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**Why Are You Satisfied with an Online Game? Exploring
Game Attractiveness and Gaming Climate from a Socio-
Technical Perspective**

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Abstract

Some online games are prosperous and have attracted a large number of players, while others cannot sustain. Both technical and social factors likely affect a player's satisfaction with an online game. However, there is a dearth of studies in which have investigated online games from a socio-technical perspective. This article seeks to address this gap through an empirical study on technical factors (manifesting as game attractiveness) and social factors (manifesting as gaming climate) influencing a player's satisfaction in an online game. Specifically, game balance and technical quality are manifestations of game attractiveness, while pro-gaming norms, integrity and active participation reflect internal gaming climate. Using online questionnaires, field data were collected from two research sites relating to two online games respectively. The data were then analysed with PLS, revealing that game balance, technical quality, integrity and active participation are positively related to a player's satisfaction in an online game. The findings suggest that both technical factors (game attractiveness) and social factors (gaming climate) impact a player's satisfaction in an online game. This study contributes to the literature on online games, and also presents important implications for designers and operators of online games.

Keywords: Online game, Socio-Technical perspective, Game attractiveness, Gaming climate, Satisfaction

Supervisor: Li Zhao

Foreword

I am really grateful for my supervisors Li Zhao who was helping and supporting to this Master thesis work consistently and untiringly. He suggested an interesting and valuable research topic for me but also provided his great viewpoints for my thesis. His advices and guidance were exceptionally instructive to me during I was working on my study.

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1 Introduction

Online game is the most popular online activity that people can play the games with others through the Internet (Gorritz & Medina, 2000). Online games are ubiquitous on modern technological platforms; for example, game consoles, personal computers (PC), and mobile devices. They have spanned various genres, such as massively multiplayer online role-playing games (MMORPGs), massively multiplayer online first person shooter (MMOFPS) and multiplayer online battle arena (MOBA). Online game is one of particular video games through Internet or other computer networks (Rollings & Adams, 2006).

Compared with traditional PC or console video games that support only one or few players playing together on one platform, online games are played through the Internet (Hilton, 2006), and thereby allow different players to play together on a game server even they live in different places. Over the Internet, people can play most popular online games such as Defense of the Ancients, World of Warcraft, League of Legends, and Counter-Strike. As the most popular genre of online games, massively multiplayer online games (MMOGs, e.g., World of Warcraft, Blade souls, and Monster Hunter Online) had a large number of followers. MMOGs support hundreds of thousands of players to play together in a virtual world designed by online game company.

In recent years, online games have been popular around the world. Some famous online games (such as World of Warcraft, Counter-strike and League of Legend) had huge worldwide followings. According to the data from Statista (2015), for instance, the number of monthly active MMOGs players worldwide was estimated 23.5 million in 2014. The online games products have been sold about 22.6 billion US dollar (Nayak, 2013). Specifically, the MMOGs revenue has been reached US\$11.6 billion in 2015, up from US\$10.2 billion in 2013, while the MMOGs market is expected to reach US\$12.8 billion by 2017 (Superdata, 2015). Figure 1 shows detail data divided into free-to-play and pay-to-play business models from 2013 to 2017 (Superdata, 2015).¹

As shown above, online games have become a very popular entertainment activity nowadays. Accordingly, online games have attracted the attention of researchers in relevant fields including the field of computer science and engineering as well as the field of information systems (IS). In the field of computer science and engineering, researchers have studied online games from a technical angle. The studies mainly focused on the technology, design and development of online games. For instance, Gregory (2009) studied game engine architecture, while Eichenberger et al. (2005, 2006) explored the CELL processor, which was a hardware technology, used in the game development. Ponder et al. (2003) proposed the VHD++ development framework for Virtual Reality (VR) and Augmented Reality (AR) game development. There are also research on the design of

¹ Online game divide to pay-to-play or free-to-play models. Pay-to play online games need a monthly subscription fee of about \$15 or others. Free-to-play online games are totally free for players but pay for such items or characters in the games.

virtual goods in an online game (Hamari & Lehdonvirta, 2010), and the design of a virtual world (Wasko, Teigland, Leidner and Jarvenpaa, 2011).

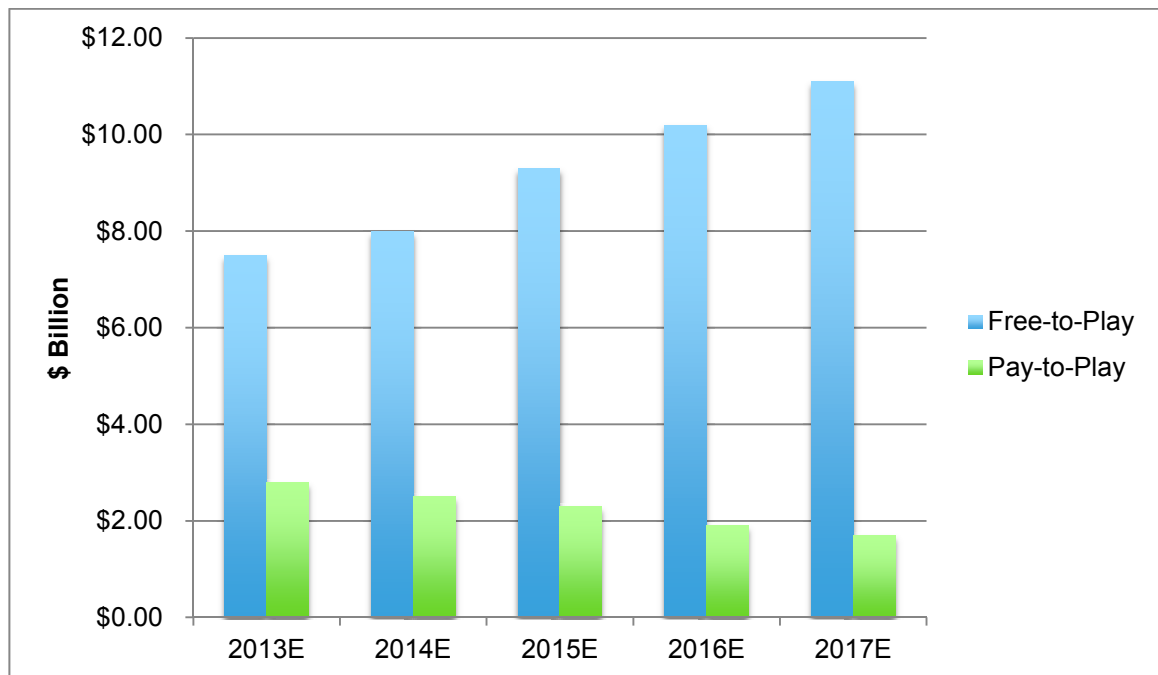


Figure 1. Worldwide MMOGs market (\$ billion) (SuperData, 2015).

In the Information Systems (IS) field, the motivation of playing an online game is the main topic of the existing studies. For example, some studies found that people prefer to play the online game due to the enjoyment in playing game (Wu, Wang, & Tsai, 2010; Wu & Liu, 2007; Koo, 2009; Lee, 2009). Similarly, Agarwal and Karahanna (2000) as well as Nah, Eschenbrenner and DeWester (2011) indicated that enjoyment is the key factor influencing people's intention to play the online games. Furthermore, Wu et al. (2010), Xu, Turel, & Yuan, (2012) and Yee (2006) mentioned that the achievement could promote a player's playing incentive to an online game. They indicated that players desired to gain more power, status or rare items in online games to fulfil their sense of achievement (Wu et al., 2010; Xu et al., Yee, 2006). Other factors, such as game design (Liu, Li, & Santhanam, 2013; Zhao & Fang, 2009; Wu & Rao, 2008), game fairness (Wu et al., 2010), security (Wu et al., 2010), plot of the game (Rajanen & Marghescu, 2006), and service quality (Yang, Wu, & Wang, 2009; Zhao & Fang, 2009), are also found to affect a player's willingness to play an online game.

In the IS field, some theoretical lenses have been adopted to examine why individuals play an online game, for instance the theory of reasoned action (TRA), technology acceptance model (TAM), and flow theory. Chang, Liu and Chen (2014) adopted TRA model and suggested the subjective norms and personal attitude were related to players' playing intentions. Based on TAM, Lee (2009) indicated that perceived ease-to-use and perceived usefulness affected a player's playing intention to an online game. Other researchers (such as Animesh, Pinsonneault, Yang and Oh (2011), Chen et al. (2014), and Lee (2009)) revealed that flow experience was a key factor influenced a player's intention to (or continue to) play an online game.

The above studies were useful in understanding online games. However, a comprehensive study on game attractiveness from a technological perspective has been lacking hitherto. In addition, the internal social context within an online game (such as gaming climate) will also influence a player's satisfaction in an online game. However, few research efforts have studied the internal social factors within an online game. Addressing this gap, the present study adopts a socio-technical perspective to explore the technical factors (manifesting as game attractiveness) and the social factors (manifesting as gaming climate) that influence a player's satisfaction with an online game. In particular, the research question of this study is: how game attractiveness and gaming climate affect a player's satisfaction in an online game?

The study is arranged as followings. Firstly, the theoretical background related to this study is presented. Secondly, the research model as well as relevant hypotheses development are proposed according to the theoretical base. The third section is to present the methodology of this study. Then the data analysis section shows the results of the assessment of the research model. The last section discusses the findings, contributions, limitation of this study, as well as the directions of future research.

2 Theoretical background

As noted above, this study investigates a player's satisfaction with an online game from both technological and social perspectives, referred to as a socio-technical perspective.

2.1 Socio-technical perspective

Trist (1963) firstly proposed the term "socio-technical" to refer to the understandable interrelationship between social factors and technology aspects. Based on prior works, Pasmore, Francies and Shaini (1982) further proposed the term "socio-technical system". In a socio-technical system, the organization, people and technology used in the organization influence each other in the progress of productions as well as other business operations (Pasmore et al., 1982). The technical system is assembled by tools, technologies, devices, IT infrastructures, processes and information of organizational members (Pasmore, 1998). The social systems include people (who are the members of the organization) and their individual and social attributes (Shani, Grant, Krishnan, & Thompson, 1992). Many studies have revealed the benefits of combining both technological and social aspects in a system such as an organization (Boddy, Boonstra, & Kennedy, 2008). Prior studies that used the socio-technical perspective fell within three categories: i) development of information systems, ii) organizational design, and iii) research on information systems. Table 1 summary the previous studies that used the socio-technical perspective in these three domains. Most previous studies fell into the first and second categories (Hirschheim & Klein, 1994; Kettlinger, Teng, & Guha, 1997).

Within the first category, the socio-technical perspective was used to guide the development of information systems by combining two types of knowledge (i.e., technical knowledge and social knowledge) when designing information systems (Lu & Cai, 2000). According to the socio-technical theory, both technical and social systems need to be taken into account for information system development (Bostrom & Heinen, 1977a, 1977b). While the technical aspect focused on technologies and processes, the social part considered the relationship between the people within the particular social context (Bostrom & Heinen, 1977a, 1977b). Accordingly, the socio-technical framework has been used to guide the development of various information systems as shown in prior studies (e.g., Bygstad, Nielsen, & Munkvold, 2010; Palvia, Sharma, & Conrath, 2001; Patnayakuni & Ruppel, 2010).

Within the second category, the socio-technical approach was used to frame organizational innovation and changes (Luna-Reyes, Zhang, Ramon Gil-Garcia, & Cresswell, 2005). For example, a socio-technical framework was adopted to guide business-IT alignment in organizations (Lee, Kim, Paulson, & Park, 2008). Kling, McKim and King (2003) further applied the socio-technical theory to the organizational design of scholarly communication forums. Herrmann and Loser (1999) further presented the socio-technical processes in the SeeMe applications.

Table 1. Literature reviews related to socio-technical theory

Authors	Domain	Topics	Technical factors	Social factors
Palvia et al., 2001	Information System development	Quality assessment for computer information systems	Transaction processing, management information, decision and executive support	External and internal environment
Lu & Cai, 2000	Information System development	Integrating design knowledge	Stakeholders' domain knowledge	Stakeholders' background knowledge
Bygstad et al., 2010	Information System development	Integrating a socio-technical system into a IS project	Task and technology	Attribute of people
Patnayakuni & Ruppel, 2010	Information System development	Using socio-technical system to improve the processes of systems development	Tools, technologies, devices, IT infrastructure, processes and information	Individual and social attributes
Kling et al., 2003	Organizational design	Scholarly communication forums	E-journal	Readers and authors' local networks and tools
Luna-Reyes et al., 2005	Organizational design	Emergent socio-technical change in a IS development	MACROS project	Customer relations
Herrmann & Loser, 1999	Organizational design	SeeMe applications	Work flow management systems database	Employee

Lee et al., 2008	Organizational design	Business-IT alignment	Application, database and hardware	Line group and IS group
Kling & Courtright, 2003	Research on Information systems	Group behaviour and learning in electronic forums	Sociological communities and virtual communities	Trust
Chai & Kim, 2012	Research on Information systems	Knowledge sharing	Structural assurance	Ethic culture, social tie and sense of belonging
Lamb & Kling, 2003	Research on Information systems	Reconceptualising users as social factors	Computer supported cooperative work	Affiliations, environments, interactions and identities

In the information systems (IS) field, researchers have also used the social-technical approach to explicate how to improve the usage of information systems. For instance, the socio-technical theory was used to investigate the factors influencing the use of knowledge management systems. Specifically, Davenport and Prusak (2000) noted that the success of knowledge information systems is related to both the technological infrastructure and social/environmental factors in an organization. If the organizations focused on only technical aspects but ignored the social process, the knowledge information system would fail (Davenport & Prusak, 2000). According to the study of Chai and Kim (2012), the socio-technical perspective was the useful approach to explore the motivations and factors that impact people's intention to share knowledge in social networking sites.

Given that online games are particular applications supported by computer and Internet technology, the technical factors are certainly important for players' satisfactions with online games. In addition, online games are not played solely by a player but jointly by many players. Within an online game, all the players form a community. The internal climate of the community of players can also affect a player's satisfaction with an online game, because many players have to coordinate to achieve the objectives in the game. Hence, a socio-technical perspective can help understand a player's satisfaction with both technical and social aspects of an online game. Specific to this study, technical aspects include game balance and technical quality; these factors are the core of the attractiveness of an online game, and thus are categorized as game attractiveness. The factors that define

the internal social climate of an online game includes the internal social norms regarding playing games, the integrity of players in general, and whether players actively participate the activities in the game. In what follows, the technical aspects (i.e., game attractiveness) and social aspects (i.e., gaming climate) are discussed in detail.

2.2 Game attractiveness

As mentioned above, game attractiveness is manifested in game balance and technical quality of an online game.

Game Balance

Game balance is important for the fairness of competition in an online game. As Sirlin (2009) points out a balanced multiplayer game is based on this game can provide a reasonably lot of choices for players. The main purpose of game balance is to promote a game internally consistent and fair, preventing players to exploit flaws of game to obtain advantages, and to ensure that game is enjoy and engaging (Rollings & Adams, 2003). Newheiser (2009) indicated that an unbalanced game design might undermine the entire ruleset of the game. Balance oversight in the design of online game will ruin the entire development effort (Sirlin, 2009). For instance, if an online game is unbalanced, most players may choose the more powerful items or characters without any consideration about strategies and self-skills. On the other hands, other worse items and characters may be useless. Accordingly, unbalanced design of an online game will exactly ruin the playing experience of players.

Technical quality

The other important component of game attractiveness is technical quality of an online game, manifested in the quality of the server connection, cheating prevention system and the feedback system of the online game. Chen (2010) found the stability of connection was important for the players' intentions to play an online game because unstable connection made players frustrated. Given the fierce competition in the online games, players may cheat to win in the competition through some illegal cheating plug-in or vicious bugs existed in the games (Yan & Randell, 2009). However, cheating behaviours in an online game destroyed the rules, fairness and playing experience of players. Therefore, the ability of detecting and preventing the cheating behaviours is important. In addition, timely updating the prevention systems and bug fixing in time is also important for players' playing experience.

As noted earlier, the internal social context within an online game (manifesting as gaming climate) also influences a player's satisfaction in an online game. In what follows, gaming climate is discussed in detail.

2.3 Organizational climate and gaming climate

The concept of gaming climate derives from organizational climate. Organizational climate reflected a generalized range of personal assessments of the work contexts (James & James, 1989; Denison, 1996), such as roles, communication (James & McIntyre, 1996), and the

climate for safety (Neal, Griffin, & Hart, 2000). Prior studies found that organizational climate affected the interactions in the midst of individuals (Griffin & Mathieu, 1997), attitudes toward organizational incentives (Griffin, Tesluk, & Jacobs, 1995; Griffin, 1996), and emotional feedback to the work context (Michela, Lukaszewski, & Allegrante, 1995; Hart, Wearing, & Griffin, 1996). In addition, organizational climate positively impacted personal incentive to accomplish work outcomes (Brown & Leigh, 1996). For instance, organizational climate influenced individuals' intentions to share knowledge in organizations (Morrison, Upton, & Cordery, 1997; Bock, Zmud, Kim, & Lee, 2005).

Players within an online game form a community, which can be regarded as a special type of organization. In the same vein, an organizational climate also exist in a specific online game. In this study, this specific organizational climate in an online game is referred to as gaming climate. Although few research efforts have studied gaming climate, both online game players and game companies have paid a lot of attention to the climate within an online game. In some popular forums for online games, players always discuss the gaming climate and prefer to play in a good gaming climate.

Three components of gaming climate are identified in this study, including pro-gaming norms, active participation and integrity. Pro-gaming norms refer to the norms of professional game player, such as the norm of tolerance of mistakes made by other players and norm of acknowledging one's own mistakes in the online games. Integrity indicates the quality of online game players' honesty and whether they having basic ethical and moral principle in an online game. Specifically in this study, integrity indicates whether players are honest, trustworthy, and fair. Active participation refers to how actively players participate in internal discussion and activities in an online game.

3 Hypotheses development

Figure 2 depicts the research model for this study. The model consists of two major parts: game attractiveness and gaming climate. Game attractiveness includes game balance and technical quality. Gaming climate includes pro-gaming norms, integrity, and active participation. In what follows, the relationships in the model are hypothesized and discussed in detail.

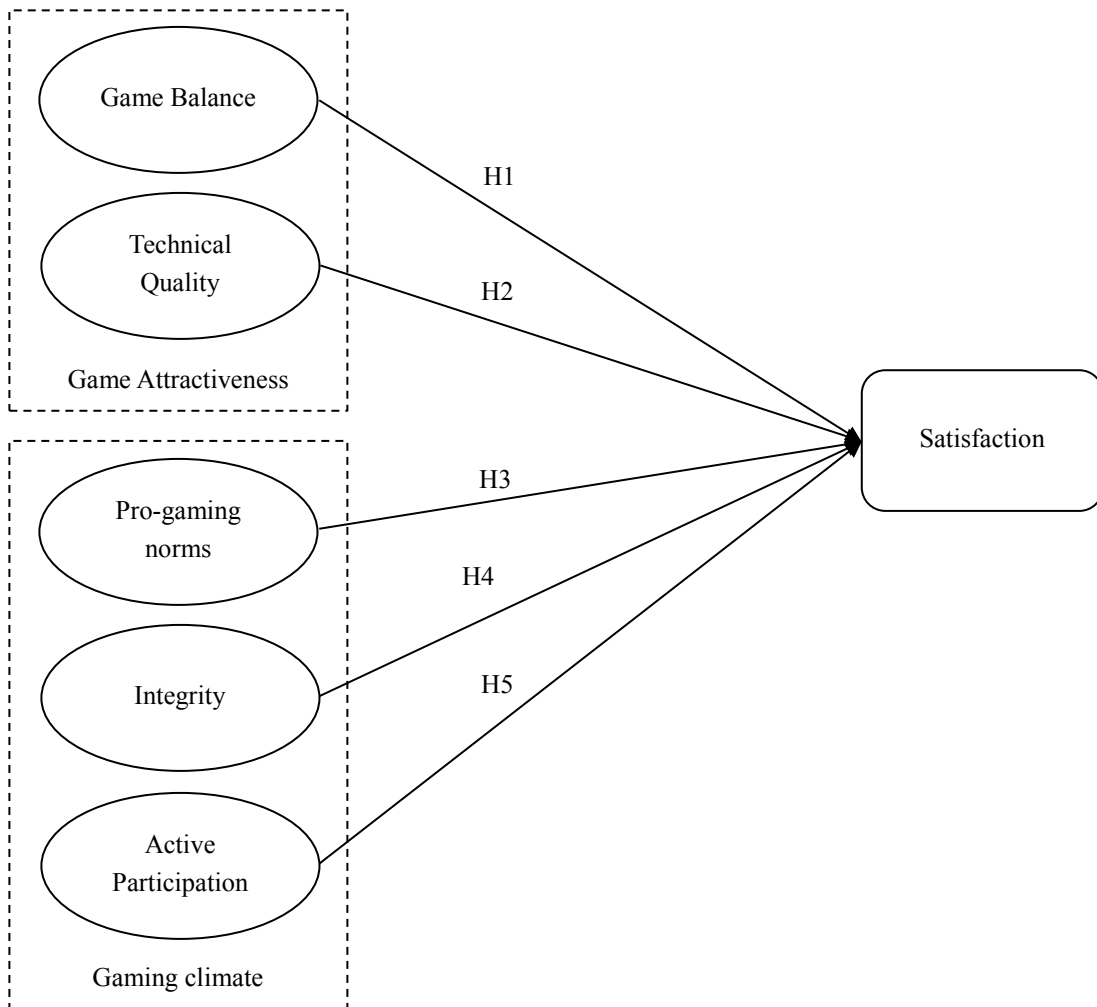


Figure 2. Research Model

3.1 Game attractiveness

As noted above, game attractiveness reflects the technical aspects of an online game in general, given that the two dimensions of game attractiveness (technical quality and game

balancing), it reflects the technical quality of a game and the quality of game design in particular.

3.1.1 Game balance

As Newheiser (2009) noted, game designers should pay attention to game balance when designing an online game. Griesemer (2010), who was the developer of Halo 3, indicated that game balance was to manage unfair scenarios in a game. It is to ensure that all the strategies supported by online games are variable (Griesemer, 2010). Although game balance is one of the most time-consuming and difficult phase in the process of game design and development, the effort is worthwhile, because balanced game can improve the depth, pacing, randomness, fun and variety of an online game (Jaffe, Miller, & Andersen, 2012).

In a balanced game, players should have many meaningful choices designed in the game. To promote the game deeper, the choices can be different and diverse from each other, but each choice should have advantages and drawbacks in the typical surrounding designed by game developers (Sirlin, 2009). For example, the items, equipment, weapons and characters should be selectable in an online game. Otherwise, the design of this online game is unbalanced because players always select the most powerful items, equipment or characters. In addition, a balanced game should ensure fairness. Particularly, players with equal playing skills should have an approximate same chance to win although they might start the game with different choices, such like different options, characters, items and resources (Sirlin, 2009). For instance, the requirements of winning should be same for every competent online game player.

Online game players would consider game balance when choosing an online game to play, because game balance affects the experience of competition in an online game. For example, Wu et al. (2010) found that fairness of game design is related to a player's willingness to play an online game. Unbalanced game would ruin the playing experience of players (Kiili 2005; Newheiser, 2009). Therefore, game balance likely influences a play's satisfaction with an online game. This leads to the following hypothesis.

H1: Game balance is positively related to a player's satisfaction in an online game.

3.1.2 Technical quality

Technical quality includes game server quality, ability of preventing cheating behaviours and solving technical problems such as fixing bugs. Indicators of server quality include the stability of server connection and the reliability of response time. Players are likely to choose an online game with a good quality of server. Technical quality also involves whether the game companies can detect and prevent the illegal plug-ins as well as the cheating behaviours efficiently. Given that security problems of an online game are always related to illegal plug-in and bug utilization (Chen, 2010; Yan & Randell, 2009), the ability of detecting and preventing the cheating behaviours from players are important (Yan & Randell, 2009). Wu et al. (2010) mentioned that the game security was the key factor that affects the satisfaction of a player in an online game. The technical quality of an online game directly affects the players' experience of playing the game. As Chen (2010) found,

stable connection could promote the players intention to play an online game. The quality of technical service of online games was also important for a player's satisfaction in an online game (Boyer & Hult, 2006). Thus, it is likely that player is satisfied with online games with high technical quality. This leads to the following hypothesis.

H2: Technical quality of an online game is positively related to a player's satisfaction with this online game.

3.2 Gaming climate

Reflecting the social aspects within an online game, gaming climate includes the pro-gaming-norms, the integrity of players, and online game players' active participation in an online game.

3.2.1 Pro-gaming norms

Norms reflects a degree of accordance in a collective (Coleman, 1990). The objective of norms is the moderation for human behaviour in consensus with the expectations of the community (Kankanhalli, Tan, & Wei, 2005). In the context of online games, almost all players are strangers, thereby making norms is very important for moderating the players' behaviour in the games. Norms that can enhance the climate for playing online games are referred to as pro-gaming norms. For example, professional players should tolerate to other players' mistake and diverse ideas. To facilitate cooperation in the game, players should also acknowledge their own mistakes. In addition, professional players should not use dirty words to attack others. The norms provide guidelines for members' behaviour in a collective. Especially the players for an online game are typically strangers. The norms can provide a basis for the actions in the game. For instance, if most players were unfriendly and hard to communicate, a new player will not be satisfied with the game and would leave. Thus, the following hypothesis is proposed:

H3: Pro-gaming norms in an online game are positively related to a player's satisfaction in an online game.

3.2.2 Integrity

Integrity indicates whether an individual is fair, honest, genuine, and would like to keep his/her promise (Jarvenpaa, Knoll, & Leidner, 1998). As Bock et al. (2005) noted, fairness is an important indicator of organizational climate. In the same vein, fairness is also an important indicator of gaming climate. That is, players should be fair in dealing with other players in the game. An unfair climate will ruin players' experiences in collaborating with each other, and eventually decrease a player's satisfaction with an online game. Prior studies showed that honesty and genuineness positively influenced people's intentions to use the e-commerce and online shopping (McKnight, Choudhury, & Kacmar, 2002; Gefen, Karahanna, & Straub, 2003). Similarly, players' honesty and genuineness are significantly related to a player's satisfaction in an online game. For instance, the players should be honest and genuine to other players in the game. Dishonest players may cheat and thus ruin the playing experience of other players. Therefore, the players' integrity in general likely

influences a player's satisfaction in an online game. Thus, the following hypothesis is proposed.

H4: The level of integrity in an online game is positively related to a player's satisfaction in this online game.

3.2.3 Active participation

Active participation in this study refers to how actively a player participate the events in an online game. Online game events include parties, discussion, and the building of teams for fighting. A virtual online group can sustain and thrive only when members actively participate in this group. For example, the development of a social media website relies on users' active participation and contribution on the website (Pagani & Mirabello, 2011). If a new participant finds the general participation on the website is not active, this new comer may leave, because s/he will be afraid that nobody will collaborate with him/her. In the environment of online games, a player would like to play an online game in which other players are active, because s/he needs other players to actively respond to his/her invitation of building teams to play the game. If most players in an online game are not active, it is impossible for one player to play the online game alone. This will discourage this player, and consequently, she/he would not be satisfied with this online game. This leads to the following hypothesis.

H5: The general level of active participation in an online game is positively related to a player's satisfaction in this online game.

4 Research methods

The detail research methods are demonstrated in the following parts. The survey items are developed based on the existing literatures and experts' viewpoints, and then validated by sorting exercises. A pre-test examines and refines the reliability and validity of measurements. The formal data for this study were collected from a forum for the online game World of Warcraft and an online community for the online game Monster Hunter Online.

4.1 Measurement development

Most constructs in the theoretical model were adapted from prior studies. In addition, for the new constructs which were not found in the existing literatures, special scales were developed based on viewpoints from experts in the field of online games.

The construct of game balance was developed based on Sirlin's (2009) game balance introductions. Game balance has three items that measured various choices designed by game designers in the online game (e.g., in an online game, sufficient contexts are provided to allow each choice to have balanced advantages and limitations) (Sirlin, 2009).

Technical quality is related to the servers and the technical services provided by online game companies. Thus, the items of technical quality were developed based on Weill and Vitale (2002) as well as opinions from experts. There were four items focus on the online game server's quality as well as the ability of technical problem solution (e.g., in a game, game server's availability and response time are reliable) (Weill & Vitale, 2002).

The four items for pro-gaming norms were developed based on Weill and Vitale (2002) and experts' viewpoints. These items focus on the players' attitude when there are different idea and mistake made by others during playing the online game (e.g., there is a norm of tolerance of mistakes made by other players in the game) (Weill & Vitale, 2002).

The five items that measure the online players' integrity in online games were adapted and developed from Jarvenpaa et al. (1998) and McKnight et al. (2002). Because the online game is a special virtual environment, the items of integrity not only need to emphasize whether player is fair and honest, but also should focus on whether player is cheating in the online game (e.g., players do not cheat in the game.) (Jarvenpaa et al., 1998; McKnight et al., 2002).

Active participation has three items to measure it. These items were developed based on Pagani and Mirabello (2011) and the opinions of experts. All items of active participation focus on whether the players actively join a group or discussion related to an online game (e.g., most players in the game actively respond to others' invitation of building teams) (Pagani & Mirabello, 2011).

Finally, the three items that measure the player's satisfaction in an online game were adapted and developed based on from McKinney, Yoon & Zahedi (2002).

The survey used the seven-point scale (1 = strongly disagree, 4 = neutral, 7 = strongly agree) to represent the degree of agreement or disagreement by participants. The items were translated from English to Chinese carefully because the target group of this survey is the Chinese online game players.

4.2 Conceptual validation

Given that most items of constructs were adapted from different prior studies, but some items were developed based on experts' opinions. Thus, this study implemented a two-stage validation sorting based on the exercises designed by Moore and Benbasat (1991). In the first stage, two master students were participated in the structured sorting. There were 38 questions in a Word file and were mixed up. In addition, there also were all constructs' names and definitions in another Word file. Participants were given these two Word file. Participants need to sort all the questions by selecting each question into a construct category according to the definition. Both participants placed all the questions into correct constructs.

Another four online game players participated in the second stage that is the unstructured sorting. Every participant was given only the questions in a Word file (without the definitions of the constructs). They had to category all the questions by their own thinking. They sorted these questions according to the relevance of each question. They also had to give a label to indicate each category they made. This process helped to identify some items with ambiguously wording or similar meaning. The labels given by the participants were very closely to the actual constructs' names or meaning. Overall, the Accuracy rate was above 80%. According to the suggestions by two participants and rethinking, one item for satisfaction had been reworded.

4.3 Pre-test

Although the study used the sorting exercises to check the validity of constructs and items, the quality of items might not be accurate sufficiently for the final survey. A pre-test was then conducted to examine the validity and reliability of the items. For instance, whether the wordings of the items were relevant to the context and the logicity of items is consistent.

In this pre-test, there were 33 respondents who all had experiences of playing online games. 23 respondents were students who are from several countries but studying in University of Oulu now. 10 respondents were online game players who are living in China currently. Except the Chinese participants that filled in the Chinese version of questionnaire, other participants were writing the English version of questionnaire. The questionnaire of this pre-test was designed to require the respondents to choose an online game in which they familiar. The purpose of pre-test was to examine the validity and accuracy of survey constructs. Thereby, the data collected from this pre-test would not be involved in the final data analysis. The results of pre-test for factor analysis are presented in Appendix A1 and Appendix A2 illustrates the results of structural model in this pre-test.

There are some items should be modified and reworded due to their lower loading values presented in the Appendix A1. For instance, PgN3, PgN4, Int2, and Int4 are only 0.50, 0.67, 0.65, and 0.63. According to the Appendix A2 showing the PLS structural model results of pre-test, game balance and technical quality were not significantly related to a player's satisfactions in an online game ($\beta = 0.01, p > 0.05$ for game balance, and $\beta = 0.03, p > 0.05$ for technical quality). Additionally, the pro-gaming norms, integrity and active participation were not significantly related to a player's satisfaction with an online game ($\beta = 0.01, p > 0.05$ for pro-gaming norms, $\beta = 0.24, p > 0.05$ for integrity, and $\beta = 0.43, p > 0.05$). Hence, both hypotheses of game attractiveness and gaming climate were not supported in this pre-test. However, the effects of integrity and active participation were closed to significant standard. Causing the lower loadings in measurement model and no significances in structural model of the pre-test might be the small size of respondents. Moreover, the survey of this pre-test did not appoint a specific online game as the reference for answers of respondents, which also might impact the results of pre-test. In addition, the participants also gave some suggestions and comments to help the modification to the survey items. The detailed final survey items are shown in Appendix B.

4.4 Research site

The target of population of this study is the online game players. Therefore, players of two games were selected: players of World of Warcraft and players of Monster Hunter Online. Both two games are MMORPGs. An online game forum related to the World of Warcraft was chosen as one research site of this study. World of Warcraft (WoW) is a popular MMORPG created and operated in 2004 by Blizzard Entertainment. Similar with other MMORPGs, players control their character created by themselves within a specific virtual world in the third-person view. Players can play with other players together to explore the unknown landscape, complete quests as well as fight various monsters and other players in this game. World of Warcraft is an online game operated by pay-to-play business model. It requires the players should pay for a playing times subscription (Blizzard Entertainment, 2015.)

World of Warcraft had 5.6 million subscribers at the end of June 2015 so that it became the most-subscribed and most famous pay-to-play MMORPG in the world nowadays. World of Warcraft also holds the Guinness World Record for the pay-to-play MMORPG with the most subscribers until right now. In addition, World of Warcraft is the highest grossing online game because it has grossed over 10 billion dollars at the beginning of game operations in July 2012. (MMO Champion, 2015.)

Another research site was an online community (specifically QQ community) in which Monster Hunter Online was the theme of this community. Participants in this community are players of Monster Hunter Online. The Monster Hunter Online is a free-to-play MMORPG lunched in 2013 by Tencent Games Company only in the mainland of China. Monster Hunter Online is an online version of Monster Hunter series. Originally, Monster Hunter series were an offline, classical action game created by a Japanese game company – Capcom. Tencent Games Company then developed its online version entitled “Monster Hunter Online,” whereas the technical support is still provided by Capcom. Because the development of Monster Hunter Online was adapted to CryEngine 3, the graphics of this online game is better than other Monster Hunter game series. (Tencent Games, 2015.)

4.5 Data collection

This study adopted a Web survey for collecting the data. An invitation letter with a link to the online survey was posted in the online game forum related to the World of Warcraft as well as in the online community for Monster Hunter Online respectively to recruit the participants randomly. Every player in the community and forum can answer the survey voluntarily. The name of the game was specified in the online survey for these two online games respectively. In total, 268 usable responses were received. The detail demographic information for all participants is presented in the Table 2.

Most participants have been playing the online game for over two years presented in Table 2. In addition, most online game players of these two online games are male. With respect to educations, most of participants have a bachelor's degree (or above).

Table 2. Demographics of participants in this study (N = 268)

Demographics		Frequency	Percent (%)
Age	< 18	33	12.3
	18-29	215	80.4
	≥ 30	20	7.5
Educations	High school	40	14.9
	College (≤ 3 years)	80	29.9
	Bachelor's degree	135	50.4
	Master's degree or higher	13	4.8
Gender	Female	15	5.6
	Male	253	94.4
Playing tenure in one online game	< 2	75	28.0
	2 – 4	59	22.0
	4 – 6	64	23.9
	> 6	70	26.1

Notes: Age and playing tenure in one online game are number of years.

5 Data analysis

To test the items, hypotheses and research model, this study utilized the partial least squares (PLS), which is a latent structural equation modelling approach for evaluating the reliability and validity of the items as well as assessing the relationship between each constructs (Chin, 1998b; Wold, 1982). PLS makes minimal demands and residual distributions because it uses a component-based approach to calculate and assess the data (Chin, 1998a; Chin, 1998b; Lohmöller, 1989).

PLS was frequently adopted in IS research because it can analyse measurement model as well as structural model with multi-item constructs (Chin & Marcolin, 2003). A PLS model recommends a two-stage analytical approach (Anderson & Gerbing, 1988; Hair, Andreson, Tatham, & Black, 1998). The first stage of PLS model is the assessment of the measurement model through the confirmatory factor analysis. The second stage is the evaluation of the structural model by checking the structural relationships.

5.1 Measurement reliability and validity

The assessment of measurement model includes three different validity evaluations: content and internal validity, convergent validity as well as discriminant validity. Content validity is used to assess the consistency of items in which measures a same construct (Bock et al., 2005). This study was done the content validity by implementing a conceptual validation sorting and pre-test. Furthermore, content validity and internal consistency reliability can be evaluated by using Cronbach's alpha (Cronbach, 1951; Cronbach & Thorndike, 1971). The value of Cronbach's alpha is recommended to exceed 0.7 to represent an adequate reliability of constructs (Nunnally, 1967).

This study assesses the convergent validity by checking average variance extracted (AVE) and composite reliability (CR) scores from the items (Hair et al., 1998). Fornell and Larcker (1981) suggested AVE scores should be used 0.5 as the generally recognized value. Many studies indicated PLS have adopted 0.5 as the generally acceptable value of CR, but Chin (1998b) suggested 0.7 is better for a reliable construct.

The values of correlations of constructs, Cronbach's alpha, AVE, CR, and square root of AVE of this study are presented in Table 3. All constructs' values of Cronbach's alpha are higher than recommendable value 0.7, from 0.71 (game balance) to 0.89 (integrity) presented in Table 3. The CR values of all constructs also are higher than generally acceptable standard 0.7, ranging from 0.83 (game balance) to 0.92 (integrity and satisfaction). And the AVE values of all constructs exceed 0.50 and range from 0.62 (technical quality) to 0.79 (satisfaction). In other words, all the convergent validities from the measures are acceptable.

Table 3. Results of Cronbach's Alpha, AVE, CR, and Construct correlations

Constructs	Cronbach's Alpha	AVE	CR	1	2	3	4	5	6
1. Game Balance	0.71	0.63	0.83	0.79					
2. Technical Quality	0.80	0.62	0.87	0.45	0.79				
3. Pro-gaming Norms	0.85	0.69	0.90	0.36	0.46	0.83			
4. Integrity	0.89	0.70	0.92	0.42	0.51	0.60	0.84		
5. Active Participation	0.83	0.74	0.90	0.46	0.46	0.51	0.56	0.86	
6. Satisfaction	0.87	0.79	0.92	0.51	0.48	0.38	0.50	0.54	0.89

Notes: The bold numbers in the diagonal row refer to square roots of AVE

Discriminant validity is assessed by checking the values of square root of AVE and the factor loadings to check the difference between each item. The scores of square root of AVE can show the comparing of each correlation among the latent variables (Chin, 1998b; Cook, Campbell, & Day, 1979). Table 3 shows the values of square root of AVE in bold at the diagonal row, and all values are higher than the off-diagonal values in the same rows and columns. The detail factor analysis is indicated in Table 4. Comrey (1973) suggested the standards of loadings, the range from 0.45 to 0.54 refers to fail, 0.55 to 0.62 represents good, 0.63 to 0.70 is very good, and higher than 0.71 should be excellent. Although the item GaB3 only is 0.62 that only good, all other items are excellent due to above 0.71 shown in the Table 4. Therefore, the discriminant validity is sufficient same as convergent validity.

5.2 Hypotheses testing

Because the measurement model was evaluated sufficiently, the all proposed hypotheses and model of this study were examined with PLS. The results of PLS analysis are presented in Figure 3 and Table 6 summaries the results of hypotheses testing. Figure 3 and Table 6 indicate the significances and variance explained (R^2) for evaluating the explanatory power of structure model, standardized path coefficients and T-statistics for assessing the significance level by p-values.

The R^2 for player's satisfaction with an online game model presented in Figure 3 is 0.43. All the hypotheses of game attractiveness are significantly related to player's satisfaction in an online game. The link between game balance (H1) and player's satisfaction is supported ($\beta = 0.25$, $p < 0.0001$), which means the game balance is positively related to a player's satisfaction in an online game. In addition, the path between technical quality (H2) and player's satisfaction approaches significant ($\beta = 0.25$, $p < 0.01$), thereby, there is the positive relationship between technical quality and a player's satisfaction in an online game.

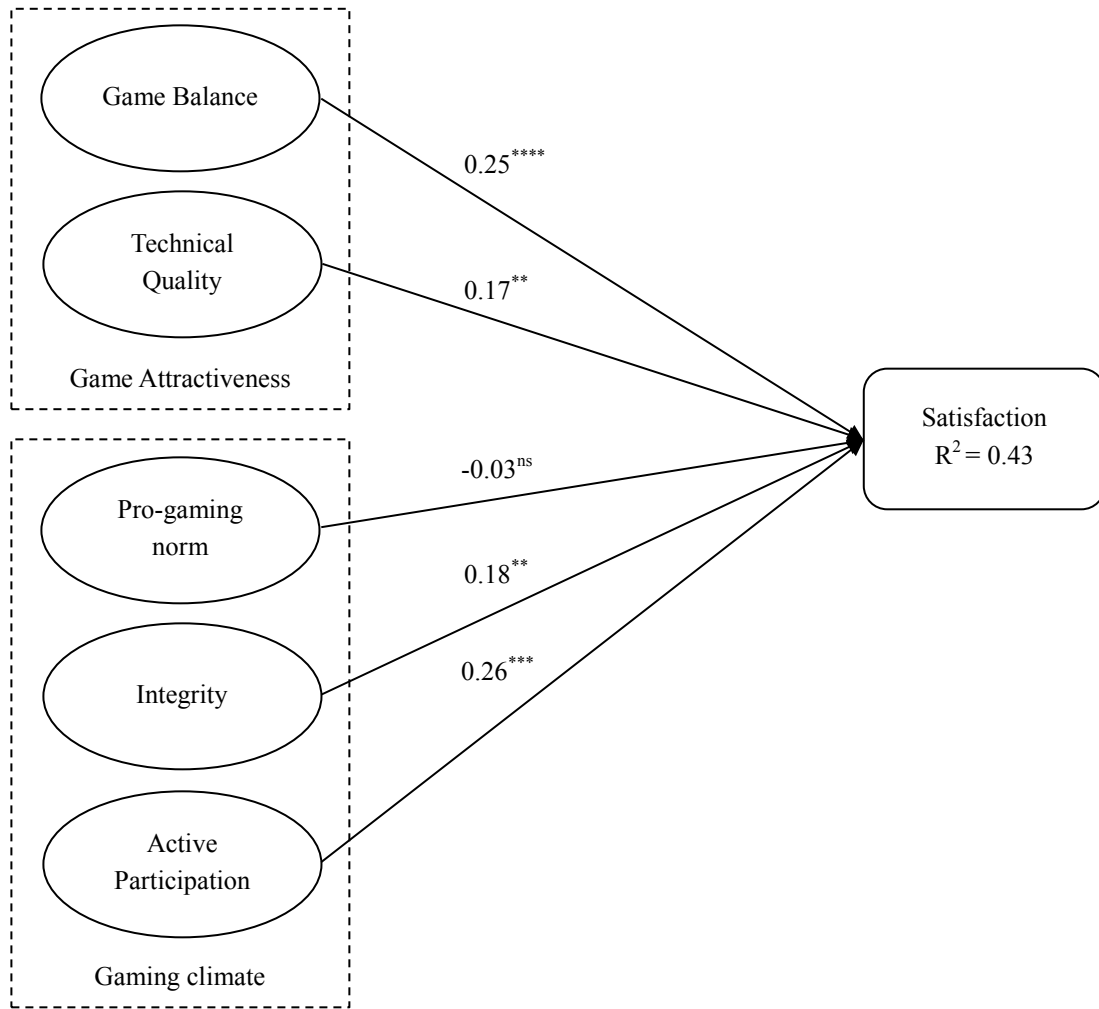
Table 4. Results of factor analysis

Items	GaB	TeQ	PgN	Int	AcP	Sat
GaB1	0.85	0.31	0.25	0.36	0.33	0.40
GaB2	0.88	0.43	0.32	0.35	0.43	0.50
GaB3	0.62	0.33	0.32	0.30	0.33	0.28
TeQ1	0.41	0.76	0.29	0.40	0.33	0.43
TeQ2	0.33	0.80	0.39	0.42	0.36	0.32
TeQ3	0.34	0.83	0.39	0.37	0.40	0.43
TeQ4	0.33	0.77	0.43	0.42	0.35	0.29
PgN1	0.31	0.35	0.82	0.57	0.47	0.32
PgN2	0.25	0.41	0.86	0.45	0.38	0.29
PgN3	0.32	0.40	0.85	0.47	0.45	0.36
PgN4	0.32	0.40	0.79	0.51	0.39	0.30
Int1	0.41	0.46	0.55	0.85	0.52	0.43
Int2	0.31	0.34	0.48	0.84	0.43	0.39
Int3	0.37	0.45	0.53	0.88	0.54	0.44
Int4	0.29	0.47	0.49	0.77	0.39	0.37
Int5	0.35	0.41	0.47	0.84	0.47	0.45
AcP1	0.40	0.41	0.45	0.54	0.86	0.48
AcP2	0.38	0.38	0.44	0.47	0.86	0.44
AcP3	0.41	0.40	0.42	0.44	0.86	0.47
Sat1	0.48	0.45	0.33	0.43	0.51	0.89
Sat2	0.43	0.43	0.41	0.48	0.50	0.89
Sat3	0.45	0.40	0.29	0.42	0.43	0.89

Notes: GaB = Game balance; TeQ = Technical quality; PgN = Pro-gaming norms; Int = Integrity;
AcP = Active participation; Sat = Satisfaction

The most of constructs of gaming climate are supported. The relationship between pro-gaming (H3) norms and satisfaction of players in an online game is not supported by results of hypotheses testing ($\beta = -0.03, p > 0.05$). The integrity (H4) of players positively affects a player's satisfaction in an online game ($\beta = 0.18, p < 0.01$) because the link between integrity and satisfaction is supported. Additionally, the path between active participation (H5) and player's satisfaction is positive and significant ($\beta = 0.26, p < 0.001$), so that the

result suggest that more level of active participation of players can positively promote a player's satisfaction in an online game.



*p<0.05, **p<0.01, ***p<0.001, ****p<0.0001 ns: no significant

Figure 3. PLS analysis of structural model

Table 6. Summary of Significant Results

Hypothesis	T-Value	P-Value	Supported?
H1: Game balance → Satisfaction	4.24	$p < 0.0001$	Yes
H2: Technical quality → Satisfaction	2.71	$p < 0.01$	Yes
H3: Pro-gaming Norms → Satisfaction	0.46	$p > 0.05$	No
H4: Integrity → Satisfaction	2.98	$p < 0.01$	Yes
H5: Active participation → Satisfaction	3.44	$p < 0.001$	Yes

6 Discussions

The objective of this study was to investigate the factors that influence a player's satisfaction in an online game. The study adopted the socio-technical perspective to examine the relationship between game attractiveness and a player's satisfaction, as well as the relationship between gaming climate and the player's satisfaction. Accordingly, this study found that two factors related to game attractiveness positively influenced the players' satisfaction. Additionally, this study indicated that two dimensions of the gaming climate were positively related to a player's satisfaction with an online game.

6.1 Discussion of findings

The findings of this study support most of hypothesized relationships. Base on the findings of this study, game balance significantly affects a player's satisfaction in an online game. In prior study, fairness of game design was related to a player's intention to an online game (Wu et al., 2010). As noted earlier, fairness is only one dimension of game balance, which is the most important phase for the online game design (Newheiser, 2009; Griesemer, 2010). In the discussion of online game, players would like to play an online game with a good balance. Thus, the findings about the effect of game balance are consistent with the viewpoint held by online game players.

Moreover, the findings of this study indicate that technical quality positively influences a player's satisfaction in an online game. This result is consistent with the prior studies on the online game, which found that stable servers' connection is related to players' intentions to play an online game (Chen, 2010). Moreover, Wu et al. (2010) mentioned that the game security was the key factor that affects the players' satisfactions. Game security involved cheating plug-in detection and prevention as well as updating the online game to fix such as bugs (Chen, 2010; Yan & Randell, 2009). On the other hands, the service technical quality of online products was important for customers' intention to use (Boyer & Hult, 2006). Therefore, the results regarding the effect of technical quality are consistent with the findings of prior studies.

The findings of this study showed the pro-gaming norms did not significantly impact a player's satisfaction in an online game. In other words, the level of pro-gaming norms in the online games is irrelevant to a player's satisfaction. Prior studies on knowledge sharing reveal that social capital is related to people's intention to share their knowledge or exchange resource with others (Wasko & Faraj, 2005; Kankanhalli et al., 2005; Tsai & Ghoshal, 1998; Chiu, Hsu, & Wang, 2006; Nahapiet & Ghoshal, 1998). The concept of social capital is the resources that can assess and mobilize the purposive behaviours of members in a social structure (Lin, 2001). Additionally, a significant factor of social capital in knowledge sharing was pro-sharing norms (Kankanhalli et al., 2005). It is found that pro-sharing norms affect the climate for knowledge sharing, which includes the collaboration and sharing (Goodman & Darr, 1998; Jarvenpaa & Staples, 2000; Orlikowski, 1993),

openness to different views (Leonard-Barton, 1998) as well as norms of teamwork (Starbuck, 1992). Like pro-sharing norms, there may be the pro-gaming norms in the society of online game, which is one dimension of online gaming climate and is related to a player's satisfaction in an online game. In the theory of TRA, subjective norms referred to the person's perception that she/he whether performs the behaviour was affected by her/his important people's thinking (Ajzen & Fishbein, 1975, 1980). Given that the context of online game, pro-gaming norms may be better than subjective norms because most players are strangers. For example, only few people play the online game due to the suggestions or invitations from their friends, but most people play an online game according to the other reasons such as fun or a good gaming climate. However, the results of this study are inconsistent with hypothesis and prior studies. This may due to small sample size and inaccurate measures of pro-gaming norms in the survey.

Moreover, the results of this study suggest that integrity of online players positively influences a player's satisfaction in an online game. In other words, players would be more satisfied with an online game due to a higher level of integrity of other players in this game. In the previous studies, trust was a key factor that reflected the relational dimension of social capital (Tsai & Ghoshal, 1998). Trust not only could promote people to share the knowledge but also could increase the quality of knowledge during the sharing (Chiu et al., 2006; Wasko & Faraj, 2005). In addition, in the contexts of online shopping, trust is also the key factor deciding whether people go to online shopping (Gefen et al., 2003). Trust had three dimensions, ability, benevolence and integrity (Mayer, Davis, & Schoorman, 1995). However, most players are strangers in the online games, they cannot easily establish the trust to other players. Integrity is better than trust to explore the gaming climate because integrity focused on fairness, honest and ethic (Jarvenpaa et al., 1998). The findings of this study prove the integrity exactly affect a player's satisfaction in an online game.

Finally, the results of this study indicate the positively relationship between active participation and a player's satisfaction in an online game. The higher level of active participation makes players be more satisfied. Typically, players would like to play an online game in which other players are active. Prior research reveals that people are more likely to use the social media that have more active users (Pagani & Mirabello, 2011). Thus, the findings of this study are consistent with prior research.

6.2 Contributions to the literature

This study contributes to the research on online games. It demonstrates that technical factors (manifesting as game attractiveness) and social factors (manifesting as gaming climate) can predict a player's satisfaction with an online game. Previous studies presented the playfulness that was a factor related to people's intentions to play the online games and was related to game technology and game design (Webster & Martocchio, 1992; Agarwal & Karahanna, 2000; Wu & Rao, 2008; Zhao & Fang, 2009). This study has enriched the technical aspects for online games by specifying game balance (that is related to game design) and technical quality (that is related to game performance), both of which will affect a player's satisfaction with an online game.

As one dimension of game attractiveness, game balance is important for game design and player's playing experience in an online game (Kiili, 2005). Unbalanced game design would waste the development resource and negatively affect the playing experience of online game players (Sirlin, 2009). However, past studies have not investigated the relationship between game balance and a player's satisfaction with an online game. This study reveals that game balance is positively related to a player's satisfaction. Additionally, the current study developed the construct and its measures based on Sirlin's (2009) definition of game balance.

Technical quality is the other dimension of game attractiveness. Prior studies found that stability of servers' connection and game security influence players' intentions to play an online game (Chen, 2010). In addition, cheating detection and prevention should also be considered in game technology (Yan & Randell, 2009). However, a construct measuring the technical quality of online games had been lacking. Based on prior studies, this study developed the measures for the construct "technical quality" relating to online games. The results further show that technical quality influences a player's satisfaction with an online game.

With respect to gaming climate, one dimension of gaming climate is pro-gaming norms, which is a new construct developed based on pro-sharing norms (Kankanhalli et al., 2005) as well as experts' opinion in the field of online games. Compared with other norms in organizational contexts, pro-gaming norms specifically present the gaming climate within an online game. Given that pro-sharing norms can promote people to share their knowledge with others (Kankanhalli et al., 2005), pro-gaming norms may be related to a player's satisfaction with an online game. Although the findings of this study did not support the hypothesis regarding pro-gaming norms, this construct itself may provide insights to future research on online games, especially the gaming climate.

Integrity is the second dimension of gaming climate. Integrity in online game reflects whether other players are fair, honest and genuine. In prior studies, integrity is one factor relating to trust in organizations ((Mayer et al., 1995). It is hard to establish trust in online games given that most players are strangers. Hence, integrity of other players reflects the gaming climate and would affect a player's satisfaction with an online game. The results of this study suggest that integrity significantly influences a player's satisfaction with an online game.

Active participation is the third dimension of gaming climate. Active participation indicates whether players are active in an online game. Because main activities in an online game are team building and discussions, the measures of active participation reflect whether players actively participate those activities in the online game. These measures for active participation in online games provide a foundation for future research on online games.

In the aspect of perspective, prior studies adopted TRA model to explain the people why they used or played the information technology products such as website and online game (Chang et al., 2014; Wu & Liu, 2007; Lu, Zhou, & Wang, 2009). TRA suggested personal attitude and subjective norms were the most significant factors to affect the personal intention behavior (Ajzen & Fishbein, 1975, 1980). TRA was frequently utilized to the researches of people's intention such as knowledge sharing (Bock et al., 2005). Similarly, TAM was adapted to the research of intention to use information technology products

(Agarwal & Karahanna, 2000). In the theory of TAM, perceived usefulness and perceived ease-to-use were the effects to the personal attitude to the information technical usages (Davis, Bagozzi, & Warshaw, 1989), and perceived usefulness as well as perceived ease-to-use were related to the technology design mentioned by Hong, Thong and Wai-Man Wong (2002).

In addition, Chang et al. (2014), Lee (2009) and Pilke (2004) explained that flow theory affects the players' willingness to play an online game. Flow is "an optimal state of experience in which one is completely absorbed and engaged in an activity that nothing else seems to matter" (Csikszentmihalyi, 1975, p. 36, 1990). In fact, a large number of studies present that engagement (Webster and Ho, 1997; Chapman, Selvarajah, and Webster, 1999), cognitive absorption (Agarwal, Sambamurthy and Stair, 1997) and telepresence (Hoffman and Novak, 1996), are similar to or a subset of flow theory. These theories also were the factors that influenced people's intent to use some information technology products such as a website and the virtual world in some prior studies (Animesh et al., 2011; Nah et al., 2011; Webster & Ahuja, 2006; Agarwal & Karahanna, 2000; Goel, Johnson, Junglas, & Ives, 2011). According to the summary of Agarwal and Karahanna (2000), enjoyment was one dimension of flow, engagement and cognitive absorption. Moreover, they argued that cognitive absorption affected the perceived usefulness and perceived ease-to use which were the dimensions of TAM theory (Agarwal & Karahanna, 2000).

This study used socio-technical approach to explore a player's satisfaction in an online game. The socio-technical approach has not been used in previous studies. Compared with above theories, socio-technical perspective explored both technical factors and social reasons to explain why players are satisfied with an online game. This study identified technical factors (manifesting as game attractiveness) and social factors (manifesting as gaming climate) that influence a player's satisfaction in an online game. Specifically, game balance and technical quality are manifestations of game attractiveness, while pro-gaming norms, integrity and active participation reflect internal gaming climate. The findings of this study support that game attractiveness and gaming climate are positively related to a player's satisfaction with an online game.

6.3 Implications for practice

Collectively, these results have important implications for practitioners who are interested in the online games regarding how online games attract people to play. The results of this study indicate that game attractiveness and gaming climate affect a player's satisfaction with an online game. Thereby, the findings of this study offer suggestions to game developers and companies about how to increase a player's satisfaction by promoting game attractiveness and gaming climate.

Firstly, online game developers and companies can adjust the game balance of their online game product. For instance, game developers and companies can add a lot of meaningful choices such as items and weapons in an online game. In addition, these choices should have both advantages and limitations in the typical contexts. Game developers should adjust the game balance to ensure that every player has an approximately same chance to win if they have equal game skills, regardless the choice they have made before starting the

game. The sufficient balancing in an online game can save resources during game development and increase a player's satisfaction with an online game.

Secondly, game companies should improve the technical quality of their online games in order to satisfy the players. Technical quality in the online game context is shown by the stability of server connection, detection and prevention of cheating behaviours, fixing bugs, as well as the quality of technical services. The network connection of the game server should be stable. Game companies should implement the cheating detection and prevention system and update it frequently to ensure that certain players cannot use some cheating plug-ins in the online games. Furthermore, game companies should also update the online game to fix bugs, and should punish the cheaters on time.

Thirdly, the online game companies should take into account the gaming climate of the online games. Based on the findings of this study, gaming climate also influences a player's satisfaction with an online game. Game companies should pay attention to the integrity of online game players. Game companies can establish systems to reward the honest and genuine players, and to warn or publish the players who are not. For example, game companies can evaluate the level of players' integrity according to other players' comments or reports regarding whether a player has cheated or is fair. Although the assessment of players' integrity is difficult, the results of the assessment are valuable and will lead to a good gaming climate, thereby benefiting the game companies.

Finally, game companies should pay attention to players' activeness in the online game. The findings of this study suggest that high level of activeness of players in the game can increase the players' satisfaction and thus will attract more people to play the online game together. Therefore, game companies can implement a rewarding system to reward the players who actively participate the teams, discussions and activities in the game so as to promote the activeness of players.

Most previous studies focused on technical aspects of online game such as game design and game playfulness (Eichenberger et al., 2005, 2006; Ponder et al., 2003; Wasko et al., 2011; Hamari & Lehdonvirta, 2010). However, the social factors also are important for a player's intention or satisfaction in an online game. The findings of this study provided sufficient evidences to support the social aspects are positively related to a player's satisfaction with a game. The game companies should emphasize both technical aspects and social factors with same priority in the online game development, operation and maintenance.

6.4 Strengths and weaknesses

There are several strengths to this study. The first strength is that the study adapted the socio-technical perspective to explore the factors of game attractiveness and gaming climate as well as the relationship between their factors and a player's satisfaction. As the mentioned above, previous studies did not attempt to use the socio-technical approach to agree the impacts of technical aspects and social aspects for explaining why people play an online game (stead of other online game).

This study indicated the definitions of game attractiveness and gaming climate systematically, including two contents of game attractiveness and three factors of gaming climate. Game attractiveness can be represented the technical aspect of the online games,

and gaming climate presents the social part of the online games. Therefore, the research model of this study is logical and valuable to explore a new knowledge gap so that contributing the research of online games.

On the other hand, it should note that the study still has some weakness. Firstly, the study used the cross-sectional data so that the study cannot investigate the process by which game attractiveness develops or the ways that gaming climate changes over time. Due to the cross-sectional design, this study could not examine the dynamic relationship between a player's satisfaction with a game and the changes in game attractiveness or gaming climate.

Secondly, based on a sample of 268 survey participants, most hypotheses were supported by the data collected from players of two online games. However, a larger sample size can bring more statistical power and allow more sophisticated statistical analysis. For instance, with a larger sample size, the relationship between pro-gaming norms and a player's satisfaction in an online game may be significant.

Third limitation was the study only recruited two online games players to answer the questionnaire. Both these two games, World of Warcraft and Monster Hunter Online are MMORPGs. Singular genre of online game may limit the generalization of results to other genres of online games. Finally, the research model was empirically validated by data collected from Chinese online game players. Cultural difference may exist.

6.5 Directions of future work

To address the above weakness, the following future researches are suggested. Firstly, given the limitation of cross-sectional data, future work can use the longitudinal data to assess the dynamic changes. Secondly, future research can collect more data to increase the sample size. Thirdly, data should also be collected from other genres of online games to increase generality and data could also be collected from different countries.

In addition to suggestions above, more future research could explore the other factors relating to game attractiveness or gaming climate, which may influence a player's satisfaction in an online game. For example, previous studies indicated the game enjoyment or playfulness was relevant to game design and also affect a player's intention to play an online game positively (Wu & Rao, 2008; Zhao & Fang, 2009; Nah et al., 2011). Thereby, future research can attempt to examine whether game enjoyment or playfulness impacts player's satisfaction with an online game.

More future working can be done to modify and continually explore the definitions and measures of pro-gaming norms. Similar with the relationship between pro-sharing norms and knowledge sharing (Kankanhalli et al., 2005), there should be the norms promote the gaming climate and impact a player's satisfaction in an online game.

7 Conclusion

From a socio-technical perspective, this study has investigated how technical factors (manifesting as game attractiveness) and social factors (manifesting as gaming climate) influencing a player's satisfaction in an online game. Specifically, game balance and technical quality are manifestations of game attractiveness, while pro-gaming norms, integrity and active participation reflect internal gaming climate. The findings suggest that two dimensions of game attractiveness (i.e., game balance and technical quality) and two dimensions of gaming climate (i.e., integrity and active participation) impact a player's satisfaction in an online game. By developing the measures for these constructs and proving their influences on a player's satisfaction in an online game, this study contributes to the research on online games. This study also has important implications for designers and operators of online games regarding how to improve players' satisfaction.

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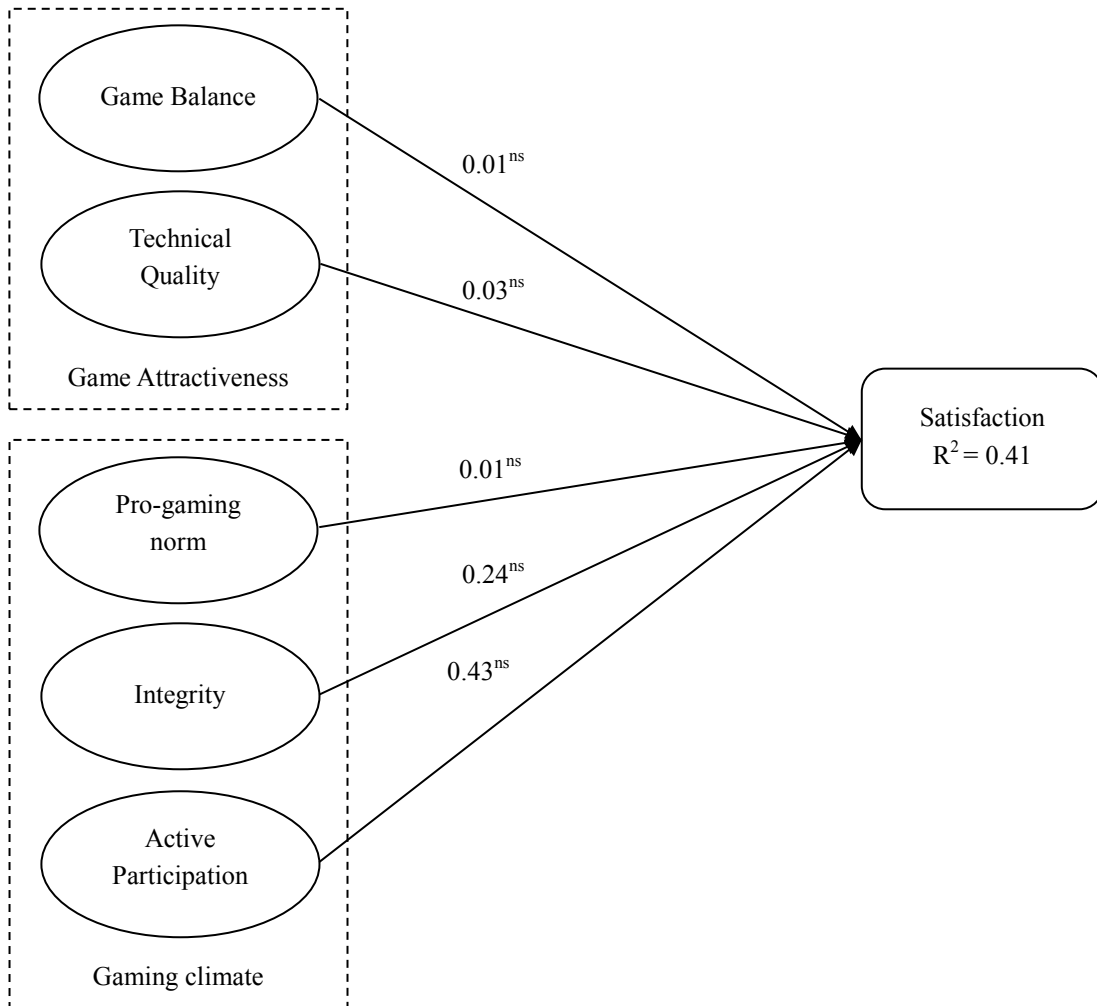
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Appendix A. PLS results for pre-test

Factor analysis of pre-test

Items	GaB	TeQ	PgN	Int	AcP	Sat
GaB1	0.86	0.40	0.10	0.32	0.54	0.33
GaB2	0.89	0.51	0.21	0.53	0.47	0.33
GaB3	0.81	0.39	0.06	0.40	0.43	0.33
TeQ1	0.34	0.78	0.42	0.59	0.21	0.38
TeQ2	0.37	0.77	0.48	0.43	0.10	0.29
TeQ3	0.49	0.81	0.38	0.60	0.36	0.31
PgN1	0.12	0.40	0.82	0.29	0.15	0.19
PgN2	0.25	0.49	0.82	0.37	0.24	0.27
PgN3	0.01	0.18	0.50	0.26	0.22	0.11
PgN4	-0.02	0.38	0.67	0.42	0.04	0.23
Int1	0.46	0.53	0.33	0.81	0.56	0.45
Int2	0.27	0.73	0.50	0.65	0.15	0.27
Int3	0.43	0.53	0.37	0.89	0.41	0.63
Int4	0.33	0.46	0.39	0.63	0.40	0.44
Int5	0.28	0.49	0.30	0.76	0.48	0.38
AcP1	0.51	0.21	0.13	0.46	0.85	0.43
AcP2	0.46	0.35	0.29	0.51	0.85	0.43
AcP3	0.49	0.19	0.14	0.45	0.91	0.44
Sat1	0.41	0.32	0.19	0.52	0.52	0.90
Sat2	0.38	0.48	0.28	0.56	0.48	0.94
Sat3	0.19	0.31	0.31	0.52	0.30	0.79

Notes: GaB = Game balance; TeQ = Technical quality; PgN = Pro-gaming norms; Int = Integrity;
AcP = Active participation; Sat = Satisfaction

Results of structural model in pre-test

*p<0.05, **p<0.01, ns: no significant

Appendix B. Formal constructs and items

Construct	Item and code
<p>Game balance (Developed based on Sirlin, 2009)</p>	<p>In <name of the online game>, lots of meaningful choices are presented to the players. (GaB1)</p>
	<p>In < name of the online game>, sufficient contexts are provided to allow each choice (that a player makes in the game) to have balanced advantages and limitations. (GaB2)</p>
	<p>In <name of the online game>, players with equal game skills have a roughly same chance to win although they might start the game with different choices (options / characters / resources / etc). (GaB3)</p>
<p>Technical Quality (Developed based on Weill and Vitale, 2002)</p>	<p><Name of the company for this online game> detects and prevents cheating plug-ins effectively. (TeQ1)</p>
	<p><Name of the company for this online game> quickly solves technical problems (e.g., bugs and cheaters). (TeQ2)</p>
	<p>In <name of the online game>, game server's availability and response time are reliable. (TeQ3)</p>
	<p><Name of the company for this online game> promptly and effectively punish the unethical players. (TeQ4)</p>
<p>Pro-gaming Norms (Developed based on Weill and Vitale, 2002)</p>	<p>There is a norm of tolerance of mistakes made by other players in the game. (PgN1)</p>
	<p>There is a norm of acknowledging one's own mistakes in the game. (PgN2)</p>
	<p>There is a norm of openness to conflicting views in this game. (PgN3)</p>
	<p>Avoiding the use of offensive or hurtful language is a norm in this game. (PgN4)</p>

<p>Integrity (Adapted from Jarvenpaa et al., 1998; McKnight et al., 2002)</p>	Players try hard to be fair in dealing with one another in the game. (Int1)
	Players will do what they promised in the game. (Int2)
	Players are sincere and genuine in the game. (Int3)
	Players do not cheat in the game. (Int4)
	Players display a solid ethic in the game. (Int5)
<p>Active participation (Developed based on Pagani and Mirabello, 2011)</p>	Most players in the game actively respond to others' invitation of building teams. (AcP1)
	Most players actively participate the discussion in the game. (AcP2)
	Most players in this game actively seek for teams to join. (AcP3)
<p>Satisfaction (Adapted from McKinney et al., 2002)</p>	All things considered, I am very satisfied with this online Game. (Sat1)
	Overall, I am very satisfied with the gaming climate in the online game. (Sat2)
	Playing this online game made me contented. (Sat3)