WHY THEY ENJOY VIRTUAL GAME WORLDS? AN EMPIRICAL INVESTIGATION

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ABSTRACT

In the past decade, virtual worlds have demonstrated the potential to be the next generation of interface for entertainment, interaction, content, and e-commerce. As a major type of virtual worlds, online games become a huge business and engage millions of players around the world. However, e-commerce researchers have so far paid insufficient attention to why players enjoy using virtual game worlds. To address this insufficiency, the current study develops and empirically tests a theoretical model of determinants of online gaming enjoyment. Specifically, this study suggests that key elements of online games are the primary factors associated with the enjoyment of playing an online game. The current study also investigates the impact of enjoyment on gaming behavior while we control for other known critical variables of attitude and subjective norms. The proposed research hypotheses are tested by using questionnaire responses of 253 online game players. Overall, the results indicate that online game story, graphics, length, and control are highly related to enjoyment, and that enjoyment has a significant impact on behavioral intention even with the presence of control variables.

Keywords: behavioral intention, enjoyment, online game, subjective norms, virtual worlds.

1. Introduction

In the past decade, we have witnessed the rapid growth of Internet-based simulated environment – virtual worlds. As an important aspect of e-commerce, virtual worlds refer to artificial environments created by computer systems, in which the users have the impression of being immersed [Manetta and Blade 1995]. As such, the objective of virtual worlds is to achieve a feeling of telepresence, enjoyment, immersion, and participation from a distance [Jakala and Pekkola 2007]. The advances in personal computing, coupled with the remarkable penetration of the high-speed Internet, bring virtual worlds to the reach of everyone.

Virtual worlds involve many online game genres and reality-based fictional environments such as Second Life, Entropia Universe, and Cyworld [Bray and Konsynski 2007; Guo and Barnes 2007]. While the online games such as Massive Multiplayer Online Role Playing Games (MMORPGs) are designed to build a fantasy-based entertaining virtual world where participants adventure jointly, the later three types of virtual worlds focus on creating computer-mediated, shared experiences where participants can interact together [Bray and Konsynski 2007]. Online games are often featured with in-game items for players to acquire, quests or missions for players to accomplish, and a loose structure created by an open-ended fictional story [Yoon 2005]. However, the reality-based virtual worlds such as Second Life may not necessarily have these features. DFC Intelligence [2006] estimates that the number of global

online game players will increase from 124 million by 2005 to 376 million by 2009 and that the worldwide subscription revenue from online games will grow from $2 billion in 2005 to $6.8 billion in 2011. The rapid growth of online game business calls for an investigation to find the key factors that may explain the enjoyment of playing online games. But so far, little empirical study has been conducted on the subject.

Online games, as an important type of virtual worlds, run on a cluster of servers and are played online through the Internet [Hsu and Lu 2004]. Unlike traditional PC or console games where usually one person plays a game, online games allow many players around the world to play together [Wu and Liu 2007]. Many online games, especially first-person-shooting games and role-playing games, are inseparable from virtual worlds [Bray and Konsynski 2007; Guo and Barnes 2007]. For example, in the game of EverQuest, players explore a virtual world of sword and sorcery, fighting monsters and enemies for treasure and experience points. Another online game, Matrix Online, continues the story told in the Matrix movie series and immerses players into the role of a "redpill," a human who was formerly trapped inside the virtual universe of the Matrix. The game setting of Star Wars Galaxies is the well-known Star Wars fictional universe, with the time period currently set in between the events in Episode IV: A New Hope, and Episode V: The Empire Strikes Back.

Previous studies find that people play online games for various reasons such as overcoming challenge, alleviating tension, making friends, and killing time, but the most basic goal is to enjoy [Davis et al. 2005; Kim et al. 2002]. Thus, virtual game worlds should be enjoyable. In other words, online games should be able to provide players with a pleasurable experience. But what makes online games enjoyable? This question is of considerable interest because creators, sponsors, and operators of online games can benefit greatly from improved understandings of the driving factors behind players' pleasurable experience. More to the point, the question should also be of great importance to industry vendors as they strive to motivate users to play online games more often. In addition, addressing the question may enable practitioners to better design and engineer other reality-based virtual worlds and thus leverage these Web-based technologies to create new e-commerce models for generating revenues and engaging consumers [Holsapple et al. 2005].

The purpose of this study is to focus on virtual game worlds and empirically test a theoretical model to examine the factors related to the formation of online gaming enjoyment. The proposed theoretical model suggests that key elements of online games are the primary factors explaining why players will perceive an online game as enjoyable. The five most important elements of online games captured by the model are story, graphics, sound, length, and control. Moreover, the model also examines the subsequent effect of online gaming enjoyment on players' intention to play online games. By investigating the links between game elements and enjoyment, and the link between enjoyment and behavioral intention, the current study provides a clear picture of how the basic game attributes impact players' intention to play online games through the development of enjoyable gaming experience.

2. Theoretical Concepts of Enjoyment

Enjoyment is recognized as the conceptualization of intrinsic motivation [Wu and Liu 2007]. Defined as the engagement in activity for "its own sake," intrinsic motivation mainly relates to perceptions of pleasure, joy, and fun [Deci and Ryan 1985]. According to the theory of intrinsic motivation, the reward of performing an activity is the process of the activity itself and not an end result [Lesser and Madabhushi 2001]. The theory has been widely used to understand information system related human behavior [Venkatesh 1999].

Enjoyment can be defined as the degree to which performing an activity is perceived as providing pleasure and joy in its own right, aside from performance consequences [Venkatesh 2000]. As a state of positive emotional experience, enjoyment can occur not only in the chase of physical activities such as dancing, but also in the pursuit of mental activities such as playing chess. According to the Flow Theory, enjoyment is one of the five important dimensions of flow experience [Csikszentmihalyi 1990].[1] Moreover, the occurrence of enjoyment can also be general or situation-specific. An example of general enjoyment would be that an individual perceive interacting with computers as enjoyable, no matter what the individual is doing on them, while an example of situation-specific enjoyment would be that an individual may enjoy working with a specific IT tool such as MSN Messenger.

Enjoyment has received considerable research attention in recent years [Koufaris 2002; Lee et al. 2005; Venkatesh 2000]. Testing an integrated theoretical model on online consumer behavior, Koufaris [2002] finds that shopping enjoyment has a significant impact on consumer intention to re-visit an online store. Based on this finding,

[1] Flow is defined as the state in which individuals are so involved in an activity that nothing else seems to matter; flow theory can be applied to almost any activity including making music, rock climbing, dancing, sailing, and playing chess [Csikszentmihalyi 1990]. This study focuses on enjoyment rather than flow because prior work suggests that multidimensional flow construct may not be adequate to explain online consumer behavior and researchers must be cautious in using flow in their e-commerce studies [Koufaris 2002].

the author argues that shopping enjoyment may be a critical variable in studying online consumer behavior. Prior research also shows that enjoyment can have an indirect influence on behavioral intention through other variables. For instance, focusing on the roles of anchors and adjustments in technology acceptance, Venkatesh [2000] finds that enjoyment significantly impacts behavioral intention through perceived ease of use. In an empirical investigation of user acceptance of e-learning, Lee and colleagues [2005] observe that enjoyment not only have a direct impact on behavioral intention but also indirectly impact it via attitude. In short, previous research shows that enjoyment can play an important role in predicting system use behavior. The current study extends such research by examining the factors related to and effects of enjoyment in virtual game worlds.

In summary, researchers have so far investigated enjoyment in the context of instant messaging [Li et al. 2005] and online shopping [Koufaris 2002], but paid insufficient attention to its role in online gaming. Based on the factor that players tend to be motivated mostly by intrinsic motivation, we expect that enjoyment is a critical construct in studying online game player behavior.

3. Research Model and Hypotheses

Drawing upon the established theories and prior empirical findings, we propose a conceptual model that investigates the factors related to and effects of online gaming enjoyment. As depicted in Figure 1, our model suggests that enjoyment is highly related to online game story, graphics, sound, length, and control, and enjoyment predicts intention to play online games while the effects of attitude and subjective norms on behavioral intention are under control.

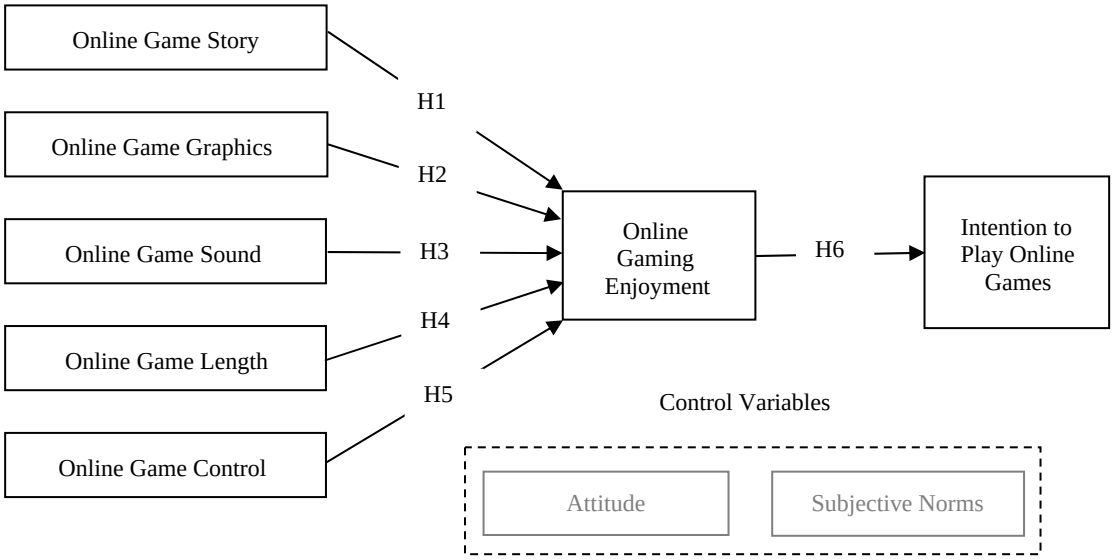

Figure 1. Research Model

3.1. Online Game Story and Enjoyment

Like movies, most online games have a story to which players may attach their fantasies and desires. An online game story usually tells players what is going on in a game. More specifically, it describes the circumstances of the events or the experiences of the characters that happen in the game sessions [Juul 2001a]. Like those presented in movies, novels, and operas, stories are also a key component of an online game.

Consequently, online games stress the importance of story a lot. This is because an interesting story can motivate players to explore the game, to continuously return to the virtual world, and to see the in-game characters through to the end [Pearce 2003]. Moreover, an attractive story can make an online game more enjoyable by evoking fantasies and sense of curiosity in players. Thus, they immerse themselves into the story to build an in-game character who determines his own fate by acting within the time and space of a virtual world [Ryan 2001]. In such a situation, the players definitely enjoy the tasks such as fighting terrorists and saving the earth from an alien invasion, and forget momentarily all the unpleasant and worrisome things in their real lives. In short, they perceive the game as appealing and entertaining. Thus, we are led to the following hypothesis.

Hypothesis 1: Online game story is positively related to online gaming enjoyment.

3.2. Online Game Graphics and Enjoyment

Online game graphics refers to visual information players receive during the game, which are presented in the form of pictures, images, or drawings. Because most people consider online games as mainly visual experience oriented entertainment, the primary goal in the development of the games is to improve the technology for their visual presentation [Smith 2002]. When designers are able to render more and more polygons, they can present a more "big and real" virtual game world, construct more nuanced characters, and depict more precise action details. Assumedly, intensive visual information will give the digital spaces explored by the interactive players some of the richness of the cinematic signifier [Smith 2002].

As long as online games are considered to be primarily visual, it is reasonable for both designers seeking to elevate their game and players eager to have fun to concentrate on the visual expressivity of this online entertainment. To increase the quality of the gaming experience, online game designers pay close attention to how well graphics are developed to represent "reality." For example, in some online games, the basic facial features of an avatar include a photo-realistic face with slight dynamic changes in expressions [Pearce 2002]. Those changes, such as subtle smile and blinking of eyes, are non-controllable by players but are employed to enhance the liveliness of the avatar. Consequently, the players will perceive the games as amazingly real and enjoy playing them. Thus, we hypothesize:

Hypothesis 2: Online game graphics is positively related to online gaming enjoyment.

3.3. Online Game Sound and Enjoyment

Online game sound refers to auditory information players receive during the game such as music, speech, weapons firing, running, etc. Online games adopt certain roles of sound from the prior narrative medium: cartoon movies. This is because online games and cartoon movies share the similarity that they both rely on visual and auditory cues to convey a sense of time and space of a fictional world, and that they are both based on the similar production techniques [Ward 2002]. In general, online game sound serves two purposes: expanding the concept of a game's virtual world and drawing players forward through the sequence of gameplay [Whalen 2004].

Online game sound achieves the two purposes by providing players more information to reinforce the impact of graphics. Research on cognition and animation suggests that visual objects are perceived as alive and exhibiting anthropomorphic behavior when their actions are accompanied by a synchronized soundtrack [Cohen 2000]. In online gaming context, sound can not only provide an audio complement to action on the screen but also help create a sense of a real physical space [Morris 2002]. In addition, the auditory information through speakers or headphones can make players reach the winning situation sooner by supporting them to perceive the game's space in 360 degrees [Whalen 2004]. Thus, as a key interaction cue, sound plays an important role in shaping players' perception toward online gaming.

By creating the perception of real physical space, online game sound makes gameplay a more compelling experience, for example, by engaging players in the exploration of a mystery world full of puzzles or immersing them in the excitement of fighting terrorists to save the in-game character that has been kidnapped. As a result, the players are likely to consider the online game enjoyable. Thus, we hypothesize:

Hypothesis 3: Online game sound is positively related to online gaming enjoyment.

3.4. Online Game Length and Enjoyment

Online game length is the average amount of time that players spend on reaching the predefined winning situation. Researchers and practitioners believe that there is no magic number to target in terms of online game length but each game has its unique "ideal length" based on the gameplay, story, pacing, and introduction of new elements [Zeschuk and Muzyka 2004]. To allow players to more enjoy an online game, it is critical to integrate the length to the background story of the game [Eilers 2000], and to match the length to the quality of the experience in the game [Zeschuk and Muzyka 2004].

A game story is unlikely to be told satisfactorily unless sufficient time is given for its telling. On the other hand, extending a story beyond its natural limits for the sake of game length can not do any good to players' gaming experience but weaken the narrative of the story [Boon 2006]. Thus, online game length becomes a balance. Developers should offer as much gameplay as they can from the available materials based on the background story. At the same time, they should pace their games in a satisfying manner and make it clear to the players that a predefined winning situation can be achieved in a reasonable period of time [Boon 2006]. By doing so, developers are more likely to provide players with an enjoyable online game. Thus, we are led to the following hypothesis.

Hypothesis 4: Appropriate online game length is positively related to online gaming enjoyment.

3.5. Online Game Control and Enjoyment

Playing online games to some extent can be viewed as an exercise of control systems [Juul 2001b], which requires hand-eye-coordination and often causes physical or physiological reactions [Eskelinen 2001]. Online game control refers to the mechanism that allows players to manage and direct an online game by using keyboard and mouse. In other words, the control is the interface between online games and players. Online game control is important because it impacts players' feelings of how the game is easy to manage. To allow players to grab a mouse and immediately play an online game, the control must be designed in a way that is intuitively understandable, easy to learn, and easy to use.

There are few good games with bad controls. When players have difficulties in controlling in-game character body movement or in weapon aiming, they perceive the online game as having low play value and thus are less likely to continue, let alone to have fun. On the contrary, when the control is easy to use, players will consider the online game as a decent and attractive one. For example, in some online games, players are able to set their crosshair at any level and it will stay there. When the crosshair is positioned by the players over an enemy, its color changes from blue to red that indicates the players' shot will hit the enemy. Moreover, the aiming mechanism also allows the players to "lock on" to a target to achieve more accurate shot by placing the crosshair on the target for a certain period of time. As a result, the players will have a strong feeling that the weapon is totally under their control and will report more satisfaction with the weapon performance, and thus they seem to enjoy the game more [Davis et al. 2005]. Therefore, we hypothesize:

Hypothesis 5: Online game control is positively related to online gaming enjoyment.

3.6. The Impact of Enjoyment on Intention

Enjoyment has been found to impact behavioral intention in many online interaction settings. Prior work suggests that enjoyment directly affects the behavioral intentions of online customers. For example, Heijden [2002] finds that users who have experienced enjoyment are more likely to show intention of returning to a Dutch movie website. Similarly, Li et al. [2005] find that users who perceive the use of instant messaging as enjoyable are more likely to have intention of continuing using it. In addition, past studies also find that enjoyment positively impacts the use of information systems [Davis et al. 1992; Igbaria et al. 1996]. In short, the relationship between enjoyment and behavioral intention has received theoretical and empirical support.

Compared with other activities such as online shopping or using information system, playing online games is more experience-oriented and online game players are more motivated by the intrinsic motivations associated with playing online games. Thus, players who experience enjoyment, the emotional response of pleasure, are more likely to be motivated to continuously play online games. Therefore, it is plausible to hypothesize that enjoyment received from playing online games influences players' intention to play.

Hypothesis 6: Online gaming enjoyment positively influences intention to play.

3.7. Control Variables

To test the research model, we control two salient variables known to impact behavioral intention: attitude and subjective norms. According to the Theory of Reasoned Action (TRA), a well-established general theory of human behavior, behavioral intention is determined by an individual's attitude toward the behavior and the individual's subjective norms [Ajzen and Fishbein 1980]. TRA often serves an important theoretical basis for developing research frameworks such as the Technology Acceptance Model (TAM) [Davis 1989]. Because previous research suggests that in the context of online gaming, attitude and subjective norms play a more important role than other variables [Hsu and Lu 2004], we control their effects on behavioral intention.

4. Methodology

4.1. Survey Instrument, Pilot Test, and Data Collection

To test the research model, data were collected via a survey instrument that uses multi-item scales to measure all research constructs. The scale measuring the online gaming enjoyment is adapted from Koufaris [2002]. Measures for intention to play online games are adapted from Agarwal and Karahanna [2000]. The items used to measure the two control variables are adapted from two sources: attitude measures are based on Agarwal and Prasad [1999] and subjective norms measures are adapted from Hsu and Lu [2004]. The items used to measure online game story, graphics, sound, length, and control are newly developed. All survey questions use a seven-point Likert scale.

To ensure the clearness and appropriateness of the questionnaire items, a pilot test of the survey instrument was carried out with 26 online game players. We modified the survey questions based on the comments and suggestions obtained from the participants. For example, the initial questionnaire items for Intention2 and Intention3 were "I will intend to play online games" and "I believe I will play online games for a long time," respectively; the initial survey

items for Attitude2 and Attitude3 were "I like to play games online" and "I feel that playing games online is attractive," respectively. As shown in Appendix A, the final measures for these items are slightly different and more concise and precise.

The survey subjects of this study are experienced online game players who are undergraduate students at a business school in the eastern United States. A total of 392 students completed the survey questionnaire with regard to their most experienced online games and online game websites. Of the 392 questionnaires, 139 were discarded because respondents had no prior experience with playing online games, or because survey responses were incomplete. Thus, a total of 253 valid surveys are used for data analysis of this study.

Of the respondents, 100 are female and 153 are male. The average age is 23 and most participants (83%) are in their early 20s. In average, each participant spends 3.2 hours on gaming every week, with a range from half an hour to twenty hours. The average tenure for these online game players is 2.8 years, ranging from several months to twelve years. Finally, home is the primary location of playing online games.

4.2. Psychometric Properties of Measures

We employ Partial Least Squares (PLS) Graph Version 03.00 to measure the reliability and validity of data and to test the research model. As a structural equation modeling (SEM) tool, PLS is widely used in IS research [McFarland and Hamilton 2006; Raymond et al. 2001]. PLS allows us to use convergent and discriminant validity and internal consistency reliability (ICR) to evaluate the psychometric properties of the measures of the nine constructs (including two control variables) [Chin 1998; Compeau et al. 1999]. First, we use average variance extracted (AVE) to assess the convergent and discriminant validity of the constructs. The AVE measures the amount of variance that a construct captures from its indicators relative to the amount due to measurement error.

To assess the convergent validity, AVE of a given construct should be larger than .50 (i.e., the square root of AVE should be larger than .707), indicating that most variance is captured by the construct from its indicators [Fornell and Larcker 1981]. To assess the discriminant validity, the square root of AVE of a given construct should be larger than the correlations between that construct and all other constructs, indicating that the construct is different from other constructs [Chin 1998]. Second, convergent and discriminant validity can also be assessed by analyzing factor loadings of all construct indicators. The standardized item loadings (similar to loadings in principal components) should be larger than .707, and the items should load more strongly on their corresponding constructs than on other constructs [Compeau et al. 1999].

Similar to Cronbach's alpha, ICR is also recognized as composite reliability and used to assess the internal consistency for a given group of items measuring the same construct. ICR is considered adequate if its value is larger than .70 [Compeau et al. 1999].

Table 1 presents the loadings and cross-loadings calculated by correlating nine construct factor scores with all standardized item scores. All items show high loadings (>.707) on their corresponding constructs, and no items load more strongly on the constructs they are not intended to measure. Table 2 shows means, standard deviations, ICRs, square roots of AVEs, and correlations among latent constructs. Because none of the means are extremely high, and all the standard deviations are comparable and not very small, ceiling effect unlikely exists. Ceiling effect refers to an effect in which data can not take on a value above some ceiling [Austin and Escobar 2003]. All ICRs are greater than the minimum reliability criterion (.70). Moreover, all square roots of AVEs (on the diagonal in bold) are greater than .707, and in all cases larger than the correlations between that construct and all other constructs. Over all, these results confirm convergent and discriminant validity, and reliability of the measurement instrument.

4.3. Test of the Model and Hypotheses

We test the hypotheses by examining path coefficients (similar to standardized beta weights in a regression analysis) and their significance levels in the PLS structural model. To examine the statistical significance of path coefficients, we performed bootstrapping with 500 resamples to obtain estimates of t-statistic values [Chin 1998].

Figure 2 shows path coefficients and significance levels for each hypothesis as well as the variances for the two dependent constructs: online gaming enjoyment and intention to play online games. Online game story, graphics, sound, length, and control together explain 30% of the variance in online gaming enjoyment. The total variance in intention to play online games explained by the research model is 64%.

Five of the six hypotheses are supported. Online game story, graphics, length, and control are all significantly related to enjoyment, thus supporting hypothesis 1, 2, 4, and 5. Consistent with the prediction, enjoyment has a significant effect on intention to play online games, thus supporting hypothesis 6. Finally, hypothesis 3, which posits that online game sound is positively related to behavioral intention, is not supported. Table 3 summarizes these results. As expected, the two control variables, attitude and subjective norms, are empirically the important predictors of behavioral intention. The results show that even when controlling the effects of attitude and subjective norms on intention, online gaming enjoyment still predicts intention.

Table 1. Loadings and Cross-Loadings

	Story	Graphics	Sound	Length	Controls	Enjoyment	Intention	Attitude	Norms
Story1	**0.97**	0.45	0.50	0.47	0.30	0.37	0.41	0.42	0.30
Story2	**0.98**	0.48	0.54	0.51	0.35	0.39	0.43	0.43	0.33
Story3	**0.94**	0.58	0.57	0.51	0.36	0.34	0.36	0.37	0.32
Graphics1	0.48	**0.94**	0.62	0.44	0.32	0.35	0.34	0.43	0.26
Graphics2	0.47	**0.95**	0.62	0.46	0.40	0.37	0.29	0.38	0.26
Graphics3	0.51	**0.94**	0.70	0.50	0.43	0.36	0.30	0.35	0.23
Sound1	0.52	0.69	**0.96**	0.45	0.32	0.27	0.26	0.36	0.21
Sound2	0.53	0.66	**0.96**	0.49	0.35	0.28	0.23	0.33	0.24
Sound3	0.55	0.64	**0.96**	0.51	0.34	0.27	0.28	0.35	0.24
Length1	0.49	0.49	0.50	**0.95**	0.52	0.39	0.37	0.44	0.37
Length2	0.48	0.47	0.49	**0.95**	0.52	0.44	0.38	0.43	0.34
Length3	0.49	0.44	0.44	**0.93**	0.55	0.45	0.40	0.47	0.38
Controls1	0.33	0.39	0.32	0.51	**0.93**	0.43	0.38	0.41	0.29
Controls2	0.31	0.35	0.31	0.53	**0.91**	0.40	0.33	0.35	0.31
Controls3	0.32	0.40	0.35	0.54	**0.94**	0.41	0.39	0.43	0.33
Enjoyment1	0.37	0.40	0.34	0.44	0.43	**0.90**	0.60	0.69	0.33
Enjoyment2	0.32	0.30	0.17	0.38	0.37	**0.91**	0.68	0.70	0.38
Intention1	0.42	0.35	0.28	0.42	0.40	0.65	**0.94**	0.72	0.51
Intention2	0.40	0.32	0.25	0.38	0.36	0.71	**0.95**	0.72	0.48
Intention3	0.35	0.26	0.23	0.35	0.36	0.65	**0.93**	0.69	0.47
Attitude1	0.34	0.39	0.31	0.40	0.36	0.75	0.65	**0.92**	0.40
Attitude2	0.39	0.38	0.30	0.47	0.45	0.76	0.75	**0.94**	0.45
Attitude3	0.41	0.34	0.37	0.41	0.35	0.57	0.64	**0.84**	0.39
Norms1	0.37	0.28	0.28	0.42	0.33	0.37	0.51	0.45	**0.92**
Norms2	0.20	0.15	0.11	0.25	0.25	0.27	0.36	0.30	**0.85**
Norms3	0.29	0.28	0.23	0.35	0.30	0.41	0.51	0.46	**0.93**

Table 2. Means, Standard Deviations, ICRs, AVE Square Roots, and Correlations

Latent Construct	Mean	Standard Deviation	ICR	AVE Square Roots (on-diagonal) and Correlations (off-diagonal)								
				Story	Graphics	Sound	Length	Controls	Enjoyment	Intention	Attitude	Norms
Story	4.66	1.23	.98	**.96**								
Graphics	5.24	1.15	.96	.52	**.94**							
Sound	5.09	1.15	.97	.55	.69	**.96**						
Length	5.09	1.12	.96	.51	.50	.50	**.94**					
Controls	5.27	1.00	.95	.35	.41	.35	.57	**.93**				
Enjoyment	5.38	1.02	.90	.38	.38	.28	.45	.44	**.90**			
Intention	4.73	1.45	.96	.42	.33	.27	.41	.40	.71	**.94**		
Attitude	5.45	1.12	.93	.42	.41	.36	.47	.43	.76	.75	**.90**	
Norms	3.86	1.37	.93	.33	.27	.24	.39	.33	.40	.46	.52	**.90**

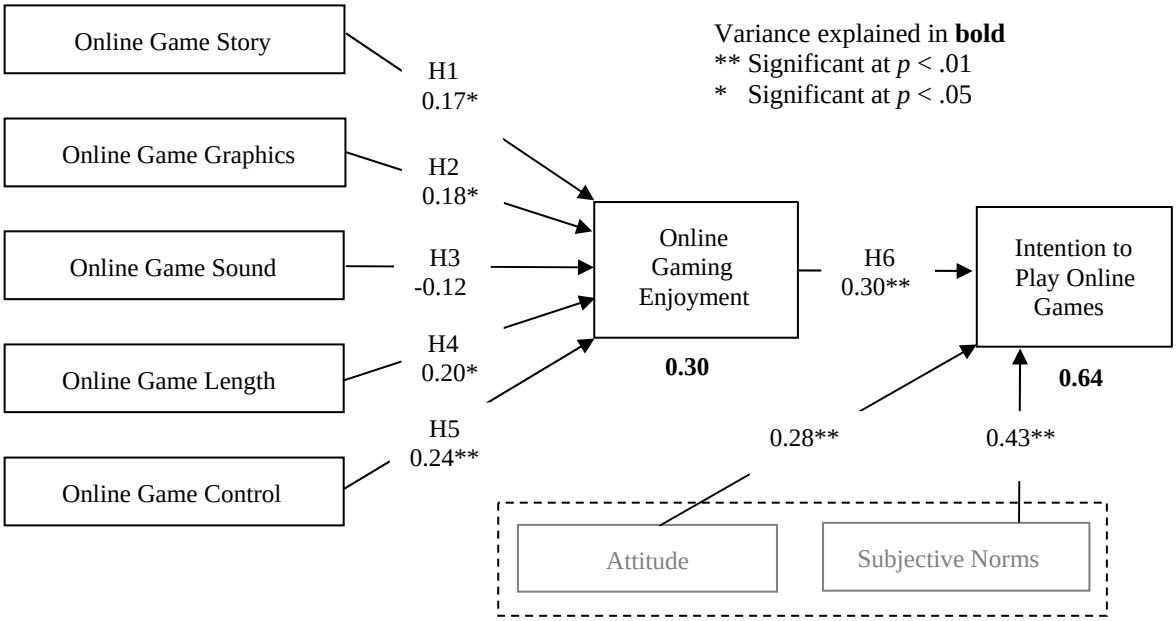

Figure 2. Research Model

Table 3. Summary of Hypothesis Test Results

Hypothesis	T-Statistic	P-Value	Support
H1: Game Story → Gaming Enjoyment	1.98	<.05	Yes
H2: Game Graphics → Gaming Enjoyment	2.13	<.05	Yes
H3: Game Sound → Gaming Enjoyment	1.36	=.18	No
H4: Game Length → Gaming Enjoyment	2.36	<.05	Yes
H5: Game Control → Gaming Enjoyment	3.33	<.01	Yes
H6: Gaming Enjoyment → Intention to Play Games	4.27	<.01	Yes

5. Discussion

5.1. Summary of Results

The current study shows that online game story, graphics, length, and control are highly related to online gaming enjoyment. The results also indicate that online gaming enjoyment has a great effect on intention to play online games while we are controlling for effects of attitude and subjective norms.

We also find that online game sound is not positively related to online gaming enjoyment. The insignificance of the link between the two constructs may be caused by the following reason. Research subjects of this study are undergraduate students at a business school in the eastern United States. The two most popular physical places for them to play online games are home and school. Because they can not or do not want to disturb other family members, their roommates, or other students in the same room, the players may not turn on the speakers when they are playing online games. At the same time, they may not be able to use headphones as a remedy because headphones are not available. This is usually the case when they play online games in school. As a result, these players won't receive auditory information when they are playing online games. Thus, they may perceive online game sound not as important as other four factors in helping them achieve online gaming enjoyment. Therefore, the insignificant link between sound and enjoyment may be because most of the time online game sound is not available to the players in this study due to the constraint of gaming environment. While merely conjecturing on our part, this reasoning warrants detailed future investigation.

5.2. Contributions

As a contribution to the literature, this study proposes that the five most important online game elements are positively related to the development of online gaming enjoyment. These five most important online game elements include story, graphics, sound, length, and control. The results confirm that all the elements except for sound are

significantly related to enjoyment. In this way, the current study sheds some lights on the mechanism of players' formation of emotional response of enjoyment.

Another contribution of this study is that we highlight the role of enjoyment in behavioral intention in the online gaming environment. Prior research in e-commerce has investigated the role of enjoyment in shopping intentions, assuming that shopping enjoyment can predict intention to purchase online. The current study shows that enjoyment also has an important impact on players' intentions to play online games even when the effects of attitude and subjective norms on intention are under control. This is in accordance with previous e-commerce studies and provides additional evidence that enjoyment can be a primary trigger for behavioral intention. Meanwhile, the study also provides some support to the TRA by showing that attitude and subjective norms – the two control variables in the model – are both the critical predictors of behavioral intention.

5.3. Implications for Future Research

This study is motivated by a need to understand the relationships between online game elements and the development of enjoyment. Our research model and empirical results yield the following implications for future research.

First, this study finds that online game sound is not significantly related to online gaming enjoyment. A possible explanation provided by the authors here is that most of the time online game sound may not be available to the players in this study due to the constraint of gaming environment. Future research can reexamine the relationship between online game sound and enjoyment and test whether the explanation is valid.

Second, the current study finds that online gaming enjoyment is a key predictor of behavioral intention. Such a finding indicates that enjoyment, as an important construct of intrinsic motivation, is worth e-commerce researchers' attention and is critical in studying online game player behavior. Because of its significant role in predicting behavioral intention, more research is needed to investigate what are the other potential factors in explaining online gaming enjoyment.

Third, the results of this study also show that attitude and subjective norms, two major constructs of TRA, impact behavioral intention to play. This finding thus confirms that when people decide whether to perform particular behaviors, they consider the normative expectations of others they view as important, such as friends, coworkers, and schoolmates. The finding suggests that TRA fits well to the context of virtual worlds and can shed light on the key determinants of voluntary behavior of using entertainment-oriented IT such as online gaming. TRA also postulates that attitude toward a behavior involves an individual's belief that a particular behavior will lead to certain outcomes and the individual's evaluation of those outcomes [Ajzen and Fishbein 1980]. Therefore, underlying beliefs of attitude are important and warrant detailed future investigation [Zhou et al. 2007].

5.4. Implications for Practice

This study offers implications for practitioners. First, this study shows that online game story, graphics, length, and control are all highly related to enjoyment. Such a finding implies that in order to make players enjoy playing an online game, designers need to build up the game with interesting background story, high quality graphics, suitable length, and easy-to-use control. Second, this study also suggests that enjoyment predicts behavioral intention, implying that when players achieve online gaming enjoyment, they are likely to be motivated to play online games more frequently. Therefore, to build successful online games, developers and vendors must pay close attention to the element of enjoyment.

5.5. Limitations

As a survey-based study, interpretation of our results is subject to some limitations. First, participants are asked to answer the survey questions based on their perceptions toward the online game and the online game website that they have used the most, but they are not asked to indicate the game name and the website name.[2] Therefore, it is likely that many of the participants answer the survey questions based on their perceptions toward the same online game or online game website that is very popular among undergraduates of a single university. If this is true, bias may be thrown into the results because the responses are dominated by player impressions of a single online game or online game website. Thus, cautions should be taken here.

Second, because the data in this study are collected from the same source in the same questionnaire, there is a potential for common method bias [Woszczynski and Whitman 2004]. We investigate this possible bias by using Harmon's one factor test [Podsakoff and Organ 1986]. The test results indicate that we are not able to completely eliminate the possibility of the existence of the common method bias.

Finally, different samples are needed to test the research model to establish external validity. Cook and Campbell [1979] contend that researchers need to consider the study participants when evaluating the

[2] Our post-survey conversations with the survey participants indicate that first-person-shooting games and role-playing games are the two most popular game genres for the participants.

generalizability of a study. Because the participants of this study are undergraduates averaged 23 years of age, additional research is necessary to evaluate the generalizability of the research model and findings.

6. Conclusion

In conclusion, the purpose of this paper is to study the virtual game worlds and investigate the relationships between key game elements and online gaming enjoyment. Using a survey conducted at an educational institution, we find support for five of the six hypotheses. The results of this study confirm the impact of enjoyment on players' intention to play online games and the significant links between enjoyment and four game elements: online game story, graphics, length, and control. While much information systems research has found a small or nonexistent effect for subjective norms, this paper shows that they significantly impact behavioral intention and suggests they may play an important role in the context of virtual worlds. Future research is thus encouraged to further investigate the effect of subjective norms on information technology acceptance and usage. Finally, the insignificance of the link from online game sound to enjoyment also points out the areas of future research opportunity.

REFERENCES

Agarwal, R. and Karahanna, E. "Time Flies When You're Having Fun: Cognitive Absorption and Beliefs about Information Technology Usage," *MIS Quarterly*, Vol. 24, No. 4:665-694, 2000.

Agarwal, R. and Prasad, J. "Are Individual Differences Germane to the Acceptance of New Information Technologies?" *Decision Science*, Vol. 30, No. 2:361-391, 1999.

Ajzen, I. and Fishbein, M. Understanding Attitudes and Predicting Social Behavior, NJ, Englewood Cliffs: Prentice-Hall, 1980.

Austin, P. C. and Escobar, M. D. "The Use of Finite Mixture Models to Estimate the Distribution of the Health Utilities Index in the Presence of a Ceiling Effect," *Journal of Applied Statistics*, Vol. 30, No. 8:909-923, 2003.

Boon, R. The 40 Hour Millstone, http://ihobo.com/articles/mag_millstone.shtml, 2006.

Bray, D. A. and Konsynski, B. R. "Virtual Worlds: Multi-Disciplinary Research Opportunities," *The DATA BASE for Advances in Information Systems*, Vol. 38, No. 4:17-25, 2007.

Chin, W. W. "The Partial Least Squares Approach to Structural Equation Modeling," in *Modern Methods for Business Research*, G. A. Marcoulides (ed.), Lawrence Erlbaum Associates, Mahwah, NJ, 295-336, 1998.

Cohen, A. "Film Music: Perspectives from Cognitive Psychology," in *Music and Cinema*, Buhler, J., Flinn, C. and Neumeyer, D. (eds.), Hanover, NH, University Press of New England, 2000.

Compeau, D. R., Higgins, C. A. and Huff, S. "Social Cognitive Theory and Individual Reactions to Computing Technology: A Longitudinal Study," *MIS Quarterly*, Vol. 23, No. 2:145-158, June 1999.

Cook, T. D. and Campbell, D. T. Quasi-Experimentation: Design and Analysis Issues for Field Settings, Houghton Mifflin Company, Boston, 1979.

Csikszentmihalyi, M. Flow: The Psychology of Optimal Experience, New York: Harper & Row, 1990.

Davis, F. D. "Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology," *MIS Quarterly*, Vol. 13, No. 3:318-339, 1989.

Davis, F. D., Bagozzi, R. P. and Warshaw, P. R. "Extrinsic and Intrinsic Motivation to Use Computers in the Workplace," *Journal of Applied Social Psychology*, Vol. 22:1111-1132, 1992.

Davis, J. P., Steury, K. and Pagulayan R. "A Survey Method for Assessing Perceptions of a Game: The Consumer Playtest in Game Design," Game Studies, Vol. 5, No. 1, http://www.gamestudies.org, 2005.

DFC Intelligence, http://www.dfcint.com/game_article/mar06article.html, 2006.

Deci, E. L. and Ryan, R. M. Intrinsic Motivation and Self-Determination in Human Behavior, New York, NY: Plenum Press, 1985.

Eilers, M. "Does (Game) Length matter?" http://www.imgmagazine.com/news/index.php?date=2000-12-28, 2000.

Eskelinen, M. "The Gaming Situation," Game Studies, 1:1, http://www.gamestudies.org, 2001.

Fornell, C. and Larcker, D. F. "Evaluating Structural Equations Models with Unobservable Variables and Measurement Error," *Journal of Marketing Research*, Vol. 18, No. 1:39-50, 1981.

Guo, Y. and Barnes, S. "Why People Buy Virtual Items in Virtual Worlds with Real Money," *The DATA BASE for Advances in Information Systems*, Vol. 38, No. 4:69-76, 2007.

Heijden, H. "User acceptance of hedonic information systems," *MIS Quarterly*, Vol. 28, No. 4:695-704, 2006.

Holsapple, C. W., Pakath, R. and Sasidharan, S. "A Website Interface Design Framework for the Cognitively Impaired: A Study in the Context of Alzheimer's Disease," *Journal of Electronic Commerce Research*, Vol. 6, No. 4:291-303, 2005.

Hsu, C. L. and Lu, H. P. "Why Do People Play On-line Games? An Extended TAM with Social Influences and Flow Experience," *Information & Management*, Vol.41, No. 7:853-868, 2004.

Igbaria, M., Parasuraman, S. and Baroudi, J. J. "A Motivational Model of Microcomputer Usage," *Journal of Management Information Systems*, Vol.13, No. 1:127-143, 1996.

Jakala, M. and Pekkola, S. "From Technology Engineering to Social Engineering: 15 Years of Research on Virtual Worlds," *The DATA BASE for Advances in Information Systems*, Vol. 38, No. 4:11-16, 2007.

Juul, J. "Games Telling Stories? A Brief Note on Games and Narratives," *Game Studies*, Vol. 1, No. 1, http://www.gamestudies.org, 2001a.

Juul, J. "The Repeated Lost Art of Studying Games," *Game Studies*, Vol. 1, No. 1, http://www.gamestudies.org, 2001b.

Kim, K. H., Park, J. Y., Kim, D. Y., Moon, H. I. and Chun, H. C. "E-lifestyle and Motives to Use Online Games," *Irish Marketing Review*, Vol. 15, No. 2:71-77, 2002.

Koufaris, M. "Applying the Technology Acceptance Model and Flow Theory to Online Consumer Behavior," *Information Systems Research*, Vol. 13, No. 2:205-223, 2002.

Lee, M. K. O., Cheung, C. M. K. and Chen, Z. "Acceptance of Internet-Based Learning Medium: The Role of Extrinsic and Intrinsic Motivation," *Information & Management*, Vol. 42, No. 8:1095-1104, 2005.

Lesser, J. and Madabhushi, L. "Measurement of Consumer Intrinsic Motivation: Exploratory Assessment of Its Two Primary Dimensions and Theoretical Bases," *Marketing Management Journal*, Vol. 11, No. 2:81-96, 2001.

Li, D., Chau, P. Y. K. and Lou, H. "Understanding Individual Adoption of Instant Messaging: An Empirical Investigation," *Journal of the Association for Information Systems*, Vol. 6, No. 4:102-129, 2005.

McFarland, D. and Hamilton, D. "Factors Affecting Student Performance and Satisfaction: Online Versus Traditional Course Delivery," *Journal of Computer Information Systems*, Vol. 46, No. 2:25-32, 2005.

Morris, S. "First-Person Shooters – A Game Apparatus," in *Screenplay: Cinema/Videogame/Interface*, King, G. and Krzywinkska, T. (eds), London, Wallflower Press, 2002.

Pearce, C. "Sims, Battlebots, Cellular Automata God and Go – A Conversation with Will Wright," *Game Studies*, Vol. 2, No. 1, http://www.gamestudies.org, 2002.

Pearce, C. "Game Noir – A Conversation with Tim Schafer," *Game Studies*, Vol. 3, No. 1, http://www.gamestudies.org, 2003.

Podsakoff, P. M. and Organ, D. W. "Self-Reports in Organizational Research: Problems and Prospects," *Journal of Management*, Vol. 12, No. 4:531-544, 1986.

Raymond, L., Brisoux, J. and Azami, A. "Marketing Information Systems Practices in Small Manufacturing Firms: Antecedents and Consequences," *Journal of Computer Information Systems*, Vol. 41, No. 3:32-41, 2001.

Ryan, M. L. "Beyond Myth and Metaphor – The Case of Narrative in Digital Media," *Game Studies*, Vol. 1, No. 1, http://www.gamestudies.org, 2001.

Smith, G. M. "Computer Games Have Words, Too: Dialogue Conventions in Final Fantasy VII," *Game Studies*, Vol. 2, No. 2, http://www.gamestudies.org, 2002

Venkatesh, V. "Determinants of Perceived Ease of Use: Integrating Control, Intrinsic Motivation, and Emotion into the Technology Acceptance Model," *Information Systems Research*, Vol. 11, No. 4:342-365, 2000.

Venkatesh, V. "Creation of Favorable User Perceptions: Exploring the Role of Intrinsic Motivation," *MIS Quarterly*, Vol. 23, No. 2:239-260, 1999.

Ward, P. "Videogames as Re-Mediated Animation," in *Screenplay: Cinema/Videogame/Interface*, King, G. and Krzywinkska, T. (eds), London, Wallflower Press, 2002.

Whalen, Z. "Play Along – An Approach to Videogame Music," *Game Studies*, Vol. 4, No. 1, http://www.gamestudies.org, 2004.

Woszczynski, A. B. and Whitman, M. E. "The Problem of Common Method Variance in IS Research," in *The Handbook of Information Systems Research*, A. B. Woszczynski and M. E. Whitman (Eds.), Hershey, PA: Idea Group Inc., 66-77, 2004.

Wu, J. and Liu, D. "The Effects of Trust and Enjoyment on Intention to Play Online Games," *Journal of Electronic Commerce Research*, Vol. 8, No. 2:128-140, 2007.

Yoon, U. A quest for the legal identity of MMORPGs: from a computer game, back to a play association. *Journal of Game Industry & Culture*, Vol. 10, 2005.

Zeschuk G. and Muzyka R. "Why Don't People Finish Games?" http://www.gamestar.com/12_04/features/fea_finish_jadeempire.shtml, 2004.

Zhou, L., Dai, L. and Zhang, D. "Online Shopping Acceptance Model – A Critical Survey of Consumer Factors in Online Shopping," *Journal of Electronic Commerce Research*, Vol. 8, No. 1:41-62, 2007.

APPENDIX A: SURVEY ITEMS

Online Game Story	
Story1	I like the story of the online game.
Story2	The story of the online game is appealing.
Story3	I am satisfied with the story of the online game.
Online Game Graphics	
Graphics1	I like the graphics of the online game.
Graphics2	The graphics of the online game is appealing.
Graphics3	I am satisfied with the graphics of the online game.
Online Game Sound	
Sound1	I like the sound of the online game.
Sound2	The sound of the online game is appealing.
Sound3	I am satisfied with the sound of the online game.
Online Game Length	
Length1	I like the length of the online game.
Length2	The length of the online game fits my needs.
Length3	I am satisfied with the length of the online game.
Online Game Controls	
Controls1	The controls of the online game are easy to use.
Controls2	It is easy to learn how to use the controls of the online game.
Controls3	I feel comfortable with the controls of the online game.
Online Gaming Enjoyment	
Enjoyment1	I enjoyed playing online games.
Enjoyment2	I enjoyed using online game website.
Intention to Play Online Games	
Intention1	I will play online games frequently in the future.
Intention2	I intend to play online games.
Intention3	I will play online games for a long time.
Attitude toward Playing Online Games	
Attitude1	It is a lot of fun to play online games.
Attitude2	I like to play online games.
Attitude3	Playing online games is attractive.
Subjective Norms	
SubjectiveNorm1	My friends believe that I should play online games.
SubjectiveNorm2	My coworkers believe that I should play online games.
SubjectiveNorm3	My schoolmates believe that I should play online games.