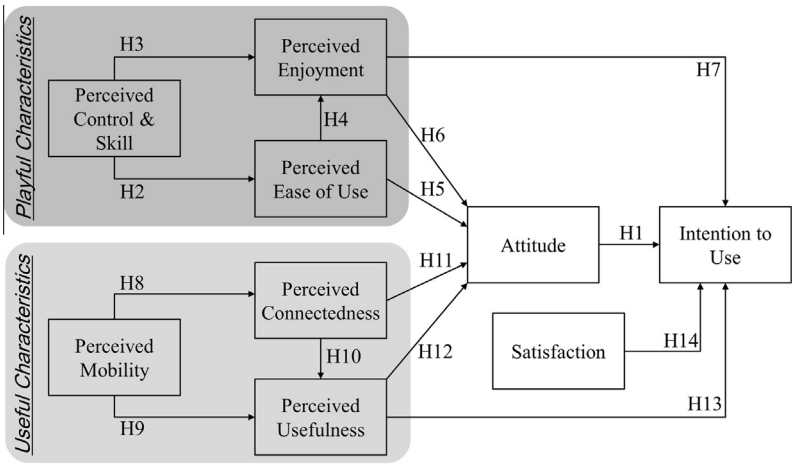

Fig. 1. The proposed research model.

For example, Shin and Shin found that there are positive relationships (specifically between PU and user attitude and PU and intention to use) in playing SNGs (Shin and Shin, 2011). As another example, Shin and his colleague found that these positive relationships are confirmed when people use SNSs (Shin, 2010; Shin and Shin, 2011). Therefore, taking into account the support of previous studies, the current study hypothesizes the following:

H12. Perceived usefulness of M-SNGs is positively related to user attitude toward the games.

H13. Perceived usefulness of M-SNGs is positively related to user intention to use the games.

2.8. Satisfaction

Many previous studies have shown that perceived satisfaction with a particular service positively affects the intention of users to use the service on an ongoing basis (Chiu et al., 2005; Park and del Pobil, 2013). For instance, Park and del Pobil (2013) indicated that service and system satisfaction has a significant effect on behavioral intention to use mobile communication services (long-term evolution services). In addition, Battacherjee (2001) found that satisfaction that is initially formed about an information system positively affects the continual intention of users to keep using the system and subjective services. Based on these findings, the current study hypothesizes the following:

H14. Satisfaction with M-SNGs is positively related to user intention to use the games.

2.9. The research model

The research model based on the proposed hypotheses is shown in Fig. 1.

3. Research methodology

3.1. Survey development

A survey was developed to confirm the suggested variables for investigating the psychological factors of users regarding the use of SNGs. The methods and procedures were adopted from Shin and Shin (2011).

20 undergraduate students (12 females and 8 males with an average age of 23.3 years), all of whom had more than two months of experience using M-SNGs, were collected for these procedures. All the students were from different departments. Considering that there is obvious evidence suggesting that undergraduate students are similar in a number of ways to SNSs users and internet game users more generally (Hargittaii, 2007).

Based on the results of in-depth interviews, a pre-test was conducted to investigate the reliability and validity of the questionnaire items. 37 validated items previously used by prior studies were initially selected. The selected questionnaire items were revised by a professional panel comprised of five experts in the fields of communications and mobile services. Subsequently, four rounds of a pilot survey were administered to 15 graduate and 15 undergraduate students with previous experience using M-SNGs. Participants in the pilot survey were instructed to ask the experimenter if they had any difficulty understanding the questionnaire items. This instruction was specified in order to minimize the potential issue of survey participants answering questionnaire items that they did not fully understand. Item reliability was examined by measuring Cronbach's alpha. Based on the results of the pilot survey, nine items were eliminated from the initial questionnaire items,

Table 1
Questionnaire items conducted in the main survey.

Constructs	Items	Descriptions	
Perceived control & skill	PCS1	When playing M-SNGs, I do not feel disturbed.	Koufaris (2002), Park and del Pobil (2013)
	PCS2	When playing M-SNGs, I strongly feel that I am inside a different world.	
	PCS3	During M-SNGs, I am intensely absorbed in the games and I fully control the games.	
Perceived ease of use	PEOU1	Playing M-SNGs does not require a lot of mental effort.	Davis (1989, 1993)
	PEOU2	I find M-SNGs easy to play.	
	PEOU3	I find it easy to access and play M-SNGs when and where I want.	
Perceived enjoyment	PE1	I enjoy playing SNGs.	Koufaris (2002), Yi and Hwang (2003)
	PE2	I find M-SNGs enjoyable and fascinating.	
	PE3	I do not enjoy doing other things when I play M-SNGs.	
Perceived mobility	PM1	Mobility and M-SNGs make it possible to get real-time data.	Huang et al. (2007),
	PM2	It is convenient to use M-SNGs at anytime and anywhere.	
	PM3	Mobility is an outstanding advantage of mobile phones with M-SNGs.	
Perceived connectedness	PC1	I feel good because I can access M-SNGs via mobile systems.	Shin (2010)
	PC2	I feel connected to external reality because I can play the M-SNGs that I want to play.	
	PC3	I feel emotionally comforted because I can do something interesting and enjoyable with M-SNGs at my convenience.	
Perceived usefulness	PU1	I think M-SNGs are useful to me.	Davis (1989, 1993)
	PU2	It would be comfortable for me to play M-SNGs.	
	PU3	I find M-SNGs enjoyable and fascinating.	
Attitude	ATT1	It would be a wonderful idea to play M-SNGs.	Davis (1989, 1993)
	ATT2	I would have positive feelings toward M-SNGs in general.	
	ATT3	It is easier and better for me to play M-SNGs, as opposed to other games.	
Satisfaction	SS1	Overall, I am satisfied with M-SNGs.	Park and del Pobil (2013), Lee and Chung (2009)
	SS2	The SNGs that I am playing now meet my expectations.	
	SS3	I recommend M-SNGs to others who intend to play new mobile games.	
	SS4	M-SNGs are a beneficial tool in improving my life.	
Intention to use	IU1	I intend to play M-SNGs as much as possible.	Davis (1989, 1993)
	IU2	I intend to continue playing M-SNGs in the future.	
	IU3	I would rather play M-SNGs than other kinds of games.	

Table 2
Respondents' information in the main survey ($N = 1409$).

Age (yrs)	*N*	%
Under 20	282	20.0
21–25	669	47.5
26–30	292	20.7
31–36	131	9.3
Over 36	35	2.5
Gender		
Male	681	48.3
Female	728	51.7
A period of player experience		
2–3 months	355	25.2
3–6 months	801	56.8
6–12 months	148	10.5
Over 1 year	105	7.5
Education		
High school	262	18.6
College	889	63.1
Graduate or above	258	18.3
Mean times to play per week		
1–2 h	619	43.9
2–4 h	496	35.2
4–6 h	201	14.3
Over 6 h	93	6.6

leaving a final survey comprised of 28 items. The final questionnaire items in the main survey, along with their sources, are shown in Table 1.

After these procedures, a professional survey company conducted a two-month internet survey to evaluate the research model. Participants were instructed to answer all items on a 7-point Likert scale (1 = "strongly disagree", 7 = "strongly agree"). The company received 1579 responses. After an elimination procedure for data filtering, 1409 valid samples were used in the analysis. Table 2 shows the demographic information of participants. All participants answered that they

regularly play M-SNGs (with more than 2 months of experience), and that they spend more than an hour per week playing M-SNGs. The descriptive statistics were analyzed by predictive analytic software SPSS 18.0.

4. Results

4.1. Descriptive analysis

Table 3 shows descriptive analysis of the constructs. All average values were higher than 4.0, indicating that participants generally had positive attitudes toward mobile SNSs.

4.2. Analysis methods

The proposed causal connections were examined with structural equation modeling (SEM) and confirmatory factor analysis (CFA) methods. The software package LISREL 8 was used to evaluate the validity and reliability of the constructs (Table 4 and Table 5). Based on previous research, which recommends a sample size greater than 200 for accurate use of SEM (Anderson and Gerbing, 1988; Holbert and Stephenson, 2002; Fornell and Larcker, 1981), this study met the recommendations for sufficient sample size.

Table 3
Descriptive analysis.

Constructs	Mean	Standard deviation
Perceived control & skill	5.22	0.94
Perceived ease of use	5.19	1.01
Perceived enjoyment	5.67	0.95
Perceived mobility	5.44	0.89
Perceived connectedness	5.49	1.22
Perceived usefulness	5.01	1.04
Attitude	5.23	0.98
Satisfaction	5.11	1.33
Intention to use	5.13	1.22

Table 4
Internal reliability and convergent validity of the measurements.

Construct	Items	Internal reliability		Convergent validity		
		Cronbach's alpha	Item-total correlation	Factor loading	Composite reliability	Average variance extracted
Perceived control & skill	PCS1	0.88	0.86	0.82	0.92	0.83
	PCS2		0.86	0.90		
	PCS3		0.82	0.87		
Perceived ease of use	PEOU1	0.86	0.90	0.87	0.96	0.88
	PEOU2		0.89	0.90		
	PEOU3		0.88	0.91		
Perceived enjoyment	PE1	0.90	0.92	0.84	0.93	0.82
	PE2		0.81	0.83		
	PE3		0.87	0.88		
Perceived mobility	PM1	0.94	0.93	0.81	0.90	0.75
	PM2		0.88	0.75		
	PM3		0.82	0.82		
Perceived connectedness	PC1	0.93	0.91	0.86	0.93	0.81
	PC2		0.87	0.85		
	PC3		0.81	0.82		
Perceived usefulness	PU1	0.89	0.87	0.82	0.91	0.78
	PU2		0.86	0.85		
	PU3		0.77	0.76		
Attitude	AT1	0.86	0.81	0.82	0.91	0.76
	AT2		0.81	0.74		
	AT3		0.80	0.83		
Satisfaction	ST1	0.93	0.85	0.84	0.95	0.83
	ST2		0.89	0.86		
	ST3		0.91	0.83		
	ST4		0.93	0.87		
Intention to use	IU1	0.89	0.88	0.83	0.93	0.79
	IU2		0.81	0.79		
	IU3		0.77	0.82		

4.3. Validity and reliability of the measurements

The overall fit indices indicated that data from the main survey was well represented by the measurement model, with the exception of the χ^2/d.f. ratio (the recommended level for the ratio of χ^2/d.f. is 3.00; our results were χ^2/d.f. = 4.94, normed fit index (NFI) = .955, non-normed fit index (NNFI) = .951, incremental fit index (IFI) = .941, comparative fit index (CFI) = .933, goodness-of-fit index (GFI) = .928, adjusted goodness-of-fit index (AGFI) = .919, standardized root mean square residual (SRMR) = .048, and root mean square error of approximation (RMSEA) = .047.

4.4. Hypotheses testing

To evaluate the structural relationships, the hypothesized connections were analyzed. Although the ratio of χ^2/d.f. did not meet the recommended level, the overall fit indices of the proposed research model demonstrated an acceptable goodness of fit (χ^2/d.f. = 4.99, NFI = 0.945, NNFI = .936, IFI = .936, CFI = .937, GFI = .910, AGFI = .904, SRMR = .049, and RMSEA = .048). As shown in Table 6 and Fig. 2, the statistical results supported 13 hypotheses (with the exception of H2).

In the area of playful characteristics, perceived enjoyment was significantly determined by perceived control and skill (H3, β = .577, CR = 31.998, p < .001) and ease of use (H4, β = .491, CR = 28.927, p < .001). However, the hypothesized connection between perceived control and skill and ease of use was not supported (H2, β = .007, CR = 0.181, p > .05).

In the case of useful characteristics, perceived mobility had significant effects on perceived connectedness (H8, β = .513, CR = 24.499, p < .001) and usefulness (H9, β = .810, CR = 56.451, p < .001). In addition, perceived connectedness had a moderate effect on perceived usefulness (H10, β = .092, CR = 3.775, p < .001).

Attitude was influenced by four determinants (two strong factors and two moderate factors), including perceived usefulness (H12, β = .583, CR = 33.950, p < .001), perceived enjoyment (H6, β = .451, CR = 21.030, p < .001), perceived ease of use (H5, β = .197, CR = 10.245, p < .001), and perceived connectedness (H11, β = .198, CR = 11.671, p < .001). Lastly, intention to use was significantly impacted by three determinants, which were two strong factors (perceived usefulness, H13, β = .621, CR = 34.857, p < .001 and perceived enjoyment, H7, β = .542, CR = 30.480, p < .001) and one moderate factor (satisfaction, H14, β = .344, CR = 17.940, p < .001).

The integrated model showed that the combination of perceived usefulness, enjoyment, satisfaction, and attitude explain 74.6% of the variance in intention to use, while 69.8% of the variance in attitude is explained by the combination of perceived usefulness, enjoyment, connectedness, and ease of use. Perceived control and skill together with ease of use explain 41.3% of

Table 5
The results of discriminant validity; diagonal elements presented the square roots of the average variance extracted.

	1	2	3	4	5	6	7	8	9
1. Perceived control & skill	0.91								
2. Perceived ease of use	0.19	0.94							
3. Perceived enjoyment	0.44	0.29	0.91						
4. Perceived mobility	0.26	0.44	0.27	0.87					
5. Perceived connectedness	0.57	0.32	0.61	0.14	0.90				
6. Perceived usefulness	0.25	0.41	0.56	0.15	0.45	0.88			
7. Attitude	0.33	0.11	0.52	0.42	0.22	0.33	0.87		
8. Satisfaction	0.12	0.45	0.28	0.37	0.21	0.14	0.47	0.91	
9. Intention to use	0.47	0.33	0.42	0.26	0.35	0.35	0.55	0.23	0.89

Table 6
Results of the hypothesis tests; $^{*}p$ < .01, $^{**}p$ < .001, AT = attitude, IU = intention to use, PCS = perceived control & skill, PEOU = perceived ease of use, PE = perceived enjoyment, PM = perceived mobility, PC = perceived connectedness, PU = perceived usefulness, ST = satisfaction.

Hypotheses	Standardized coefficient	SE	CR	Results
H1. AT → IU	0.250**	0.027	11.792	Supported
H2. PCS → PEOU	0.007	0.021	0.181	Not supported
H3. PCS → PE	0.577**	0.036	31.998	Supported
H4. PEOU → PE	0.491**	0.041	28.927	Supported
H5. PEOU → AT	0.197**	0.025	10.245	Supported
H6. PE → AT	0.451**	0.029	21.030	Supported
H7. PE → IU	0.542**	0.030	30.480	Supported
H8. PM → PC	0.513**	0.044	24.499	Supported
H9. PM → PU	0.810**	0.029	56.451	Supported
H10. PC → PU	0.092*	0.031	3.775	Supported
H11. PC → AT	0.198**	0.042	11.671	Supported
H12. PU → AT	0.583**	0.045	33.950	Supported
H13. PU → IU	0.621**	0.024	34.857	Supported
H14. ST → IU	0.344**	0.036	17.940	Supported

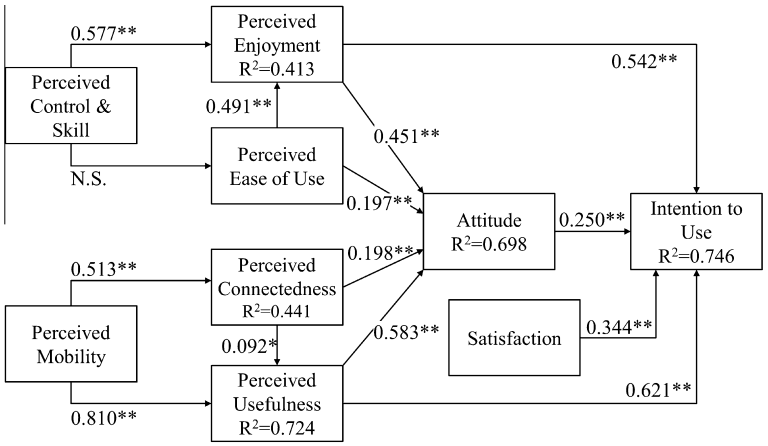

Fig. 2. Summary of hypothesis tests; $^{*}p < 0.01$, $^{**}p < 0.001$.

the variance in perceived enjoyment, the critical factor among playful characteristics, while perceived mobility and connectedness explain 72.4% of the variance in perceived usefulness, the critical factor of useful characteristics.

5. Discussion

The current study contributes a theoretical framework to explain a user-based decision process and examines the proposed research model by employing a SEM method to analyze the behavior of users of M-SNGs. Consistent with previous studies that focused on internet games and mobile services, the findings of this study confirm the proposed research model. The results contribute to our understanding of user acceptance of and intentions to play M-SNGs, and also help to elucidate implications for the successful development of better SNGs in future mobile environments.

The good fit indices between the data and the model and the notable levels of the path coefficients of the hypothesized links significantly support the validity of the proposed research model. Therefore, our findings indicate that the proposed research model accurately predicts and describes the intentions of users to play M-SNGs.

The current study finds that a combination of perceived enjoyment and perceived usefulness are the main determinants of user attitudes toward M-SNGs. This suggests that there are notable trends in the use of M-SNGs, including (1) players regard the level of enjoyment that comes from playing M-SNGs as the most significant factor of a game and (2) players want to get something useful out of playing M-SNGs (e.g., the enhancement of relationships with others). Enjoyment and usefulness are considered by users to be important factors in playing M-SNGs. Accordingly, it is valuable to explore the useful and enjoyable aspects of mobile environments. Although a total of four elements have significant effects on user attitudes, perceived usefulness has the most powerful effect on user attitudes toward M-SNGs. This finding can be interpreted to mean that psychological characteristics, which are represented by personal performance, matter more to users than the playful characteristics of games. In other words, players of M-SNGs are more affected by personal performance characteristics than playful factors. Discovery of this tendency offers a more detailed understanding of user behavior than previous studies, which have aimed to identify more general psychological results regarding the use of SNGs (i.e., positive versus negative factors in terms of user behavior). In other words, markets should provide M-SNGs that offer users the advantages of a product that is both enjoyable and useful.

Given the significant roles of perceived usefulness and enjoyment in the integrated model, this study attempts to find motivations for these two factors. Perceived mobility is the motivation and connectedness is the intermediate factor in the category of useful characteristics (relating to personal performance). On the other hand, there are two independent motivations in the playful category, namely, perceived control and skill and ease of use. Consistent with a large number of previous studies, this study generally supports the relationships in both sectors. However, in contrast to other relationships, the relationship between perceived control and skill and ease of use is not supported. This result may be different from other entertainment systems designed for enjoyment or other SNSs. It may be that players of M-SNGs expect a period of adjustment and adaptation if they experience difficulties in controlling the games. That is, the level of control and skill may not be related to ease of use for users of M-SNGs.

Consistent with the powerful effects of perceived usefulness and enjoyment on user attitude, these factors also show significant effects on intention to use. That is, there are two critical factors that impact intention to use (perceived control and skill – perceived enjoyment – attitude – intention to use, perceived mobility – perceived usefulness – attitude – intention to use).

Interestingly, the effect of perceived mobility on perceived usefulness is stronger than the effect of perceived usefulness on intention to use. Similarly, the effect of perceived enjoyment on intention to use is weaker than the effect of perceived

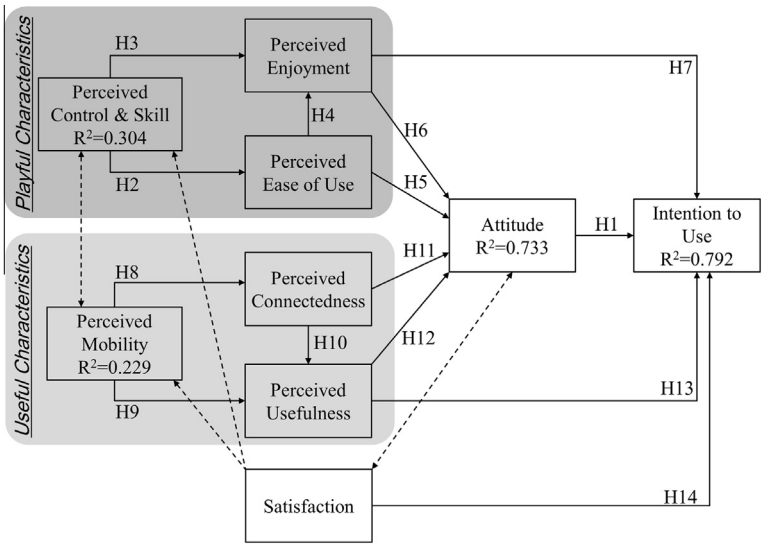

Fig. 3. The extended model with satisfaction.

control and skill on enjoyment. Thus this study expects that perceived mobility and perceived ease of use play moderating roles by enhancing other connections with regard to the user experience of playing M-SNGs.

Taking into account this finding regarding perceived control and skill and perceived mobility, further perform investigation should be performed to analyze possible connections with other constructs. As presented in Fig. 3, this study attempts to examine the following:

A. What is the determinant of perceived mobility and perceived control and skill?
B. What are the interaction effects between perceived mobility and perceived control and skill?

The results from the integrated model indicate the presence of notable interaction effects between perceived mobility and perceived control and skill. The model also demonstrates the clear role of user satisfaction as a determinant of both perceived control and skill and perceived mobility. The integrated model has better fit indices and a higher explanatory degrees than the initially proposed research model (Attitude: $R^2 = 0.698 \rightarrow 0.733$, Intention to use: $R^2 = 0.746 \rightarrow 0.792$). This finding qualifies as a significant theoretical attempt among all technology acceptance studies, including existing literature about mobile communications and internet games. The model indicates that user satisfaction significantly affects both perceived control and skill and perceived mobility. In addition, the model identifies the role of perceived satisfaction as an antecedent and motivation of both enjoyment and usefulness and supports this role with statistical analysis. Furthermore, the model identifies that satisfaction makes a significant contribution to predicting and enhancing the intention of users to play M-SNGs. This finding is supported by the findings of previous studies of the relationship between perceived usability and satisfaction.

Given that perceived control and skill shows a high degree of significance in the model, we can conclude that improved degrees of control and skill among players lead to enhanced feelings of satisfaction. Previous studies focused on user satisfaction show that perceived satisfaction is one of the most important factors in determining the general behavior and continual intention of users to use a technology or service (Park and del Pobil, 2013). User satisfaction also has a notable impact on user attitude, together with four other factors (enjoyment, ease of use, connectedness, and usefulness) that show significant correlations with user attitude.

6. Implications

The results of this study have several practical and theoretical implications for researchers as well as developers and distributors of M-SNGs. From an academic point of view, this study provides an understanding of a measurement matrix that includes perceived connectedness, mobility, control and skill, and satisfaction, as well as the relationships among these factors. Many recent studies on internet games and SNGs have identified connections between factors that have notable effects on user attitudes and motivations toward social technologies in network environments. This study not only proposes and identifies user attitudes toward M-SNGs, but is also the first to introduce perceived connectedness, control and skill, and mobility as motivational factors in an integrated model. Moreover, this study finds user satisfaction to have a core role with significant effects on perceived control and skill and perceived mobility. User satisfaction is also significantly associated with user attitude. Although a large number of studies have investigated the crucial role of perceived enjoyment and perceived

usefulness in understanding the attitude of users toward mobile services and online games, few studies have focused on the usage of SNGs in mobile environments. Therefore, the following questions remain:

A. Do other cognitive or psychological factors affect user behavior in playing M-SNGs?
B. Are there any other issues to consider in designing M-SNGs and other games of comparable purposes (i.e., educational games)?

The current study integrates and extends previous studies that focus on SNGs in the context of mobile environments. The statistical results can be used to extend the TAM concept to future iterations of mobile systems, internet services, and gaming contexts (e.g., web 3.0 and smartphone applications). The results demonstrate that new services in mobile environments, social networking services, and gaming contexts should be launched in a user-centered way to provide more meaningful services and acquire a better understanding of the user experience. Mobile SNGs can provide academic researchers in the fields of information systems and services a large number of new opportunities in terms of various game purposes (i.e., educational and connecting with friends) to further apply previous findings to new contexts. Because the TAM has rarely been applied in studies of social technologies, the current study provides a novel example of using the TAM with social technologies, and suggests the notable roles of enjoyment, usefulness, mobility, and control and skill in helping players use technologies smoothly. In addition, this study focuses on the enjoyable and useful motivations for playing M-SNGs. Academic researchers in the fields of information services and systems are showing increasing interest in studying more content-specific and detailed user behaviors regarding specific technologies and services. This trend of moving from general to specific content indicates that the main focus of evaluating services and systems has moved from the hardware and software of systems and services to the users, content, and personalized features of systems and services. In the current study, the factors of emphasis (mobility, control and skill, enjoyment, and usefulness) are drivers and antecedents of the use of M-SNGs and technologies. Thus, the integrated model provides a user-based heuristic contribution to the development of future studies related to SNGs in a mobile context.

From the perspective of the industry, the practical implications of the results can be used as a framework for the development and distribution of M-SNGs. Although the majority of successful M-SNGs to date have been free for users to access and play, game providers and developers want to achieve economic profits from M-SNGs. In order to do so, it is necessary for M-SNGs to become part of the mainstream game industry. In addition, studying user behaviors is an essential part of laying the groundwork to achieve economic profit. Given that the majority of educational and commercial internet games show good hedonic qualities and well-organized educational content, industry researchers and developers should make significant efforts to provide useful services and contents, as well as to deliver enjoyable games in mobile environments.

The statistical finding that user satisfaction plays multiple roles in the integrated model indicates that providers should control and maintain the degree of perceived satisfaction of users in playing M-SNGs by improving their games based on the experiences of users.

Lastly, this study facilitates our understanding of user behaviors related to SNGs in mobile environments, as well as the development of more effective models. When users elect to play SNGs in mobile environments, it can be inferred that they want to interact with, communicate with, and entertain others anywhere and anytime. Accordingly, M-SNGs will be further improved to be more effective games for communicating and interacting with others by ensuring the quality of service for popularity and user satisfaction.

The results of the current study also provide a foundation for industry researchers to investigate evaluation guidelines of specific services provided in mobile environments. The proposed model is suitable for investigating a framework and adapting services directed specifically at innovative user attitudes.

7. Limitations and future studies

There are limitations and caveats to research findings in this paper. First, the results may be difficult to generalize. The distribution of participants in the main survey is imbalanced. For example, many of the participants in the current study were young, as shown in the demographic information of participants, because the majority of players of M-SNGs are young.

Second, there may be some important missed connections in the research model. The model is organized by constructs of similar properties with extremely high values of correlation (i.e., mobility and connectedness), and thus the results of the current study may include some inaccurate evaluations. This study uses a concise and simple model by eliminating complex relationships among the conducted factors and by hypothesizing tidy connections. There may be other possible factors that have significant effects on behavioral intention to use. Exploring other possible connections can be a starting point for future research. It would be useful to clarify the various aspects of user satisfaction (i.e., service, system, or content) in terms of M-SNGs.

Third, this study does not include some factors that may significantly contribute to the integrated model (i.e., regional differences and nationalities; Kim et al., 2011; Kofod-Petersen et al., 2010; Vasalou et al., 2010). Because there are significant differences across various types of common M-SNGs, user experiences with each game are likely different from each other. The unified theory of acceptance and use of technology (UTAUT) is regarded by many as one of the most powerful adoption

frameworks to explain the behavior of users of information systems and services. Therefore, future research should consider the demographic information of respondents as covariates in statistical analyses such as gender, region, and age.

Fourth, the differences between M-SNGs and other games are not considered herein. Therefore, future researchers should explore changes and differences in M-SNGs from a long-term perspective.

There remain a large number of unresolved questions regarding SNGs and mobile environments. For instance, detailed methods to develop SNGs for use with mobile communications are not proposed in the current study. However, in spite of several limitations, this study provides a foundation for advanced exploration of user experiences with social technologies in mobile environments.

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