7-15-2012

Measuring The Flow Experience Of Players Playing Online Games

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Abstract

Nowadays, online games have become a highly profitable e-commerce application. Therefore, researchers increasingly believe that understanding online game player behavior is critical to the success of online game practitioners. The factors influencing the flow of online games are of major concern to academic researchers and online games practitioners. Drawing on the theory of flow, this study empirically explores how the interactivity and intrinsic beliefs impact flow experience, and how flow experience is related to replay intention. Then, confirmatory factor analysis is applied to test and the proposed research model is evaluated with partial least squares (SmartPLS 2.0). The results show that flow experience is a significant predictor of replay intention. Four antecedents to flow (telepresence, focused attention, skills and challenges) have positive influence on flow experience. Interactivity (social interactivity and human-machine interactivity) and intrinsic beliefs (perceived attractiveness, personal involvement) influence the antecedents of flow experience. Moreover, social interactivity has a stronger impact on the antecedents of flow experience than human-machine interactivity. This study finds that social interactivity is most crucial to online game success.

Keywords: Online game, Flow theory, Human–machine interaction, Social interaction, Perceived attractiveness, Personal involvement

1 INTRODUCTION

Online games have created huge profits in recent years. Fifty-eight percent of Internet users have played online games in Taiwan (MIC 2011). The worldwide market for online games is expected to grow from $15.7 billion in 2010 to nearly $29 billion in 2016 (DFC Intelligence 2011). According to reports, online games have become very popular. Identifying the reasons that people play online games is an important area of study. This study attempts to understand why online games are so popular and why many people like to play online games. Online games are a type of entertainment-oriented IT that differs from traditional task-oriented IT in terms of reason for use. People play online games just for fun as well as for entertainment, not to achieve specific goals or rewards. Thus, we believe that flow is an important factor for players to continue to play online games. The constructs of skills, challenges, telepresence and focused attention are proposed as the antecedents of flow (Hoffman & Novak 1996; Novak et al. 2000). This study conceptualizes flow in online games as a cognitive state experienced during playing that is determined by (a) high levels of skill; (b) high levels of challenge; and (c) focused attention; and (d) is enhanced by telepresence. Players can experience flow when the skills and the challenges are perceived to be congruent and above a critical threshold (Csikszentmihalyi 1977). If the skills exceed the challenges, players may become bored, and if the challenges exceed the skills, players may become anxious. If both the challenges and skills are too low, players may fall into apathy. An equal match between skills and challenges is necessary and their level must be high for a player to experience flow. A player can experience flow when he/she pays focused attention and feels a compelling sense of being present in a mediated virtual environment, which is characterized by a centering of attention on a limited stimulus field. The more a player pays focused attention and maintains telepresence, the more he/she can experience the interests of his/her own accord.

Numerous features have been suggested to make online game players want to return to online games repeatedly. Online games are typically multiplayer in nature and allow thousands of players to play and interact concurrently, enabling players to fantasize and be entertained. One of the most significant features of online games is enhanced interactivity. When people play online games, they chat, cooperate and compete with each other. They gain information about how to go through each stage of an online game from other players while playing (Kim et al. 2005). The success of online games relies on the revisits of players, and heavily depends on the very personal experiences of players while they play games online with others. This study also assumes that aesthetics plays a role in the decision to use an IS, and an especially important role in the decision to play and online game. Online game players enjoy more attractive interfaces and multimedia effects via graphical operations. An attractive online game environment can stimulate players' mediated perceptions and increase concentration when playing online games. A personal involvement with online games can have an

effect on the player's experience and behavior. Involvement, measured simply as the importance of the online games to the player, also has a strong effect on the primary antecedents of flow (Novak et al. 2000). This study expects that players with higher personal involvement will have a more positive online gaming experience due to their increased interest in the online games.

This study posits that interactivity (social interactivity and human-machine interactivity) and intrinsic beliefs (perceived attractiveness and personal involvement) in online games are strongly related with the determinants of flow. The construct of flow provides a surrogate measure for the positive experiences of users and the success of online games (Kim et al. 2005). Csikszentmihalyi proposed the original flow theory. He defined flow as, ''the holistic experience that people feel when they act with total involvement''. Flow can be used to measure the strength of online game users' intentions to keep on playing, which results in their repeated visits.

This study develops a research model using the flow theory and empirically tests the model. A flow model that hypothesizes these relationships was tested with the data collected through an online survey. This study further applied a structure equation model (SEM) to assess the empirical strength of the relationships in the proposed model. From the findings, we will discuss the relative importance of the interactivity (social interactivity and human-machine interactivity) and intrinsic beliefs (perceived attractiveness and personal involvement) of online games.

2 LITERATURE REVIEW

2.1 Online games

Online games refer to games that are played over some form of computer network (Weibel et al. 2008). They are one type of entertainment-oriented and Web-based information technology. Online games can range from simple text based games to games incorporating complex graphics and virtual worlds populated by many players simultaneously. One early type, Multi-User Dungeon (MUD) is a multi-player computer game that combines elements of role-playing games and social chat rooms. Typically running on an Internet server or bulletin board system, this type of game is usually text-driven. Online game players enjoy more user friendly interfaces and multimedia effects via graphical operations than are provided by traditional MUDs. In a recent genre of online games (Massively multiplayer online role-playing game, MMORPG), a large number of players concurrently interact with one another in a virtual world (Kim et al. 2005; Caplan et al. 2009). When playing an MMORPG, players develop their own social relationships in the virtual game world (Hsiao & Chiou 2012). Online games offer a new game environment, which requires attractive online game interfaces, higher personal involvement, interactivity between players and the system and interactivity between the players.

2.2 Flow theory

Our research model centers on the construct of flow. Csikszentmihalyi introduced the original concept. He defined it as ‘‘the holistic experience that people feel when they act with total involvement.’’ This definition suggests that flow consists of four components—control, attention, curiosity, and intrinsic interest. Csikszentmihalyi (1975) proposed such a concept as a peculiar psychological phenomenon emerging when people conduct sports, works, shopping, games, hobbies and computer uses. Flow has been studied in the various context of information technologies such as online shopping, e-learning, social networking sites, email and instant messages (Chang & Zhu 2012; Chen et al. 2008; Hausman & Siekpe 2009; Ho & Kuo 2010; Koufaris 2002; Lu et al. 2009; Novak et al. 2000; Zaman et al. 2010; Zhou & Lu 2011) and recently has been recommended as useful in the understanding of online game players’ behavior (e.g., Holsapple and Wu 2009; Huang and Hsieh 2011; O'Cass and Carlson 2010).

Some studies have related the concept of flow to information technology. For example, Trevino and Webster (1992) and Webster et al. (1993) defined flow as an optimal experience consisting of four elements: intrinsic interest, curiosity, control and attention focus. However, Ghani et al. (1994) argued that enjoyment and concernment are two characteristics of flow. Hoffman and Novak (1996) conceptualized flow on a web as a cognitive state during online navigation which involves (1) high levels of skill and control; (2) high levels of challenge and arousal; and (3) focused attention; and (4) it is enhanced by interactivity and telepresence. Later, Novak et al. (2000) developed a structural model based on previous conceptual models for measuring flow empirically. They confirmed the correlation between these antecedents and flow. Among the proposed antecedents of flow, skills, challenges, telepresence and focused attention are the primary contributors to the flow state (Hoffman and Novak 1996). Thus, greater flow requires higher skills, challenges, telepresence and focused attention. If an online game player feels the game is challengeable (high challenge), he/she has the congruent skills for the challenge (high skill), he/she has mediated perception of the environment (telepresence) and he/she is mesmerized by the game (high focused attention), then he/she will experience flow and further he/she will exhibit high intention to replay the online game. Factors like perceived attractiveness, personal involvement, social interactivity and human-machine interactivity in the new environment of online games influence the flow experience of a person through the antecedents of flow.

3 RESEARCH MODEL AND HYPOTHESIS

The flow model proposed in this research is illustrated in Figure 1. The model is based on the theory of flow and adapted to the context of online games. The interactivity (social interactivity, human-machine interactivity) and intrinsic beliefs (perceived attractiveness, personal involvement)

which presumably facilitate the flow experience are modeled as influencing the antecedents of flow (telepresence, focused attention, skills and challenges). These antecedents then affect the experience of flow. The success of online games depends on the revisits of players, which in turn relies on the flow experience of the players.

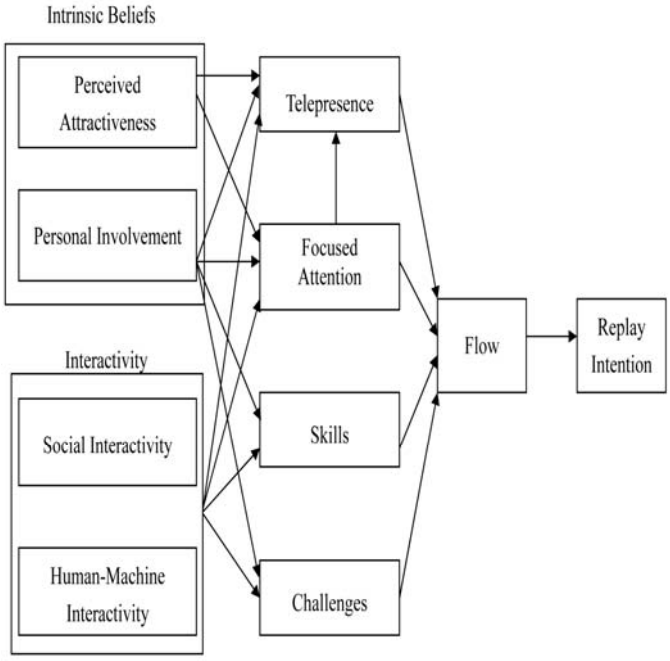

Figure 1. Research model

Interactivity between online game players may lead them to a state in which they are so intensely involved in playing the online game that nothing else seems to matter (Kim et al. 2005).The research model recognizes that online game characteristics such as social interactivity and human-machine interactivity and intrinsic beliefs such as perceived attractiveness and personal involvement can affect the flow experience of online game players through telepresence, focused attention, skills and challenge.

3.1 Telepresence and focused attention

Telepresence was first used to understand flow experience in the conceptual model proposed by Hoffman and Novak (1996). Telepresence, or the mediated perception of the environment, is the perception that the virtual environment with which one is interacting is more real or dominant than the actual physical environment (Novak & Hoffman 2000). Hoffman and Novak introduced this antecedent of flow (Hoffman & Novak 1996; Novak & Hoffman 2000) and we include it here.

Focused attention refers to a “centering of attention on a limited stimulus field (Csikszentmihalyi 1977).” Csikszentmihalyi (1977) argued that a person experiences flow when he/she pays focused attention, and he/she experiences more voluntary interests as the level of focused attention increases. Novak and Hoffman (2000) researched customer experience in online environments. They suggested

that focused attention has a direct effect on flow, as well as an indirect effect through its direct influence on telepresence. While playing online games, players have better chances to experience telepresence and flow when they pay focused attention to the games.

H1: Telepresence when playing online games positively influences flow experiences.

H2: Focused attention on playing online games positively influences telepresence.

H3: Focused attention on playing online games positively influences flow experiences.

3.2 Skills and challenges

This study defines skills as the player's capacities for action, and challenges as the opportunity for action available to the player in an online game. Many researchers have investigated the correlation between skills, challenges and flow experience (Kim et al. 2005; Novak & Hoffman 2000).

Only when people perceive that the Web contains challenges congruent with their own skills can flow potentially occur (Csikszentmihalyi & Csikszentmihalyi 1988). Otherwise, people may become bored or anxious (Ellis et al. 1994). Higher levels of perceived skills along with challenges directly cause a person to experience flow. In the context of online games, when players have a higher level of skills and challenges, they also have a higher probability of experiencing flow and are more likely to be intensely involved in online games.

H4: Skills at playing online games positively influence flow experiences.

H5: Challenges of playing online games positively influence flow experiences.

3.3 Perceived Attractiveness

Perceived attractiveness refers to the degree to which a player believes that an online game's environment is aesthetically pleasing to the eye. Dion et al. (1972) indicated that people tend to associate with physically attractive individuals more than with physically unattractive ones. Other consumer marketing research has indicated that attractive products create more favorable attitudes towards purchasing than do unattractive ones (Bloch 1995). Heijden (2003) recognized that aesthetics plays a role in the decision to use an IS and a Web site.

Steuer (1992) defined telepresence as "the mediated perception of an environment." The significance of telepresence is that when people are playing online games, they will not only perceive the "real" environment where they are physically present, but also the environment defined by hypermedia. Samberg and Kimmel (2004) confirmed that perceived attractiveness and telepresence are significantly related. An attractive online game environment surely stimulates a player's mediated perception and increases centering of attention when playing online games. This study hypothesizes that an online game environment with good aesthetics and attractiveness induces the perception of telepresence and the focused attention for the player.

H6: Perceived attractiveness positively influences the telepresence of online game players.

H7: Perceived attractiveness positively influences the focused attention of online game players.

3.4 Personal involvement

While there have been many variations on the definition of involvement (Zaichkowsky 1985; Greenwald & Leavitt 1984; Mitchell 1981; Park & Mittal 1985), it is generally accepted that involvement is: (a) a person's motivational state (i.e., arousal, interest and drive) towards an object where (b) that a motivational state is activated by the relevance or importance of the object in question (Mittal, 1989)

Involvement, measured simply as importance of the Web to the consumer, also has a significant effect on the primary antecedents of flow (Novak & Hoffman 2000). Enduring involvement (Zaichkowsky 1986) is formed by the presence of situational and intrinsic self-relevance which affects the effort to pay attention (Celsi & Olson 1988). Novak and Hoffman (2000) found that personal involvement has a significant impact on the focused attention, skill and challenges of consumers. Webster et al. (1993) found a positive association between intrinsic interest and focused attention. A player's involvement with playing online games can have an effect on the player's experience and behavior. This study expects that a player's involvement can have an effect on telepresence, focused attention, skill and challenges of online game players.

H8: Personal involvement positively influences the telepresence of online game players.

H9: Personal involvement positively influences the focused attention of online game players.

H10: Personal involvement positively influences the skills of online game players.

H11: Personal involvement positively influences the challenges of online game players

3.5 Interactivity

The Internet has opened up a new era of interactivity, and hundreds of thousands of players access online games simultaneously and enjoy synchronous interactions with other players. Online game developers consider interactivity as one of the most important characteristics that online games offer (Bartle 1990; Mulligan 1998).

Online games increase the importance of social interactivity because players compete in groups against other groups. It is critical to share information within groups to win. Telepresence is a media-induced experience. It refers to the perceived experience of presence in an environment that can be a spatially distant, real environment, or a virtual world (Steuer 1992). Interactivity affects the level of telepresence (Samberg & Kimmel 2004). In the context of online games, social interactivity and human-machine interactivity are expected to affect the level of telepresence.

Social interactivity through information sharing helps online game players experience, learn and acquire thorough knowledge about the game and thus enhances telepresence, skills, challenges and focused attention. Human-machine interactivity is related to the information which game systems

provide to help players keep on playing. Machine generated information, if relevant, timely and accurate, helps online game players stay focused on games and learn skills, resulting in enhanced skills and challenges (Kim et al. 2005). This study predicts that online game players are able to enhance their telepresence, skills, challenge and focused attention through both social interactivity and human-machine interactivity.

H12a: Social interactivity positively influences the telepresence of online game players.

H12b: Social interactivity positively influences the focused attention of online game players.

H12c: Social interactivity positively influences the skills of online game players.

H12d: Social interactivity positively influences the challenges of online game players.

H13a: Human-machine interactivity positively influences the telepresence of online game players.

H13b: Human-machine interactivity positively influences the focused attention of online game players.

H13c: Human-machine interactivity positively influences the skills of online game players.

H13d: Human-machine interactivity positively influences the challenges of online game players.

3.6 Flow

Hoffman and Novak (1996) and Webster et al. (1993) suggested that flow is associated with exploratory behavior and positive subjective experience. Internet flow experience seems to prolong Internet and website usage (Rettie et al. 2001). Nel et al. (1999) proved that the flow experience makes a person want to revisit a website. Siekpe (2005) also showed its influence on intention to purchase and intention to return to the website. Flow experience is an important predictor of intention to play online games (Hsu & Lu 2004). This study predicts that flow is positively related to intention to replay an on-line game.

H14: Flow positively influences intention to replay online games.

4 RESEARCH METHODOLOGY

4.1 Measurement

The questionnaire in the research model is derived from previous studies. Personal involvement items were based on a five-point semantic differential scale. All remaining scale items in the questionnaires adopted a 7-point Likert scale, with 1 representing total disagreement and 7 representing total agreement. The operational definitions of the construct are shown in Table 1.

Construct	Operational definition	References for the measurement
Perceived attractiveness	The degree to which a person believes that the online games interface is aesthetically pleasing to the eye	Heijden (2003)

Personal involvement	Enduring involvement, operationalized here as importance, is formed by the presence of situational and/or intrinsic self-relevance and affects the attention effort	Novak et al. (2000)
Social interactivity	Degree of interactivity between players in online games	Parks and Floyd (1996)
Human-machine interactivity	Degree of interactivity between the system and players in online games	Parks and Floyd (1996); Oliveira and Henderson (2004)
Telepresence	The compelling sense of being present in a mediated virtual environment	Novak et al. (2000)
Focused attention	Extent to which players attend to online games	Ghani and Deshpande (1994); Novak et al. (2000)
Skills	Operational abilities in online games	Novak et al. (2000)
Challenges	Opportunities to make the most of the skills the player has	Novak et al. (2000)
Flow	Extent to which a person feels indulged in online games	Trevino and Webster (1992); Novak et al. (2000)
Replay intention	The possibility for a player to replay online games	Agarwal and Karahanna (2000)

Table 1. Operational definition of constructs

4.2 Data collection

Empirical data are collected by conducting a field survey of on-line game users. Announcements were made in several popular game-related web sites, including Bahamut (http://www.gamer.com.tw), Gamebase (http://www.gamebase.com.tw), Gamemad (http://www.gamemad.com) and game related boards in Taiwan (including Yahoo!, Kimo, PChome Online and Yam) to invite online game players to fill out the questionnaire. Twenty cash prizes of NT$600, approximately US$20, were awarded at the completion of the survey. A lottery was held for the event as an incentive. A total of 203 questionnaires were received. After eliminating the duplicated copies, copies with missing value or other invalid copies, a total of 162 questionnaires were regarded as valid. As for the demographic distribution of the samples, 56.2% of respondents were male, and 43.8% were female. Around half of the respondents (58.6%) were under age 20. Young people were the largest group playing online games. 75.3% of respondents play online games from home. Most of the respondents (74.1 %) used ADSL as their main means of access to online games. 40.1% of the total respondents play role-playing games frequently.

5 DATA ANALYSIS AND RESULTS

5.1 Measurement Model Assessment

This study used the partial least squares (PLS) method of structural equation modeling (SmartPLS Version 2.0) in view of the PLS method's ability to handle highly complex predictive models. The acceptability of the measurement model was assessed by the reliability of individual items, internal consistency between items as well as the model's convergent and discriminant validity. Table 2 shows the number of items, mean, standard deviation, composite reliability, average variance extracted (AVE), as well as the square root of the AVE. Table 3 shows the correlations between the constructs.

No.	Construct	No. of items	Mean(S.D.)	Composite Reliability	AVE
1	Perceived attractiveness (PA)	3	4.067 (1.193)	0.937	0.832
2	Personal involvement (PI)	5	4.433 (1.566)	0.970	0.868
3	Social interactivity (SI)	4	4.825 (1.280)	0.917	0.853
4	Human-machine interactivity (HI)	3	4.298 (1.229)	0.945	0.836
5	Telepresence (TE)	7	4.503 (1.443)	0.940	0.809
6	Focused attention (FA)	4	4.504 (1.378)	0.974	0.906
7	Skills (SK)	4	4.105 (1.476)	0.953	0.835
8	Challenges (CH)	4	4.067 (1.337)	0.944	0.810
9	Flow (FL)	3	4.168 (1.671)	0.958	0.885
10	Replay intention (RI)	3	4.954 (1.623)	0.980	0.942

Table 2. Descriptives of Construct Variables

The composite reliability measures were all greater than 0.917, which is above the 0.700 recommended by a previous study, indicating adequate internal consistency (Bagozzi & Yi 1988). Convergent validity is demonstrated as the AVE values for all constructs were above the suggested threshold value of 0.500 (Fornell & Larcker 1981). Discriminant validity is shown when the square root of each construct's AVE is larger than its correlations with other constructs (Fornell & Larcker 1981). The square root of the AVE is much larger than its correlations with the other constructs; therefore, discriminant validity was achieved (see Table 3).

	PA	PI	HI	MI	TE	FA	SK	CH	FL	RI
PA	0.912									
PI	0.191	0.931								
HI	0.138	0.385	0.923							
MI	0.174	0.221	0.315	0.914						
TE	0.209	0.410	0.375	0.129	0.899					
FA	0.258	0.446	0.480	0.194	0.324	0.951				
SK	0.169	0.481	0.481	0.179	0.484	0.425	0.914			
CH	0.157	0.425	0.467	0.273	0.482	0.474	0.459	0.900		
FL	0.135	0.449	0.511	0.142	0.353	0.492	0.424	0.431	0.941	
RI	0.155	0.469	0.576	0.263	0.421	0.493	0.423	0.457	0.594	0.971

Table 3. Correlations between Constructs

5.2 Structural Model Assessment and Hypotheses Testing

The standardized PLS path coefficients for testing the structural model are shown in Table 4. The findings supported all of the hypotheses (H1 to H14). The direct paths to flow from telepresence (H1), focused attention (H3), skill (H4), and challenge (H5) are positive and significant. Focused attention was positively associated with telepresence (H2). Greater perceived attractiveness was positively related to greater telepresence (H6) and focused attention (H7). Personal involvement was positively associated with telepresence (H8), focused attention (H9), skill (H10) and challenge (H11). In terms of interactivity, social interactivity was positively associated with telepresence (H12a), focused attention (H12b), skill (H12c) and challenge (H12d). Human-machine interactivity was positively associated with telepresence (H13a), focused attention (H13b), skill (H13c) and challenge (H13d). Greater flow was positively related to greater replay intention (H14). These constructs explained 62.8% of the variance of replay intention. The explained variance 43.5% for telepresence, 44.8% for focused attention, 45.2% for skill, and 42.0% for challenge. In addition, the explained variance of flow was above 58.7%. The measure of the variance explanation shows that the model has sufficient explanatory power and therefore is able to predict replay intention.

Hypothesis	PLS Path Coefficient	Significance
H1: TE ➔FL	0.422	<0.001
H2: FA➔ TE	0.241	<0.01
H3: FA➔FL	0.432	<0.001
H4: SK➔FL	0.467	<0.001
H5: CH➔FL	0.454	<0.001
H6: PA➔ TE	0.113	<0.05
H7: PA➔ FA	0.124	<0.05
H8 :PI➔ TE	0.232	<0.01
H9: PI➔ FA	0.268	<0.01
H10: PI➔SK	0.243	<0.01
H11: PI➔CH	0.227	<0.01
H12a: SI➔TE	0.477	<0.001
H12b: SI➔FA	0.495	<0.001

H12c: SI➔SK	0.486	<0.001
H12d: SI➔CH	0.490	<0.001
H13a: HI➔ TE	0.306	<0.001
H13b: HI➔ FA	0.340	<0.001
H13c: HI➔ SK	0.302	<0.001
H13d: HI➔ CH	0.316	<0.001
H14: FL➔ RI	0.594	<0.001

Table 4. Results of PLS Analysis

6 DISCUSSIONS AND IMPLICATIONS

This study shows that the perceived attractiveness of the online game website has a significant effect on telepresence, and focused attention. Websites with an attractive design (including layout, color selection and general impression) stimulate more perception of telepresence and focused attention than those with unattractive designs. This study indicates that unattractive websites may reduce telepresence and lead to the reduction of players' attention. Nevertheless, an attractive online game website may surely stimulate a player's mediated perception and increase focused attention on playing online games. In sum, this study found that aesthetics play an important role in the decision to use an online game website. How an online game website attracts loyal players will be critical to online game marketers. Therefore, when designing an online game website, online game marketers and developers should pay more attention to the aesthetic aspect of the website in order to attract more players.

This study implies that interactivity rather than personal factors (intrinsic) is more important for players with regard to their replay intention. Interactivity plays the most important role in online games. Specifically, social interactivity is shown to have a stronger impact than that of human-machine interactivity. From social interactions while playing, online game players learn more about the game and acquire knowledge about how to play on and what the opportunities are. Moreover, they can focus on the game through social interactions because of the team competition nature of online games. Then, flow experience comes and players unconsciously get engrossed in playing online games. This study suggests that developers need to pay more attention to enhancing social interactivity. For instance, designing online games with high social interactivity that enables players to fantasize and be entertained allows thousands of players to engage simultaneously. The more players in the online game, the more player-generated experiences are likely to be exchanged and hence the more players it will attract. As a result, increasing returns in the online game community.

This study finds that the more important players feel an experience of flow to be in general, the more likely they are to focus their attention while playing the online game and the more likely they are to be skilled at playing the online game. If players believe they have great skills and they are able to perform action, then they may be more likely to feel flow in the online game environment.

Nevertheless, if an online game website does not provide enough challenges for actions, players will quickly become bored and log off. This study suggests that online game website design must provide enough challenge to arouse the player, but not so much that the player becomes frustrated when navigating through the online game website and subsequently logs off. To experience flow while engaged in playing online games, players need to perceive a balance between their skills and the challenges of playing online games, and both their skills and challenges must be above a critical threshold.

As with any empirical research, there are a few limitations to this study. First, this study adopts the construct of replay intention to understand players' online game-playing behavior. However, only considering the replay intention is a research limitation, and examining other constructs such as positive word of mouth, loyalty, and so on may yield different results. Therefore, further studies using other dimensional measures may be needed to verify the research model. The second limitation is that this study investigated online game playing behavior in one country. Future research could examine our findings in various cultural settings. Finally, the data presented is cross-sectional, and longitudinal data will likely be needed in the future because results are usually more robust if an observation is made over time, rather than as a snapshot in time.

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