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Why do people play social network games?

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ABSTRACT

Recently, Social Network Games (SNGs) over social network services have become popular and have spawned a whole new subculture. This study examines the perceived factors which contribute to an SNG user's behaviors. It proposes an SNG acceptance model based on integrating cognitive as well as affective attitudes as primary influencing factors. Results from a survey of SNG players validate that the proposed theoretical model explains and predicts user acceptance of SNG very well. The model shows fine measurement properties and establishes the perceived playfulness and security of SNGs as distinct constructs. The findings also reveal that flow plays a moderation role that affects various paths in the model. Based on the results of this study, both the appropriate practical implications for SNG marketing strategies and the theoretical implications are provided.

1. Introduction

Online Social Network Services (SNS) have experienced exponential growth in membership in recent years (Barker, 2009). Along with the popular SNS trend, social games – essentially games created to be playable within existing major social networking websites – seem poised to start a revolution in the game industry akin to the one initiated by downloadable casual games. A Social Network Game (SNG) is a type of browser game that is distributed primarily through social networks, and typically features multiplayer and asynchronous gameplay mechanics (Järvinen, 2009). SNGs are amongst the most popular games played around the world, and include several products with tens of millions of players. 'Top Eleven Football Manager', 'FarmVille' and 'Dawn of the Dragons' are examples of popular social network games. These games using social connections have multiplied like wildfire on social networking sites. They represent a viable business opportunity for game developers, and approximately $98 million has been invested in social game companies last year. Mobile game developers, casual game developers, and web programmers are forging ahead with social games (Kleinman, 2009). In 2009, EA purchased Playfish, a developer of SNGs, in a deal worth $300 million, and another $100 million was provided upon completion of certain milestones (Grossman, 2009).

While SNGs offer a new range of opportunities for user entertainment and experience, privacy and security have emerged as critical issues in the SNG environment (Chen, 2010). A security issue arises when a hacker gains unauthorized access to a site's protected coding or written language. Privacy issues involving unwarranted access of private information do not necessarily involve security breaches. Anyone can gain access to confidential information simply by watching a user type a password. Both types of breaches are often intertwined on social networks, especially since anyone who breaches a site's security network has easy access to the private information of any users. Take Zynga games over Facebook for example that users have live feeds from friends participating in the games, which seem harmless enough. However, the company offered players extra chips in an online poker game if they installed a toolbar that was impossible to remove. Such revenue-generating tactics are unfortunately not all that uncommon in the SNG environment, and Zynga is not the only offender. Users can earn some money based on their activity within the game, but in-game earnings are not enough to maintain interest. To accumulate significant amounts of currency, players can either purchase some with their credit card or sign up for an account with a third-party service.

Often users are asked to fill out surveys in which players can win currency. At the end of the survey, they are asked to provide their phone number so that they can receive a PIN via text to get the results. Once they have entered that PIN into the site, they are subscribed to a horoscope service – something they would not know unless they diligently read all the fine print. The victims could immediately try to cancel the subscription, but they could still end up being charged. Unwanted charges are not the only thing players are susceptible to; SNGs make players a target for viruses and hackers as well. Zynga's community forums have a couple of threads in which moderators warn users against accept-

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ing any gifts or invitations within a certain game on Facebook. But they did not specify exactly what would happen if users accepted these buggy gifts or requests. Acknowledging the series of vulnerabilities, Facebook recommend that players create a separate Facebook account strictly for gaming and socializing other players. But this kind of security affects the enjoyment and playfulness of SNGs.

Despite the burgeoning concern over security and stability, only a few studies have explored such issues in SNGs, leading to a paucity of information on how security concerns influence the playability of SNGs (Fogel & Nehmad, 2009). This study examines SNG players' perceptions of playfulness and security and their effects on other variables. Although a number of researchers have examined individual privacy concerns and company privacy policies in a diverse Web environment (e.g., Hoffman, Novak, & Peralta, 1999; Jarvenpaa, Tractinsky, & Vitale, 2000; Kim, Steinfiled, & Lai, 2008), little is known about what factors positively and negatively influence individual user acceptance of SNGs.

This study proposes a new model that can be applied to social technologies to generate a model of SNG acceptance. Using the model, the present study develops and validates methods to measure positive and negative user factors, namely, the effect of perceived playfulness and security on SNG acceptance. A Structural-Equation Modeling (SEM) analysis tests the relational model of the antecedents and the consequences of attitudes toward SNGs. SEM enables this study to vigorously test the convergent, discriminant and nomological validity of the model constructs or how well the predictions of the model are verified. To explore the relationship between SNG acceptance models, this study takes a user-centered approach, focusing on player dimensions in order to identify the primary forces driving the use and adoption of SNGs. This paper addresses a key research question: what are the customer factors that drive and inhibit the intention to play SNGs? The purpose of the inquiry is to identify the role of security and enjoyment in SNG intention and adoption. Kim et al. (2008) show that improved privacy measures on the Web improve perceived security, which has a direct effect on the intention to adopt online services. The research further shows that Perceived Usefulness (PU) is affected and this in turn affects perceived security and privacy. The present study examines this premise in the SNG context to ensure that the findings are of interest to both academics and practitioners.

This study makes both theoretical and practical contributions. This study seeks SNG-specific factors and attempts to shed light on new sets of user factors in social games. Many researchers call for more research on context-specific, as opposed to generic, behaviors with certain technologies. This is particularly important to social technologies, which consist of new concepts and different paradigms. Therefore, the theoretical contribution of this study lies in highlighting the users' emotional aspect of technological availability and identifying the essential role it plays in guiding PU and attitude. Although extensive research has examined various factors (e.g., TAM factors such as usefulness, ease of use, and enjoyment) that drive people to adopt and use SNSs in general (Boyd & Ellison, 2007; Byrne, 2007; Chiu, Cheung, & Lee, 2008; Hargittaii, 2007; Kim & Yun, 2007; Rosen & Sherman, 2006), not much SNG-adoption research has focused on specific factors. This study addresses this gap by examining players' beliefs about security and playfulness in SNGs. This exploratory study seeks new variables based on structural relations with other variables. Perceived Enjoyment (PE) along with Perceived Security (PS) are used as new constructs that reflect SNG-specific features in the Web3.0 environment.

The findings of this study provide a good basis for industry to develop a service evaluation framework that can determine the adoption potential of new services. The SNG industry is trying to ensure that games are more accessible and dynamic for players. As SNGs clearly represent a specific market segment, a thorough user analysis is necessary in order to ensure their success. The acceptance model used in this study seems well suited for developing such framework. It can be applied to services that are adopted for functional reasons and services that are directed specifically at innovative user attitudes. In particular, enhanced coverage and quality of services are essential factors that will determine the success or failure of businesses. Accordingly, the SNG industry should build more reliable networks and stable platforms to enhance its coverage and quality of service. In the long term, the industry should forge new ground as a Web3.0 platform system to integrate various services and content. The findings of this study should be interesting to firms in their general attempts to increase SNG usage and to understand the factors affecting attitude and intention.

The remainder of the paper is organized as follows: Section 2 offers a literature review of SNGs; Section 3 develops the hypotheses tested in the study and proposes the research model; Section 4 describes the research method used; Section 5 provides the results of empirical tests, followed by discussion in Section 6. Finally, Section 7 concludes with the study's limitations as well as directions and implications for future research.

2. SNG popularity soars, challenges loom

Social games – essentially games created to be playable within existing major social networking websites – represent a fast growing phenomenon and are emerging as the top application of SNSs (Chen, 2010). SNGs can be defined as a structured activity which has contextual rules permitting user engagement. The games are multiplayer games that have one or more of the following features: turn-based, based on social platforms providing users with an identity, and casual. Unlike causal gaming, where users played alone and titles cost a fee to download, social games are built to be enjoyed and shared with friends through existing social networks and platform like smartphones. The iPhone and iPod touch are the perfect formats for SNGs, enabling existing fans to play, challenge and enjoy SNGs wherever they are. One of the most popular online networking games is Zynga's Farmville, which is a highly interactive game that is now touting over 81 million fans. Zynga minces no words when it states that it's now bigger than Twitter, which is true, and Zynga is confident that this fact is widely known. The game is just one of many Zynga properties, but considering the number of players on Facebook, it's the biggest one. Other popular SNGs are 'Mafia Wars', 'Farm Town' and 'Restaurant City' on social networks.

Compared to the highly penetrated SNS market, social games are still a small segment of the market, representing no more than $500 million in 2010. But because of its popularity on sites like Facebook and MySpace, SNGs have exploded and are tapping into a broad swath of mainstream users who have shied away from buying and downloading games. That has made it the fastest-growing game market. Since its inception around 2007, Zynga has reached the point where it is on track to generate over $2 billion in revenue by 2012 (Grossman, 2009). Zynga has built a customer base of more than 230 million monthly active users on Facebook, which is an increase from the 30 million that it had in April 2009 (Järvinen, 2009). With the Facebook platform, Zynga has the ability to cross-promote new titles and turbo-boost the business. As another example – PetVille – was launched in December 2009 and it already has 18 million users (Kleinman, 2009).

Zynga and other popular games offer advantageous benefits over traditional video games. In social games, friends are not really friends; they are mere resources. They are not just

resources for the player, but also for the game developer, who relies on the insipid, viral aspects of a design to ensure system replication. Unlike traditional video games, which have rich graphics and sounds, social games are much simpler and cost less to develop. For example, it may take several designers 2 or 3 months to launch a game. Based on user experimentation, the designers will then make modifications. While a conventional game may take $2 million to $3 million to create, an SNG can be made for around $100,000 to $300,000 (Grossman, 2009). To increase distribution, SNGs are generally free to play. Developers recover their investment through ads, marketing offers, and sales of virtual goods and in-game currencies. This has proved to be a winning formula for some of the biggest social-gaming companies. The new SNG firms are shaping a new business model for the larger video game industry. By enticing a much larger number of players with a free price system and then monetizing some fraction of them, companies like Zynga and Playfish can still be greatly profitable. The games do not necessarily involve real-time competition or interaction. Many are asynchronous, meaning players can play on their own time while checking in at various points of the day. But because they tap into existing connections in one form or another, they heighten the sense of camaraderie, competition and pride found in gaming.

As a result of their immense popularity, the shortcomings of current social game deployments have come to light (Kleinman, 2009). One of the glaring problems with existing SNGs lies in their vulnerability. For example, concerns over violence and pornography have led to Chinese authorities considering extraordinary government registration fees for SNGs. Another concern is security. In order for users to achieve high scores, social entertainment applications require users to gather a considerable number of friends and supporters to play the same game, leading to player-development of social gaming channels, and groups and fan pages to facilitate player interaction. Spammers and phishers exploit the increasing trend of social gaming with fake profiles and bots that send spam messages to groups. Unlike regular social networking spam where users are enticed to add the spammer to their circle of friends, social gaming-related phony profiles are willingly added by users as an instant consequence of their interest in broadening the community of supportive players. This makes it difficult for bogus accounts to be automatically suspended, since the actions of spammers do not constitute abuse. In short, the security implications are numerous, ranging from the consolidation and increase of spamming power, data and ID theft and accounts hijacking to malware dissemination. These threats could reduce the playability of SNGs and thus user enjoyment of games would also be dwindled.

3. Acceptance model of SNGs

3.1. Attitude toward social network services

The Theory of Reasoned Action (TRA) suggests that the performance of a specified behavior by an individual is determined by his or her behavioral intention to do it, which is jointly determined by the person's attitudes and subjective norms (Ajzen & Fishbein, 1980). The best predictor of behavior is intention, which is the cognitive representation of a person's readiness to perform a given behavior. The TRA defines an *attitude toward a behavior* as an individual's positive or negative feeling about performing the target behavior, while a *subjective norm* refers to a person's perception as to whether most people who are important to him/her think he/she should/should not perform the behavior in question. In addition, a person's attitude toward a behavior is determined by his/her salient beliefs and evaluations.

Based on the theoretical foundation, the general causalities found in the TRA also apply in a SNG context.

H1. Attitude toward SNGs has a positive effect on the intention to play SNGs.

H11. Intention has a positive influence on actual behavior of SNGs.

3.2. Perceived enjoyment

SNGs are a hedonic system that offers entertaining content and playful services. As a hedonic system, SNGs are better suited to enjoyment than ease of use systems. While Davis, Bagozzi, and Warshaw (1992) classify enjoyment as a type of intrinsic motivation and PU as a type of extrinsic motivation, they define enjoyment as the extent to which computer system usage is perceived to be personally enjoyable in its own right aside from the instrumental value of the technology. Shin (2009) researched online services from the perspective of utilitarian and hedonic frameworks and found that PE as a hedonic purpose strongly influenced online use for entertainment purposes. It can be hypothesized that people seek the hedonic SNS for entertaining purposes.

H2. PE has a positive effect on intention to use SNGs.

H3. PE has a positive effect on attitude towards SNGs.

3.3. Perceived playfulness

Perceived Playfulness (PP), which is an intrinsic motivator toward technology, is defined as the level of user curiosity during an interaction with a technology (Moon & Kim, 2001). The PP used by Moon and Kim (2001) provides a better explanation than the original one proposed by Davis (1989). They found that PP was positively related to attitude toward use and perceived ease of use. However, in Moon and Kim's study, all possible Internet applications are generalized by the Web. Our study extends Moon and Kim's work by exploring the role of PP in the context of SNGs. This extension nicely fits into a social game context, which needs to have a number of elements that encourage player engagement amongst friends. It needs to provide users with different ways to interact with their real world associates. These elements can be well represented by PP. While relations between PP and attitude/intention have been included in several other studies (e.g., Chung & Tan, 2004), no research investigates how playfulness is related to enjoyment.

H4. PP has a positive effect on PE of SNGs.

H5. PP has a positive effect on attitude towards SNGs.

3.4. Perceived usefulness

TAM uses two distinct but interrelated beliefs, PU and perceived ease of use, as the basis for predicting end-user acceptance of computer technology. Of the two TAM variables, studies have found PU to have the strongest influence (Davis, 1989). The orthodox definition of PU by Davis (1989) is how strongly a person believes that using a particular system enhances his or her job performance. The current study highlights the aspect described as "capable of being used advantageously." This represents a significant conceptual shift from collective productivity to personal productivity.

H6. PU has a positive effect on intention to play SNGs.

H7. PU has a positive effect on attitude towards SNGs.

3.5. Perceived security

Online social networking has been criticized because users lack trust in site security (Dwyer, 2007). Yenisey, Ozok, and Salvendy (2005) define PS as how strongly people believe in the security of a particular SNG. Therefore, we can interpret subjective security as the mirror image of risk affinity (Dewan & Chen, 2005). Security in interactive spaces does not depend on technical security measures alone (Roca, García, & de la Vega, 2009). Kim (2008) argues that the feeling of security is largely determined by users' feelings of control in an SNS system. Pousttchi (2003) argues that an infringement of subjective security prevents consumers from using a particular procedure. Linck, Pousttchi, and Wiedemann (2006) developed a set of constructs that explains the nature of subjective security.

In line with previous studies, the current study approaches PS from a broader perspective that includes not only technical aspects such as confidentiality and authentication (Flavian & Guinaliu, 2006), but also the user's comprehensive sense of security and well-being. Of SNGs, it can be said that individuals' perceptions of security can differ from real security levels. Although a scientific assessment of security is based on technological solutions, it is the users' perceptions of security that influence trust and intention (Linck et al., 2006). Previous studies have discovered the role of PS in an e-commerce and mobile commerce context, but only a few studies have applied it to an SNS context (Acquisti & Gross, 2006; Dwyer, 2007). It is worthwhile to establish measures of PS and its relationship to other factors in the SNG context.

H8. PS has a positive effect on users' PU of SNGs.

H9. PS has a positive effect on users' attitude toward SNGs.

3.6. Flow

Flow is the mental state of operation in which person is fully immersed in what he or she is doing characterized by a feeling of energized focus, full involvement, and success in the process of the activity (Shin, 2010). During the interaction with the entertaining object, a strong sense of being there (telepresence or immersion) is developed, which leads to a much more thorough exploratory behavior afterward. The concept of flow in this study focuses on the sense of immersion, which highlights users' social interaction. Presence has been recognized as a key performance goal for many systems and can provide insights into the medium's ability to provide the feeling that the user is "there" inside the media (Nowak & Biocca, 2003). When the user is telepresent, they feel immersed in the environment represented by an SNS (Shin & Kim, 2008). Telepresence is described as the user's compelling sense of being in a mediated space different from where their physical body is located. The flow constructs can be used as valid metrics for the SNG experience.

H10. Flow experience has a positive effect on the intention to play SNGs.

Based on the above hypotheses, following model is proposed (Fig. 1).

4. Research methodology

4.1. Survey development

In order to formulate general ideas about users' factors of SNGs, pre-survey interviews were conducted for the following purposes: (1) to cross-validate factors identified from the literature; (2) to learn about SNG-specific factors; and (3) to guide the survey question design. Interview respondents were selected from students enrolled in virtual community courses at a private university in Seoul, Korea. The selection of interviewees was based on the principle of purposeful sampling – a great deal of information can be obtained from a limited number of participants. A total of 19 students were interviewed, 10 female and 9 male students from different departments in different academic years. Although the use of a college student sample is not ideal, there is evidence that college students are in many ways similar to SNSs and online game users more generally (Hargittaii, 2007). A student sample is justified given that SNS users fit the demographics of college students between the ages of 18 and 30. Participants were asked to write down their thoughts about playfulness, security, flow and attitudes toward SNGs on sticky notes and then post the notes under the four categories provided by the researchers.

Based on the initial survey, a pretest was conducted to confirm the validity and reliability of the survey. Students enrolled at the same university participated in the pretest for extra course credit ($N = 28$). Respondents were asked about any difficulties they may have encountered in the survey (e.g., ambiguous

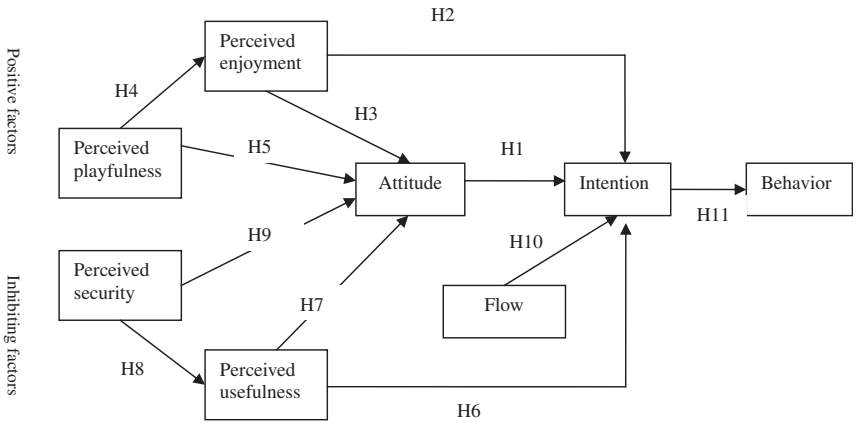

Fig. 1. A proposed model of SNG acceptance.

Table 1
Characteristics of respondents (total = 280).

Age	Number	Percentage (%)
Under 20	98	35.0
21–30	172	61.4
31–40	60	21.4
41–50	49	17.5
Over 51	1	0.35
Education		
High school or below	70	25.0
College	155	55.3
Graduate school or above	55	19.6
Gender		
Female	131	46.4
Male	149	53.2
SNG experience		
0–3 months	51	18.2
3–6 months	169	60.3
6 months–1 year	52	18.5
More than a year	8	2.8
SNG site		
Zynga Farmville	92	32.9
Mafia Wars	78	27.8
Farm Town	53	18.9
Restaurant City	36	12.8
Others	21	7.5

Table 3
Principal component analysis with varimax rotation.

Component	1	2	3	4	5	6	7
PU1	**0.773**	0.134	0.189	0.299	0.123	0.152	0.239
PU2	**0.747**	0.292	0.232	0.045	0.211	0.134	0.135
PU3	**0.700**	0.219	0.264	0.370	0.233	0.023	0.272
PS1	0.163	0.287	0.243	**0.810**	0.150	0.151	0.363
PS2	0.262	0.194	0.301	**0.751**	0.180	0.121	0.116
PS3	0.227	0.224	0.273	**0.762**	0.190	0.338	0.258
PE1	0.199	0.329	0.119	0.229	0.253	**0.815**	0.225
PE2	0.099	0.263	0.109	0.444	0.629	**0.863**	0.256
PE3	0.279	0.192	0.171	0.383	0.240	**0.737**	0.327
PP1	0.194	**0.734**	0.189	0.299	0.123	0.152	0.239
PP2	0.224	**0.892**	0.232	0.045	0.211	0.134	0.135
PP3	0.329	**0.819**	0.264	0.370	0.233	0.023	0.272
FL1	0.299	0.123	**0.752**	0.239	0.299	0.123	0.152
FL2	0.045	0.211	**0.834**	0.135	0.045	0.211	0.134
FL3	0.370	0.233	**0.903**	0.272	0.370	0.233	0.023
AT1	0.093	0.201	0.181	0.047	**0.729**	0.250	0.187
AT2	0.134	0.189	0.299	0.123	**0.852**	0.239	0.329
AT3	0.292	0.232	0.045	0.211	**0.836**	0.135	0.299
IT1	0.134	0.189	0.299	0.123	0.152	0.239	**0.772**
IT2	0.292	0.232	0.045	0.211	0.134	0.135	**0.742**
IT3	0.219	0.264	0.370	0.233	0.023	0.272	**0.701**
α-value	0.8883	0.8961	0.8477	0.8511	0.9101	0.8877	0.8672
AVE	0.69	0.72	0.79	0.81	0.71	0.61	0.81

Note: Numbers in bold shows loading coefficients for items in each construct.

questions or terms). They were also asked about their opinion of the survey in general. Feedback and information from the pretest were used to develop a final survey questionnaire. Finally, quantitative research experts reviewed and modified the wording of items based on the pilot test outcomes. The reliability of the survey instrument was established by calculating Cronbach's alpha to measure internal consistency. Each construct was tested for reliability and content validity, using Cronbach's alpha (Cronbach, 1971). Most of the scores were above the acceptable level, that is, above 0.70. The variables in this study, derived from the existing literature, exhibited strong content validity (PU: 0.89; PS: 0.91; PE: 0.92; PP: 0.94; Flow: 0.88; Attitude: 0.90; Intention: 0.92).

After the pretest, a survey agency conducted a 3-week online survey to evaluate the research model (see Appendix A for survey). Respondents were asked to rate each item on a five-point Likert scale, where one meant *strongly disagree* and five meant *strongly agree* (reverse coded items were added). The contracted agency gathered 301 responses, showing 21% of response rate. After eliminating insincere responses through data filtering, 280 valid and usable responses were selected as the sample. Of the respondents, 53.2% were female and 46.4% were male. Participants stated that they use SNGs regularly and spend about 1 h per week online on average. All the questionnaires used in this survey have been validated in previous studies. SPSS 16.0 is used for analysis of the descriptive statistics (Table 1).

4.2. Measurements

All the measures in the present study are based upon previously validated measures and are considered reliable. All of the constructs in this study were examined in terms of reliability, convergent validity, and discriminant validity. Reliability was evaluated using the composite reliability values. Hair, Anderson, Tatham, and Black (1998) recommended an acceptance level of 0.7 for the composite reliability. As summarized in Table 2, all of the constructs in the model have a value greater than 0.82 and meet this criterion. For convergent validity (Table 3), two criteria should be met, as suggested by Fornell and Larcker (1981): (1) all of the factor loadings should not only be significant but should also exceed 0.7 and (2) Average Variance Extracted (AVE) by each construct should exceed the variance due to measurement error for that construct, i.e., AVE should be greater than 0.5. As listed in Table 2, most items revealed

Table 2
Cronbach's alpha reliability and correlations.

Construct	Cronbach's alpha	CR[c]	AVE[a]	AVE and squared correlations						
				PU	PS	PE	PP	FL	AT	INT
PU	0.88	0.89	0.69	**0.81**[b]						
PS	0.93	0.94	0.72	0.73	**0.81**					
PE	0.89	0.90	0.79	0.69	0.58	**0.79**				
PP	0.82	0.84	0.81	0.34	0.52	0.35	**0.78**			
Flow	0.88	0.89	0.71	0.59	0.76	0.69	0.32	**0.87**		
Attitude	0.82	0.85	0.61	0.64	0.69	0.53	0.42	0.42	**0.80**	
Intention	0.91	0.91	0.81	0.47	0.45	0.37	0.39	0.19	0.52	**0.90**

*Cumulative % of variance: 73.1%.
[a] Average variance extracted.
[b] Square root of AVE on the diagonal in bold; correlations on the off-diagonal. For discriminant validity, diagonal elements should be larger than off-diagonal elements (Joreskog & Sorbom, 1996).
[c] Composite reliability.

loadings greater than 0.7 on their respective constructs. Table 2 shows that all AVEs were larger than the variance due to measurement error. Thus, the two criteria for convergent validity were met (Bagozzi & Phillips, 1991). Discriminant validity evaluates how much a concept and its indicator variables differ from another concept and its indicator variables. Discriminant validity was checked using criteria suggested by Fornell and Larcker (1981): the square root of the AVE should be greater than the correlation shared between the construct and other constructs. Table 2 presents the correlations among constructs, with the square root of the AVE on the diagonal. The shared variance (correlation) between each pair of constructs was less than the average variances extracted (diagonal values), providing evidence of discriminant validity.

5. Results

5.1. Model fit

The measurement model fit was examined by a Confirmatory Factor Analysis (CFA). Eight common model-fit measures were used to estimate the measurement model fit: (1) Chi-square/degree of freedom (χ^2/df); (2) the Goodness-of-Fit Index (GFI); (3) Root Mean Square Error of Approximation (RMSEA); (4) Root Mean square Residual (RMR); (5) Normed Fit Index (NFI); (6) Non-Normed Fit Index (NNFI); and (7) Comparative Fit Index (CFI). As Table 4 shows, all the model-fit indices satisfy their respective acceptance criteria suggested in the prior literature. Therefore, it is determined that the measurement model has a good fit with the data collected. Table 4 also shows the common model-fit indices, recommended values, and results of the test of structural model fitness. A comparison of all fit indices with their corresponding recommended values (Hair et al., 1998) indicates a good model fit.

Table 4
Fit indices for the measurement model and structural model.

Fit statistics	Measurement model	Overall model	Recommended value
χ^2/df	2.741	2.733	<5
GFI	0.907	0.905	>0.90 (Bagozzi & Yi, 1988)
AGFI	0.842	0.824	>0.80 (Fornell & Larcker, 1981)
RMSEA	0.057	0.059	<0.06 (Joreskog & Sorbom, 1996)
RMR	0.052	0.065	<0.08 (Bagozzi & Yi, 1988)
CFI	0.932	0.962	>0.90 (Joreskog & Sorbom, 1996)
NFI	0.941	0.924	>0.90 (Fornell & Larcker, 1981)
NNFI	0.939	0.947	>0.90 (Bagozzi & Yi, 1988)

Table 5
Summary of hypothesis tests.

Hypothesis	Path coefficient	*t*-value	Support
H1: Attitude → Intention	0.43**	5.120	Yes
H2: PE → Intention	0.49**	4.021	Yes
H3: PE → Attitude	0.22	0.336	No
H4: PP →PE	0.61**	4.001	Yes
H5: PP →Attitude	0.47**	2.459	Yes
H6: PU →Intention	0.41*	4.203	Yes
H7: PU → Attitude	0.27	0.413	No
H8: PS → PU	0.58**	3.232	Yes
H9: PS → Attitude	0.50**	5.280	Yes
H10: Flow → Intention	0.41*	3.935	Yes
H11: Intention → Behavior	0.39*	2.135	Yes

* $p < 0.05$.
** $p < 0.001$.

5.2. Structural paths and hypotheses tests

In order to test the structural relationships, the hypothesized causal paths were estimated. Eight hypotheses were supported while two hypotheses were rejected. Table 5 shows these results, which generally support the proposed model and illustrate the key roles of hedonic and utilitarian values in the model. The results stress the vital roles of playfulness and security in determining users' intentions to play SNGs. PP showed the greatest effect on PE ($\beta = 0.61$, $t = 4.001$), followed by PS ($\beta = 0.58$, $t = 3.232$). The model shows that PU has an insignificant effect on attitude, rejecting H7. In the same manner, we found that PS has a significant effect on attitude, supporting H9. Fig. 2 also illustrates the explanatory powers of constructs. The model finds that the combination of PU, PE, PS and PP explain 45% of the variance in attitude. The combination of attitude, PE, PU and flow, explained 39% of the variance of intention. The 39% R^2, a relatively low indicator, implies other possible hidden paths in the model.

6. Discussion: extended model

This study developed a theoretical framework describing a motivation-based decision-making process and tested the proposed model using a structural-equation modeling technique on SNG-user behavior. Consistent with prior literature that has investigated SNSs and online games (e.g., Dwyer, 2007; Gambi, 2009; Hsu & Lu, 2007; Maheswaran, Tang, & Ghunaim, 2007; Roca et al., 2009; Shin, 2010), evidence from this research provides empirical support for the proposed model. The results aid understanding of users' attitudes and intentions towards SNGs, and clarify the implications for the development of effective SNG services and applications. The results of the measurement and structural-model test lend support to the proposed research model by providing a good fit to the data and by showing significant path coefficients in the model. Overall, the results show that the models demonstrate good analytical powers and explain behavioral intentions in SNGs.

The research develops the constructs of PP and PS as the chief determinants of attitude toward SNG acceptance. Two significant predicators reflect current SNG trends: (1) users have concerns about the vulnerability of SNG security and privacy breaches when they play SNGs and (2) players consider the most critical factor of SNGs to be whether the game is playful and thus fun. Confidence is important and there is value in being able to explore new things in online environments (Hassanein & Head, 2007). Of the two factors affecting attitude, PP shows a much stronger effect on attitude than PS, implying a contrasting relationship between them. It can be inferred that positive factors are weighed against negative attributes. That is, players are more influenced by positive factors than negative factors when the two can coexist and interact. This finding is slightly different from previous studies (Barnes, 2007; Dwyer, 2007; Flavian & Guinaliu, 2006), which have argued for security over positive factors.

Related to this point, the model shows the highly significant roles of PP and PS, which sharply contrast to the insignificant roles of PE and PU. Previous studies have consistently shown the significant effects of PE and PU on attitude in hedonic services (e.g., Shin, 2009; Van der Heijden, 2004). In contrast to PE and PU, PP and PS have shown significant effects on attitude in the model, which implies that the user dimensions of SNGs may be different from other SNSs or other online hedonic systems. SNGs have so many unique features that users may want to see clearer motivations than those suggested by the typical

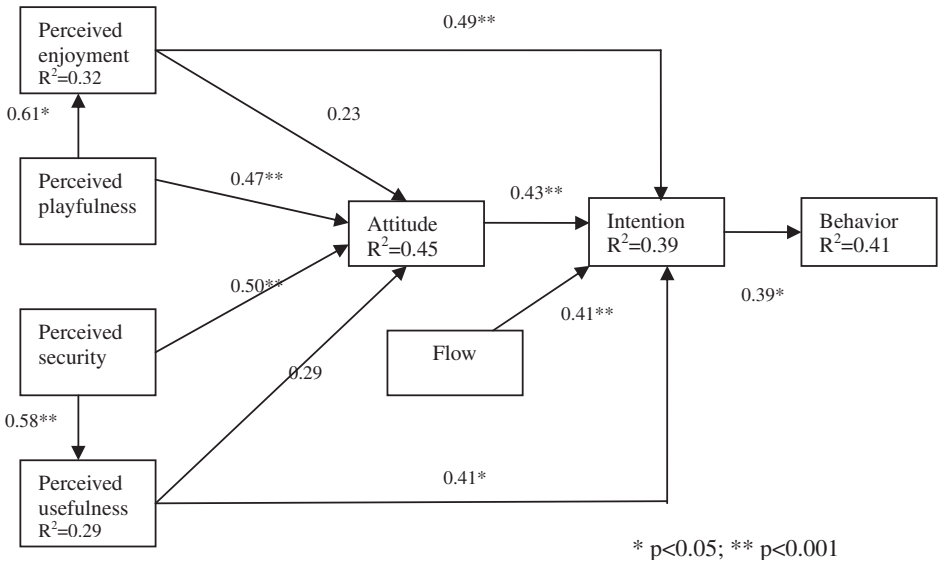

Fig. 2. Research result.

PE and PU. PP and PS represent concrete forms of PE and PU that users can feel more confident considering when formulating their attitudes. In other words, markets can provide many enjoyable and useful services, but SNG users want to clearly see what aspects are really safe to play (security) and fun to play (playability).

Interestingly, while the effects of PE and PU on attitude are weak, their effects on intention turn out to be significant. This can be explained by the fact that the effect of PP on PE is strong ($b = 0.61^{**}$; $t = 4.001$) and this effect transcends the path of PE to intention. In the same manner, the effect of PS on PU also influences the secondary effect of PU on intention. Thus, it can be said that PP and PS not only play facilitating roles but also moderating roles by enhancing other paths.

Given the significances of PS and PP, it is worthwhile performing further investigation to identify possible relations with other factors. An extended model (Fig. 3) tested the following: (1) the interaction effect between PP and PS and (2) the antecedents of PP and PS. The extended model showed the significant effects of the interaction between PP and PS as well as the clear role of flow as an antecedent to PP and PS. The extended model shows a better fit and has greater explanatory power than the initial model ($R^2 = 0.45 \rightarrow 0.58$ for attitude; $R^2 = 0.39 \rightarrow 0.47$ for intention). This represents an important theoretical contribution in TAM as well as game research literature. Previous literatures have researched the antecedents of PU and PE. This model not only identified the antecedents of PE and PU but also extended this by showing the antecedents of the antecedents for PE and PU. In the extended model, flow clearly influences both PP and PS.

The model further shows that flow apparently plays a role in enhancing intention. This finding supports previous research on flow (Nowak & Biocca, 2003; Shin & Kim, 2008). Considering the high level significance of PP, it is reasonable to argue that enhanced feelings of playfulness result in improved perception of flow. Recent research on flow indicates that flow plays important roles in determining a person's behavioral intention and actual behavior (Park, Lee, Jin, & Kang, 2010). The findings of this study advance previous studies by clarifying the relationship between flow, PP and PS in an SNG context. The extended model shows that flow relates significantly to perceptions of security and playfulness. While a moderate correlation exists between PE and PU, flow also has a significant effect on attitude. This effect implies a clear mediating effect of flow on intention through PP and PS. This mediating effect is resonant with the finding by Weibel, Wissmath, Habegger, Steiner, and Groner (2008) on the mediating role of flow in online games.

7. Theoretical and practical implications

The results highlight several implications for SNG researchers as well as SNG service providers. From a theoretical perspective, the study contributes to the understanding of the multi-dimensional matrix of PP, PS and flow. Recent studies on SNS such as Shin (2010) and Dwyer (2007) call for empirical research to understand the link between the factors affecting attitude and its antecedents in social technologies. In investigating overall acceptance of SNGs, the study proposes PP and PS as antecedents of PE and PU, which has a significant effect on attitude and intention. The finding further implies the key role played by flow, which affects PP and PS while also influencing attitude. Although extensive studies have found the role of PU and PE in the development of attitude towards Web services (e.g., Connolly & Bannister, 2007; Kim, 2008), few studies have explored the topic in the SNG context, leaving this illusive question unanswered: how much are players concerned with security and how much can such concern can be mitigated by playfulness? While future studies should further investigate this point, the theoretical contribution of this study lies in the exploration of SNGs with a new model of SNG-specific factors. This research extends previous work on social networks by providing empirical evidence and the findings shed light on the positive potential of the new TAM theory in new upcoming Web3.0 services. This underscores the fact that new services should be embedded in a user-centered approach to better understanding of user interfaces and user experiences. SNGs give TAM researchers some interesting opportunities for verification of their previous results. This research can be constructive to the TAM field, as it provides an overall architecture of how users attempt to put their media use in the best possible light. The TAM has not been extensively applied to social technologies; this study illustrates the robustness of the model and highlights the role security and playfulness play in smooth

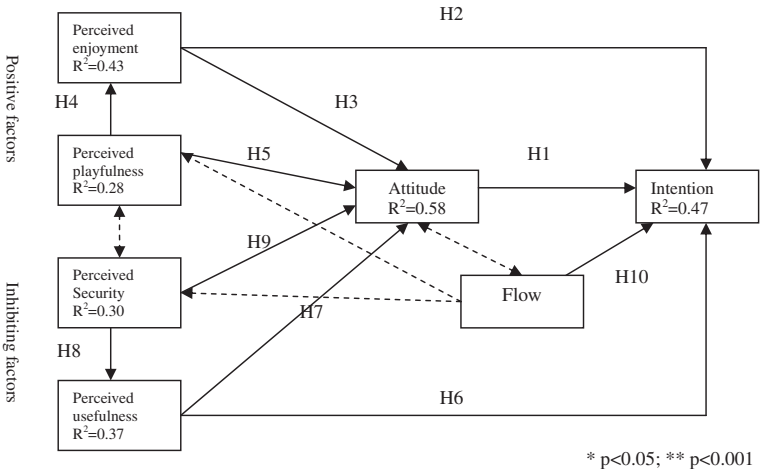

Fig. 3. Extended model with flow.

adoption, contributing to the literature on the security motivations of SNGs.

These findings could be used in TAM research where the results are not so readily verifiable; the findings could provide useful insights into how users responded to the initial survey. This could lead to a more comprehensive view of how people play SNGs, and, more importantly, how they interact with others through SNGs. In this regard, future studies should investigate additional motivations served by SNGs; how do individuals make sense of games from new platforms compared to the cognitions, emotions, and predispositions people derive from counterpart legacy technologies? Are SNGs really that much different from other games, and should they have a unique category in terms of user acceptance? It is worthwhile to explore new variables such as perceived interactivity and perceived sociality in upcoming Web3.0 social media. Researchers must also be willing to explore the direction of causality by examining changes over time with a longitudinal design. This is because SNG services continuously evolve in response to changing user needs. Finally, future studies investigating comparative data based on other types of games from different platforms (e.g., online game, mobile game) can provide additional insights into the social and cultural impact of new SNGs in Web3.0.

This study sheds light on the development of a new theory by grounding new variables in the TAM, by developing a new model, and by applying it in emerging SNG contexts. Technology acceptance researchers are increasingly interested in modeling context-specific, as opposed to generic, behaviors with certain technological artifacts. Such context dependence has been alluded to in the domain of user behavior, as well as in researchers' acknowledgment that evaluative criteria differ in terms of technology services, content, users and situations. The new variables of PS and PP in this study, which were shown to be valid and significant, ensure a consistent model of drivers of social technology and stable theory development. Hence, the model makes a heuristic contribution to growing research stream on social technologies.

Industry can frame the practical implications of these findings in terms of strategies and new models for SNG businesses. Until now, most SNGs have been free to play, but game developers will soon monetize applications as SNGs enter the mainstream. To monetize services, it is essential to capture user behaviors and provide the right services based on these behaviors. Since this study confirmed the vital role of security and playfulness in developing intention, industry players should put significant resources into establishing user trust as well as developing and delivering fun and enjoyable games. The finding that flow plays multi-dimensional roles indicates that vendors should establish user flow in SNGs by ensuring that their services are based on sublime users' experiences. Various flow-enhancing measures can be used to design SNGs from the start. Most significantly, SNG providers need to establish a trust relationship with consumers by developing and promoting comprehensive standards and ensuring that participants of privacy-seal programs adhere to those standards.

In conclusion, considering the ever-changing nature of the networked environment, this study aids understanding of user behaviors associated with SNGs and development of effective models. As users accept SNGs as a new way to entertain and bond with others, escape from reality, and communicate with others, and as firms provide enabling platforms for users, SNGs might evolve into a brilliantly effective application. To ensure their continued popularity, however, SNGs have several challenges to overcome, and user acceptance is probably the most important one. SNG developers need a better understanding of individual perceptions concerning the level of trust and the influence of security on intention to use. The findings of this study provide a good basis for industry to develop a service evaluation framework that determines the adoption potential of new services under the Web3.0 environment. The model is well suited for developing such a framework for services adopted for functional reasons and services directed specifically at innovative user attitudes.

8. Limitations

This study contributes to the ongoing literature by formulating and validating a proposed model to investigate factors contributing to adoption of SNGs. It also provides useful information for both academia and industry. Nonetheless, a number of common limitations persist, and empirical procedures, including methodological, sampling and interpretive limitations and some findings require further discussion. Firstly, responding users might not represent the whole population, because most users of SNGs are still young people. The subjects of the study were recruited as representatives of young users. Thus, this study does not provide a comprehensive picture of entire SNG communities but only provides a snapshot of a subset of users.

Methodologically, it would have been more rigorous to examine user motivations from different groups of users with a longitudinal investigation.

Secondly, the research model is not comprehensive, as it missed potentially important paths. The model is composed of conceptually similar constructs with very high correlations (for example, playfulness and enjoyment), suggesting that the findings in this study may be a result of inaccurate measures. As an exploratory attempt, this study set out with a simplified and parsimonious model by intentionally excluding complicated relations among factors. It is reasonable to infer other possible effects on intention. Possibly significant links can serve as a starting point for future studies; it might be helpful to unravel the complex multi-dimensional functions of human flow in the SNG environment.

While the contribution of this study may lie in clarifying such factors, most results do not represent breakthroughs because the fact that playfulness and security significantly influence attitude and intention can be intuitively understood. Future studies should develop more sophisticated instruments based on further clarification of conceptual differences.

Thirdly, the current study did not consider external factors for reasons of parsimony (i.e., different types of game, service provisions and content quality). Wide differences in services across different SNGs may exist, and user expectation and experiences may differ accordingly. Related to this weakness, the current study excluded individual differences that potentially influence SNG adoption as factors in SNG acceptance. Given a significant increase in variance of usage in adoption research, future studies will be able to consider demographic variables as covariates. Possibly, perceptions of security and playfulness are subject to gender biases, cultural differences, and user expertise. These dimensions may provide interesting recommendations based on the difference in trust-building mechanisms adopted for different genders and cultures. These limitations make analysis challenging, particularly the different attitudes and intention patterns. Given a significant increase in variance of usage in many studies, it may be essential to include individual variables. A closer inspection of individual differences and their direct and indirect effects on SNG usage offers rich opportunities for future research. Future studies can investigate the differences further by incorporating such external factors.

Despite several limitations, this study took an exploratory step towards examining user experiences on still-emerging social technologies and found a number of metrics that are reliable and nomologically valid. Many issues remain unresolved and several questions remain unanswered as SNGs on Web2.0 drastically evolve to Web3.0. SNGs on Web2.0 emphasize the social side of the online world, but we expect SNGs on Web3.0 to involve developed applications that emphasize focused groups with specialized features.

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Appendix A

Survey instrument (included reverse coded items).

Constructs	Measure items	Sources
Perceived usefulness	PU1: I think SNGs are useful to me PU2: It would be convenient for me to play SNGs PU3: I do not think SNGs can help me with many things	Davis (1989)
Perceived enjoyment	PE1: I enjoy playing SNGs PE2: I do not enjoy doing things with SNGs PE3: I find SNGs enjoyable and fascinating	Van der Heijden (2004)
Perceived security	PS1: I believe the information I provide with SNGs will be manipulated by inappropriate parties PS2: I am confident that the private information I provide with SNGs will be secured PS3: I believe inappropriate parties may deliberately view the information I provide with this SNG	Yenisey et al. (2005)
Perceived playfulness	PP1: When playing with SNGs I did not realize time had elapsed PP2: Playing in SNGs does not lead me much to exploration PP3: I had a positive experience from playing in SNGs	Moon and Kim (2001)
Flow	FL1: During an SNG game, I was intensely absorbed in the activity FL2: I strongly feel that I am inside a different world when playing SNGs FL3: When playing with SNGs, I do not feel any control	Nowak and Biocca (2003), Shin and Kim (2008).
Attitude	A1: I would have positive feelings towards SNGs in general A2: Using SNGs is does not appeal to me A3: It would be a good idea to play SNGs	Davis (1989)
Intention to use	I1: I do not intend to use SNGs in the near future I2: I intend to visit SNG sites as much as possible I3: I intend to continue using SNGs in the future	Davis (1989)

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