

WHEN DOES FRUSTRATION NOT REDUCE CONTINUANCE INTENTION OF ONLINE GAMERS? THE EXPECTANCY DISCONFIRMATION PERSPECTIVE

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ABSTRACT

Online game providers frequently encounter a dilemma, i.e., should they design games that offer only a limited challenge or ones that are highly challenging which will likely inspire gamers but may also create frustration. This study contributes to efforts to solve this dilemma by establishing when frustration does not reduce continuance intention and is the first answering this research question. Expectancy disconfirmation theory was used to develop the study hypotheses along with responses from 406 online gamers to test the hypotheses. The analytical results indicate that frustration is negatively related to expectancy disconfirmation only for gamers with a high gaming intensity, but not for gamers with a long gaming history. Moreover, expectancy disconfirmation is positively related to continuance intention. The analytical results theoretically extend the expectancy disconfirmation theory and also enable game providers to design challenging games without losing their gamers.

Keywords: Online game; Frustration; Continuance intention; Expectancy disconfirmation.

1. Introduction

Online games have become one of the most important activities in cyberspace due to their popularity [China Internet Network Information Center 2014; State of Online Gaming Report 2013] and increasing profitability [Mozur 2013]. Moreover, a single online game vendor can generate revenue of 1.9 billion dollars in a quarter [Osawa 2015]. These figures confirm the value of online games to managers, warranting further research. Online games offer challenges to engage customers and attempt to strengthen their intention to play [Wang & Wang 2008]. However, if the game proves too difficult for gamers to obtain achievements, they likely feel frustrated during gameplay [e.g., Blumberg et al. 2008; Chumbley & Griffiths 2006].

Frustration has been a recent topic in the literature [e.g., Sun & Spears 2012; Totok & Karamcheti 2010; Vincent et al. 2010] as it reduces positive attitudes (toward search engine effectiveness), purchase intention [Sun & Spears 2012], service usage, and thus revenues [Totok & Karamcheti 2010]. The importance of frustration has also motivated scholars to examine its antecedents, such as slow response time and request rejection [Totok & Karamcheti 2010; Vincent et al. 2010]. However, frustration might not have the same effect on gamers. For example, frustration does not influence computer gamers' willingness to play [Chumbley & Griffiths 2006]. Moreover, games become so much part of the gamers' identity that even frustration does not inhibit their persistence in playing [Neys et al. 2014]. Such

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findings indicate the uniqueness of gaming contexts and the relevance of further research into the frustration issues in gaming contexts.

To the best of our knowledge, no study has yet examined the mechanism underlying the relationship between frustration and continuance intention in an online gaming context, indicating a research gap. Research filling this gap can provide insights to online game providers, e.g., assisting them to make decisions on how challenging their games should be. Moreover, online game providers should be curious about the answer to the question: when does frustration not reduce continuance intention? Research answering this question helps managers to not only retain users, but also to stabilize their revenues, and thus build competitive advantage.

Therefore, the purpose of this study is to establish when frustration does not reduce continuance intention. Since frustration is related to unmet needs or the discrepancy between the expected product/service performance and the actual product/service performance, we consulted the expectancy disconfirmation theory [Oliver 1981]. This theory posits that when actual product/service performance exceeds expected performance, customers perceive positive disconfirmation while when actual performance falls below expected performance, customers perceive negative disconfirmation [Churchill & Surprenant 1982]. This theory has a core element/construct, expectancy disconfirmation, which we use to develop hypotheses on the relations among frustration, expectancy disconfirmation, and continuance intention.

As previous experiences shape expectation [Gebhard 1948], they should change the way in which users interpret frustration, i.e., the moderating effect of previous experiences. Hence, this study developed hypotheses on the moderator role of gamer experience in the relation between frustration and expectancy disconfirmation.

2. Literature Review and Hypotheses

2.1. Online Games

Online games are computer games played through the Internet. Gamers can interact with the gaming systems and other gamers [Choi & Kim 2004]. Online games have various types, including social games, board games, sports games, and massively multiplayer online role-playing games (MMORPGs) [Entertainment Software Association 2014]. Among them, MMORPGs have attracted numerous gamers and scholars' attention [Kirby et al. 2014; Lu et al. 2014; Rezaei & Ghodsi 2014]. Therefore, research on gamers playing MMORPG should be relevant to EC managers.

Online games have become one of the most popular entertaining activities in the world. Around the world, there were 700 million online gamers in 2013 [Spil Games 2013]. In China, the number of online gamers reached 338 million in 2014 [China Internet Network Information Center 2014]. In the U.S., the game industry generated US\$21.53 billion [Entertainment Software Association 2014]. Moreover, a single online game (World of Warcraft) has gained 12 million subscribers [Blizzard Entertainment 2010]. These figures confirm the popularity of online games and their value to EC managers, warranting further research.

Recently, research into online games has identified the importance of gaming psychology and its impact on gamer intention and behavior, including the strength of interpersonal ties between gamers [Lee 2015]; the collective behavior of gamers [Ross & Collister 2014]; the impact of emotional value, social value, price-value, and performance-quality value on repurchase intention [Rezaei & Ghodsi 2014]; and e-leadership in MMORPG and real life [Lu et al. 2014]. Moreover, Kirby et al. [2014] investigated the relationship between average hours playing per week and psychological wellbeing. As a whole, these studies showed that issues regarding online games are pertinent.

Online gaming literature has explained how positive experiences contribute to gamers' psychology and behavior. Research into online games has examined the impact of flow [Choi & Kim 2004], game story and graphics [Wu et al. 2008], enjoyment [Hsu & Lu 2007; Wu & Liu 2007], playfulness [Lu & Wang 2008], and immersion satisfaction [Teng 2010] that positively contribute to gamers' continuance intention. However, gamers may encounter negative experiences (such as frustration) that may also impact their continuance intention. As far as we know, no study has yet adopted the expectancy disconfirmation theory to investigate how frustration impacts continuance intention among online gamers. Thus, the present study is in the vanguard of such research.

2.2. Task Continuance

Task continuance, also known as continuance intention [Bhattacharjee 2001], continued intention [Lee 2010], or intention of continuous use [Lu & Hsiao 2007], can be defined as an individual's intention to continuously engage in a particular task. Task continuance can refer to a user's intention to continue using an online product/service (e.g., information system [Bhattacharjee 2001]) or the willingness to continue buying physical products [Zeithaml et al. 1996]. Furthermore, task continuance can be interchangeable with loyalty [Valvi & Fragkos 2012], and continuance intention [Bhattacharjee 2001], and has been a frequent topic in EC literature [Kang et al. 2013].

Existing studies have proposed numerous antecedents that may influence continuance intention in the use of electronic services. These antecedents can belong to four streams. First, the theory of planned behavior (TPB) was used to identify antecedents of continuance intention, including attitude, social norms, and perceived behavioral

control [Hsu & Chiu 2004]. Second, the technology acceptance model (TAM) was used to identify antecedents of continuance intention, including perceived usefulness [Bhattacharjee 2001; Hong et al. 2006] and perceived ease of use [Hong et al. 2006]. Third, social aspects were identified. Specifically, Chang and Zhu [2012] took the social capital perspective and found that perceived bridging social capital (i.e., friends who offer useful information) strongly influences users' satisfaction and continuance intention.

Fourth, positive experiences were identified as predictors of continuance intention. Specifically, pleasure was found to influence continuance intention directly, and indirectly via attitude [Kim et al. 2007]. Moreover, perceived playfulness and flow experiences positively contributed to continuance intention [Chang 2013]. In addition to positive emotions, negative emotions might influence intentions to continue use via some antecedents. Specifically, negative emotions increase complaining behavior [Chea & Luo 2008], motivating the present study to investigate an important negative emotion (i.e., frustration) and its impact on continuance intention. Among the four streams, the present study is posited as a contribution to the fourth, and contributes to the literature by initiating an examination of when frustration (does or) does not impact continuance intention among online gamers.

Continuance intention may have varied antecedents in specific online environments. Among them, online games are task environments that are unique in offering users enjoyment, achievements, challenge, and potential frustration. Therefore, this study also reviews the literature on continuance intention in the context of online games. Possible factors affecting continuance intention include social norms, attitude [Hsu & Lu 2004], flow experiences [Chang 2013; Hsu & Lu 2004; Wang & Wang 2008], anxiety, self-efficacy [Wang & Wang 2008], enjoyment [Hsiao & Chiou 2012], and satisfaction [Chang 2013]. Because online games are often thought of as a medium from which users gain excitement and enjoyment, most of the studies explore positive experiences as predictors of continuance intention. However, rare studies explore the relationships between negative experiences and continuance intention among online gamers. Specifically, game challenges can provide perceived playfulness [Wang & Wang 2008], but challenges that are too difficult and create frustration can also discourage further use of the game, creating a dilemma for EC managers. The present study joins in efforts to solve this dilemma by investigating when frustration does not reduce continuance intention among online gamers.

2.3. Expectancy Disconfirmation Theory

The expectancy disconfirmation theory has been widely applied to explain consumers' satisfaction and continuance intention in various post-purchase contexts, including electronic commerce services [Bhattacharjee 2001], mobile Internet service [Thong et al. 2006], e-service usage [Chea & Luo 2008], e-learning [Lee 2010], and social networking sites [Chang & Zhu 2012]. Its wide application indicates the usefulness of this theory. Prior studies adopting it postulate that consumer satisfaction is determined by perceived and expected product/service performance [Bhattacharjee 2001; Oliver 1981]. Specifically, a customer develops expectations about a product/service prior to purchasing it, and such expectations will be used as the frame of reference with which to evaluate the product/service performance. When a customer is involved in the purchase and consumption process, the interaction experiences derive perceptions about product/service performance.

By assessing perceived performance against prior expectations, a customer either confirms or disconfirms pre-purchase expectations. A customer's expectations are confirmed when the actual performance exactly equals the expected performance; any discrepancy between the perceived and the expected performance places the customer in a mental state termed "disconfirmation" [Webb 2000]. When actual performance exceeds expected performance, customers perceive positive disconfirmation; when actual performance falls below expected performance, they perceive negative disconfirmation [Churchill & Surprenant 1982]. In short, the relative levels of actual performance and expected performance create a continuum from negative disconfirmation (the left end), to confirmation (the middle point), and then to positive disconfirmation (the right end). Such a continuum was named expectancy disconfirmation [Chea & Luo 2008]. The present study has adopted the term "expectancy disconfirmation" to describe such a continuum. Figure 1 illustrates this construct.

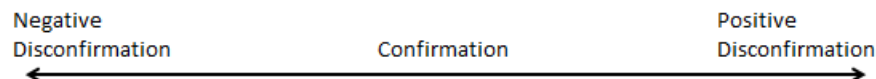


Figure 1: Continuum of Expectancy Disconfirmation

2.4. Frustration

Frustration is a feeling of dissatisfaction owing to unmet needs [Merriam-Webster Online Dictionary 2015]. Frustration can refer to no or little progress in achieving goals due to limited skills and strenuous challenges in tasks

[Csikszentmihalyi & Csikszentmihalyi 1988]. Inducing frustration is a common strategy employed by game designers to engage players. To create perceived playfulness, online games usually present players with challenges of various levels of difficulty [Thompson 2007]. If the level of the challenges is significantly greater than a gamer's skill level, the gamer will become frustrated [Chumbley & Griffiths 2006; Thompson 2007; Wang & Wang 2008]. For example, participants in a mix-design experiment experienced strong frustration and less excitement when they encountered significantly tough challenges [Chumbley & Griffiths 2006].

The occurrences of gamers' frustration indicate that the game fails to meet their needs. Frustration is a negative feeling for which gamers are motivated to find a target to attribute it to. For example, if gamers cannot progress rapidly and accumulate in-game symbols of wealth or status, they would likely regard the game as failing to meet their achievement needs [Yee 2006]. That is, gamers would attribute such failure to the game, as the game's performance (i.e., performance in providing achievements to gamers) falls below their expectation (i.e., the extent to which games should provide achievements to gamers), creating negative disconfirmation. The contrary may not hold, i.e., expectancy disconfirmation may not markedly impact frustration. Specifically, a game may provide abundant opportunities for gamers to obtain achievements that exceed their expectations (i.e., reaching a high level of positive expectancy disconfirmation), but may not necessarily satisfy gamers' achievement needs (i.e., not necessarily reducing the feeling of frustration). Therefore, we hypothesized the following:

H1: *Frustration is negatively related to expectancy disconfirmation.*

2.5. Expectancy Disconfirmation and Continuance Intention

Existing studies have proposed potential paths where disconfirmation (ranging from negative disconfirmation, confirmation, to positive disconfirmation) may further affect continuance intention. Particularly, disconfirmation can predict continuance intentions with regard to e-commerce service in two indirect routes: by influencing consumer satisfaction toward the service and by impacting consumer perception of service usefulness [Bhattacharjee 2001]. In the context of e-learning, disconfirmation also predicts continuance intention [Lee 2010], and satisfaction [Thong et al. 2006], suggesting a strong relation between disconfirmation and continuance intention. Therefore, we hypothesized the following:

H2: *Expectancy disconfirmation is positively related to continuance intention.*

2.6. Intensity of Gamer Experience and History of Gamer Experience

Intensity of user experience has been studied to measure users' behavior on the Internet [Morahan-Martin & Schumacher 2000], in the use of information and communication technology [Wu & Liu 2015] and online games [Herodotou et al. 2014; Kuss et al. 2012; van Rooij et al. 2011]. Online gaming literature also includes time-related measures. A commonly used measure representing the intensity of gamer experience is weekly hours. For example, Jansz and Tanis [2007] proposed that their participants spent an average 16 hours per week playing online first-person shooter games. Ng and Wiemer-Hastings [2005] also reported that 11% of MMORPG players spent 40 or more hours per week. Since there is no worldwide shared self-reported measure of the intensity of gamer experience [Neys et al. 2014], the frequent use of weekly hours supports our decision to use weekly hours.

The moderator role of intensity of gamer experience can be explained using the goal importance perspective. Goals perceived to have more importance drive an individual to concentrate more resources (e.g., time) on tasks related to important goals, which in turn induces higher expectations of the return on the investment [Thong et al. 2006]. A high intensity of gamer experience means that a player spends more time pursuing specific goals in games during a time span, indicating the relative importance of the goals. Gaming literature also provides evidence of the relationship between the intensity of gamer experience and goal importance. Specifically, Kuss et al. [2012] identified nine motivational components and their correlations with weekly hours of play. Herodotou et al. [2014] surveyed 1,298 gamers of World of Warcraft (WoW) and found that there was an association between persistent gameplay and basic psychological needs. For such gamers, in-game frustration may impede their pursuit of competence and harm their social image. The reason may be that less competent gamers should encounter difficulty in establishing and maintaining social relationships in game worlds [Kuo et al. 2013], particularly when social comparison occurs within the community of gamers [Neys et al. 2014]. Accordingly, higher expectation leads gamers to expect little struggle in games which transforms frustration into negative expectancy disconfirmation.

On the contrary, gamers who spend only a few hours a week playing a game might not feel that online games are as important. Such a perception leads to weak determination to obtain achievements in the game, rendering frustration foreseeable and easy to accept. That is, frustration may not disconfirm such gamers' expectation, and subsequently not formulate negative disconfirmations. Accordingly, this study hypothesizes H3a.

In addition to the intensity of gamer experience, history (measured by years of playing a game) can also be an aspect of gamer experience. History of gamer experience differs from intensity of gamer experience; the latter indicates how frequently/heavily a gamer plays a game in a given time period (e.g., number of hours in one week), while the former indicates for how long (i.e., how many years) a gamer has been playing a game. Herodotou et al.

[2014] proposed that 81% of participants had been playing WoW for more than two years. Chang et al. [2014] reported that 30.7% of their participants had played online games for more than six years. Achterbosch et al. [2008] labeled more than 80% of their participants as experienced gamers because they had played MMORPGs for two years or more. Accordingly, this study adopts history of playing an online game in the research model.

Different from H3a, the moderator role of the history of gamer experience (H3b) can be explained using the skill confidence perspective. The history of user experiences, referred to as the number of direct interactions with a product/service [Webb 2000], has been proposed as an influence on customers' expectations towards a product/service in consumer psychological studies [Devlin et al. 2002; Guiry et al. 2013; Webb 2000]. Through a long history of playing a game, gamers may develop sophisticated skills and problem-solving strategies that give them confidence in their gaming performance. Therefore, gamers with a longer history may feel that they are highly capable in that game, leading to strong expectations of obtaining achievements in the game, which gamers are typically motivated by [Yee 2006]. For experienced gamers (i.e., gamers having a longer history), in-game frustrations reflect that their accumulated expertise cannot be applied to solving the problems encountered, which suggests that the online game cannot match the high expectations of these experienced players, leading to negative disconfirmation. According to the expectancy disconfirmation theory [Oliver 1981], disconfirmation creates cognitive dissonance in which a feeling of conflict motivates an individual to take actions to resolve such dissonance. For players with a longer history of playing an online game, the easiest way to reconcile the conflict is to give low ratings to the perceived performance of the game, leading to negative expectancy disconfirmation.

On the other hand, gamers with a short history regard themselves as novices, are newer to a game and are thus more likely to expect encountering frustration occasionally. Hence, such gamers do not have a strong expectation of obtaining achievements. Therefore, frustration may not create disconfirmation or any cognitive dissonance among such gamers, i.e., frustration is not related to negative disconfirmation among gamers who have a short playing history. Thus, we hypothesize H3b.

H3a: *Frustration is related to negative expectancy disconfirmation for gamers having a strong intensity of gamer experience, but not for gamers having a weak intensity of gamer experience.*

H3b: *Frustration is negatively related to expectancy disconfirmation for gamers with a long history of playing an online game, but not for gamers with a short history.*

Figure 2 illustrates the hypotheses and research framework. Intensity of gamer experience and history of gamer experience were hypothesized as moderators with regard to H3a and H3b respectively. This framework does not include the moderators for the impact of expectancy disconfirmation. The reason is that expectancy disconfirmation in the literature has a strong and clear impact on continuance intention [as in Bhattacharjee 2001; Chang & Zhu 2012; Thong et al. 2006]. Such a strong and clear impact may not depend on users'/gamers' experience. To achieve brevity, the framework does not contain such moderators.

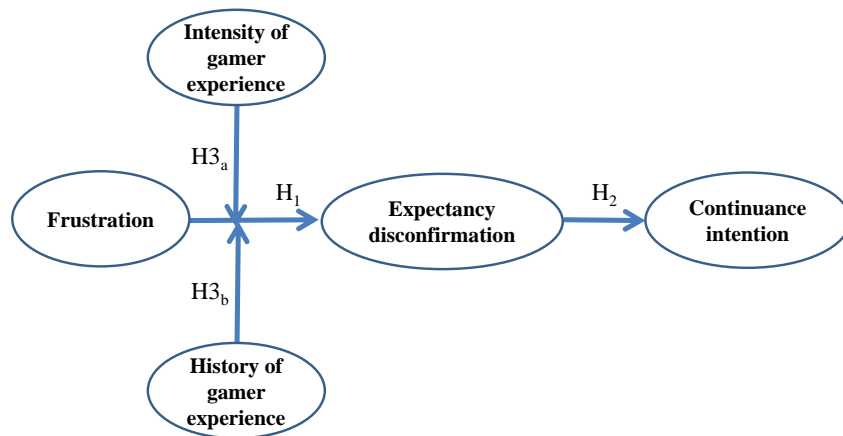


Figure 2: Research Model

3. Methods

3.1. Sampling and Data Collection Process

This study is a cross-sectional one that used online questionnaires to gather data, inviting gamers of massively multiplayer online role-play games to click on a link to access an online questionnaire. The data was collected in one month. In total, this study received 486 responses, 406 of which were valid, a ratio of 83.5%. Each participant was asked to nominate one MMORPG she/he played and rated the study items with regard to the nominated game. Participants submitting valid responses were eligible for a lottery which issued US\$320 in gift certificates in total.

We enhanced data validity by using seven criteria for filtering out invalid data. First, six participants stated that they had not played any MMORPG in the preceding month. Second, 18 participants nominated nonexistent MMORPGs. Third, one participant claimed to have played the nominated MMORPG for years more than the participant's age. Fourth, two participants claimed to have played their nominated MMORPGs for years more than the overall history of all online games. Fifth, 50 participants said they had played their nominated MMORPGs for more *weekly* hours than their *weekly* hours spent playing all online games. Sixth, one participant said s/he had played all online games for more than 168 hours per week. Seventh, the *total* hours two participants spent playing their nominated MMORPGs exceeded their *total* hours spent playing all online games. The above 80 participants showed themselves to be either incapable of responding or able only to make illogical responses. Therefore, this study regarded their responses as invalid and excluded them.

3.2. Measurement

This study assessed frustration using the four-item scale of Kammann and Flett [1983] and continuance intention using the three-item scale of Bhattacharjee and Premkumar [2004]. Intensity of gamer experience was measured using the item "On average, how many hours per week do you spend playing this game?". History of gamer experience was measured using the item "For how many years have you played this game?". "This game" in measurement items refers to the nominated MMORPG of the participant. Five-point, self-rating scales were used, i.e., from 1 (very disagreeable) to 5 (very agreeable).

This study assessed expectancy disconfirmation by adapting seven items in information systems literature [Bhattacharjee & Premkumar 2004; Venkatesh et al. 2003]. Adaptation was necessary to increase the items' relevance to online gaming. As in the literature, the seven-point anchors were used, i.e., from -3 (strongly negative disconfirmed) to +3 (strongly positive disconfirmed). Higher scores represent better evaluations on the gaming experiences.

Confirmatory factor analysis (hereafter, CFA) is known to be capable of evaluating measurement reliability and validity using various indices. Therefore, we decided to use CFA to evaluate the psychometric properties of the measurement items. The software LISREL 8.80 was used for implementing the CFA, while the software SPSS 21 was used for implementing all other analysis. When conducting the CFA, one item measuring frustration and four measuring expectancy disconfirmation were dropped owing to their cross-loadings. To maintain uni-dimensionality within items assessing each construct, dropping those items was necessary. In total, three items were retained for measuring each construct, i.e., frustration, expectancy disconfirmation, and continuance intention, consistent with information systems literature.

In the analytical results of the CFA, we found that items assessing each construct had a Cronbach's $\alpha \geq .81$, indicating sufficient reliability [Nunnally & Bernstein 1994]. Items assessing each construct had a composite reliability (hereafter, CR) $\geq .85$ and an average variance extracted (AVE) $\geq .66$, showing acceptable reliability [Bagozzi & Yi 1988]. All items had indicator loadings $\geq .65$, displaying sufficient convergent validity [Hair et al. 1998]. Eventually, the minimum AVE (i.e., .66) exceeded the maximum squared correlation (i.e., .14), demonstrating adequate discriminant validity [Fornell & Larcker 1981]. Table 1 lists the CFA results.

Table 1: Results of Confirmatory Factor Analysis

Construct-Item	<i>M</i>	<i>SD</i>	λ	α	CR	AVE
Frustration				.83	.88	.72
This game is too frustrating.	2.30	1.21	.65			
This game is too complex.	2.19	1.09	.94			
This game is too difficult.	2.14	1.10	.93			
Expectancy Disconfirmation				.81	.85	.66
The extent to which this game is playful is less/more than I imagine.	1.32	1.49	.73			
This game brings me a sense of achievement slower/faster than I imagine.	0.67	1.54	.76			
This game brings me achievements less/more than I imagine.	0.99	1.46	.93			

Construct-Item	<i>M</i>	<i>SD</i>	λ	α	CR	AVE
Continuance Intention				.94	.97	.90
I plan to continue playing this game.	3.69	1.19	.91			
I intend to continue playing this game.	3.48	1.24	.99			
I plan to continue playing this game after participating in this study.	3.42	1.34	.94			
Intensity of Gamer Experience						
On average, how many hours per week do you spend playing this game?	14.16	17.05	NA	NA	NA	NA
History of Gamer Experience						
For how many years have you played this game?	3.17	3.24	NA	NA	NA	NA

Note. λ denotes indicator loading; CR denotes composite reliability; AVE denotes average variance extracted; NA denotes not applicable.

In addition to reliability and validity checks, CFA enables evaluations on fit indices which indicate the extent to which the data fit the measurement model. The indices ($\chi^2 = 110.13$, $df = 43$, GFI = .96, AGFI = .92, NFI = .96, NNFI = .96, IFI = .97, CFI = .97, RMSEA = .06) showed that the model fit performed acceptably according to the methodological literature [Browne & Cudeck 1993; Carmines & McIver 1981].

The study constructs had correlations $\leq .38$. Such correlations do not show substantial common method variance (hereafter, CMV). To formally examine whether CMV significantly impacts the study measurements, we consulted and used the means suggested by the classic methodological literature [Podsakoff et al. 2003]. That is, assuming a construct CMV to explain all study constructs. We then tested the difference between the model having the CMV construct and the original one. The model with the CMV had $\chi^2 = 177.40$ with 52 degrees of freedom, generating a difference in χ^2 of $177.40 - 110.13 = 67.27$ and a difference in degree of freedom $52 - 43 = 9$. The difference in χ^2 (i.e., 67.27) exceeded the threshold value ($\chi^2(\alpha = .05, df = 9) = 16.92$), indicating that the model having the CMV was significantly inferior to the original model in fitting the data. That is, CMV should have minimum impact on the study measurement. Table 2 summarizes the correlations among the study constructs.

Table 2: Correlations among the Study Constructs

	1	2	3	4
1. Frustration	---			
2. Expectancy disconfirmation	-.09	---		
3. Continuance intention	-.07	.38**	---	
4. Intensity of gamer experience	.09	.06	.09	---
5. History of gamer experience	-.05	.04	.03	.16**

Note. * denotes $p < .05$; ** denotes $p < .01$.

4. Results

4.1. Sample Characteristics

Most of the gamers were male (81.6%), 21 to 30 years old (55.8%), and had college or university education (74.8%), and a monthly disposable income of \$301 and above (42.9%). The gender composition is consistent with online gaming literature [93.3% were male in Kaczmarek & Drażkowski 2014; 70.0% were male in Kowert et al. 2014; 68.8% were male in Teng & Chen 2014]. Moreover, the age of those in the present study was 12 to 52 years, consistent with online gaming literature [12 to 49 years old in Kaczmarek & Drażkowski 2014]. Such consistency showed that the sample in the present study should be representative in gender and age. Notably, this study aimed to maximize sample representativeness. Therefore, the responses containing incomplete demographic information were still regarded as valid and used for analyses. To enable interpretation and comparison with the sample in the literature, missing values were not reported and all percentages were calculated based on the available information. Table 3 lists the distribution showing the sample characteristics.

Table 3: Sample Characteristics

Variable	Category	Number	Percentage
Gender	Male	230	81.6
	Female	52	18.4
Age	12 – 20 years old	75	27.2
	21 – 30 years old	154	55.8
	31 – 40 years old	41	14.8
	41 – 52 years old	6	2.2
Education	High school or below	71	25.2
	College or university	178	63.1
	Graduate or above	33	11.7
Monthly disposable income	Under \$100	103	36.5
	\$101- \$300	58	20.6
	\$301 and above	121	42.9

Note. Responses containing incomplete demographic information were still regarded as valid and used for analyses.

4.2. Hypotheses Testing

This study used structural equation modeling (SEM) to test H1 and H2 that composed the basic structure of the framework. Moreover, the moderating effects as predicted by H3a and H3b were tested using hierarchical regressions with interaction terms. The methodological approach for testing the moderating effects is appropriate, since hierarchical regressions have several merits. First, hierarchical regressions enable evaluation on the degree of the impact of the interaction terms on the dependent variable that is typically not the capability of SEM. Second, hierarchical regressions enable evaluation of interaction of continuous variables, while SEM typically requires separating the sample into two or more groups for testing the moderations. Third, hierarchical regressions can provide an interaction graph which helps visualize the interaction effect. Fourth, the test for interaction by using regressions has a mature methodological foundation [Frazier et al. 2004], which is still one of the state-of-the-art analytical methods. This analytical process included control variables such as gender, age, educational level, monthly disposable income, whether the game is free, and whether the game allows gamers to save their avatars. Inclusion of control variables increased the rigor of the analytical results. To achieve brevity and to maintain a clear focus on the main effects and interactions for testing hypotheses, the analytical results regarding the control variables were omitted from the table. Table 4 summarizes the hypotheses testing results.

Table 4: Analytical Results of Hypotheses Testing

Hypothesis	Antecedent	Consequence	Coefficient	t value	Testing Results
H1	Frustration	Expectancy Disconfirmation	-.09	-1.45	Not Supported
H2	Expectancy Disconfirmation	Continuance Intention	.38**	6.82	Supported
H3a	Frustration	Expectancy Disconfirmation	-.09	-1.45	Supported
	Intensity of Gamer Experience		.10	1.51	
	Frustration × Intensity of Gamer Experience		-.12*	-1.82	
H3b	Frustration	Expectancy Disconfirmation	-.09	-1.43	Not Supported
	History of Gamer Experience		.05	0.86	
	Frustration × History of Gamer Experience		-.02	-0.37	

Note. * denotes $p < .05$; ** denotes $p < .01$; coefficients for H1 and H2 are standardized path coefficients in SEM; coefficients for H3a and H3b are standardized regression coefficients.

As shown in Table 4, frustration was not significantly related to expectancy disconfirmation (path coefficient = $-0.09, p > .05$), not supporting H1. The reason is that frustration may not disconfirm novice users' expectations, while only disconfirming experienced users' expectations. Mixing novice and experienced users results in an insignificant relation between frustration and expectancy disconfirmation. Expectancy disconfirmation was positively related to continuance intention (path coefficient = $.38, p < .01$), supporting H2. The strong positive relation between expectancy disconfirmation supports the adequacy of using the expectancy disconfirmation theory in this study.

The interaction of frustration and intensity of gamer experience was negatively related to expectancy disconfirmation ($\beta = -0.12, p < .05$), supporting H3a. Moreover, the interaction of frustration and history of gamer experience was not significantly related to expectancy disconfirmation ($\beta = -0.02, p > .05$), not supporting H3b. The reason is that history of experience playing the game may not always equal the current experience, since current experience should determine gamers' current responses to the study items. Specifically, online games update their content frequently, reducing the usefulness of years-ago gaming experiences.

Figure 3 illustrates the interaction effect of frustration and intensity of gamer experience on expectancy disconfirmation. The vertical axis is expectancy disconfirmation. Therefore, the upper points show more positive expectancy disconfirmation, while the lower points show more negative expectancy disconfirmation. As in Figure 3, users playing for a few hours per week reported a low level of expectancy disconfirmation (or a low evaluation on the game), and frustration seemingly did not play any marked role. However, users playing many hours per week reported strong positive expectancy disconfirmation (or evaluation on the game) only when they encountered low levels of frustration.

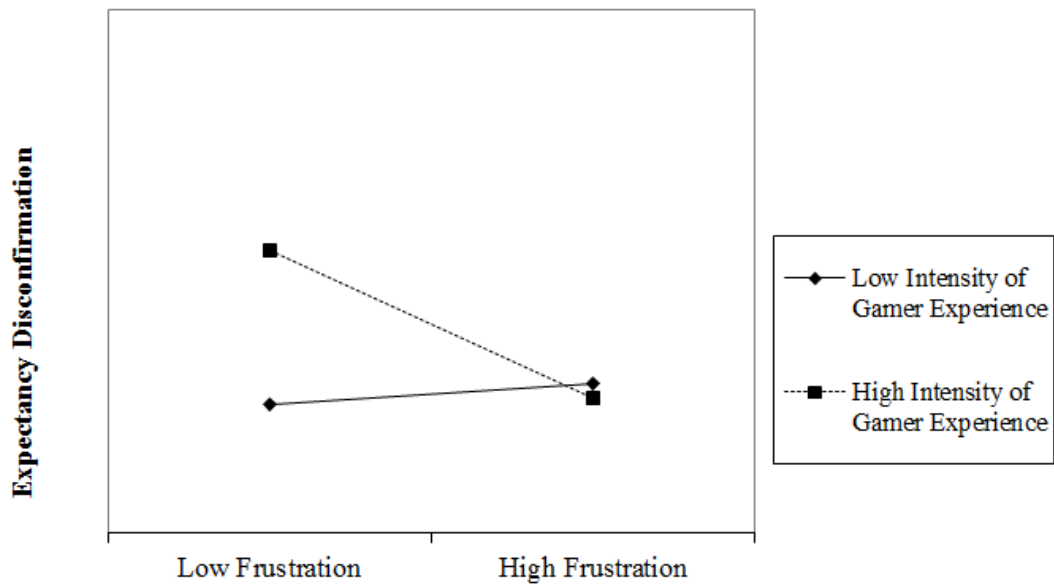


Figure 3: The Interaction of Frustration and Intensity of Gamer Experience on Expectancy Disconfirmation

4.3. Additional Analysis

One may consider that total hours of playing a game may also represent an aspect of gamer experience. Therefore, we also measured the total hours of playing a game by an item: "In total, for how many hours have you played this game?" Recalling the exact number of hours can be difficult. Therefore, this study provided the anchors: 1 representing 1 to 1,000 hours, 2 representing 1,001 to 2,000 hours, and so on, to 5 representing 4,001 to 5,000 hours, and 6 representing 5,001 hours or more. The results do not show significant interaction between frustration and total hours on expectancy disconfirmation ($\beta = -0.01, p > .05$). The reason may be that the total hours is significantly related to history of gamer experience, measured as years of playing the game ($r = .44, p < .01$). Such a reason also supports our decision not to have a hypothesis on such an interaction.

5. Discussion

5.1. Main Findings and Contribution

This study obtained 406 valid responses from online gamers to test the theoretical model. Analytical results indicate that intensity of gamer experience (i.e., weekly hours spent playing an online game) moderates the correlation between frustration and expectancy disconfirmation, which was further related to continuance intention. Specifically, frustration was negatively related to expectancy disconfirmation only for gamers intensively playing a game, but not gamers with a longer history.

On the contrary, history of gamer experience in playing the online game was not observed as a moderator. That is, gaming intensity (i.e., weekly hours) rather than gaming history (i.e., years of experience) is related to the formation of negative expectancy disconfirmation. Such findings contribute novel knowledge and valuable implications to online game providers, offering opportunities to boost their e-commerce revenues from gamers. Moreover, such findings extend the expectancy disconfirmation theory [Oliver 1981] by introducing novel interaction terms (i.e., the interaction between gaming intensity and frustration) as an antecedent for expectancy disconfirmation. Furthermore, these findings provide evidence supporting the usefulness of expectancy disconfirmation in e-commerce contexts.

5.2. Theoretical Implications

This study developed a theoretical model based on the expectancy disconfirmation theory. The model was verified as valid for predicting continuance intention among online gamers. Online games grow rapidly and provide promising revenue, and thus knowledge on retaining online gamers should assist EC managers to create stable revenues. Hence, knowledge provided by this study should be a useful addition to EC literature.

EC literature has verified the impact of frustration. Specifically, frustration reduces positive attitudes toward search engine effectiveness, purchase intention [Sun & Spears 2012], service usage, and revenues [Totok & Karamcheti 2010]. The present study makes three contributions to EC literature. First, in online search contexts, Sun and Spears [2012] found that frustration moderates the impact of hedonic vs. utilitarian searches on search engine effectiveness. The present study is in line with Sun and Spears [2012] in examining the sophisticated impact of frustration on user evaluations, but introduces two novel consequences (i.e., expectancy disconfirmation and continuance intention) and one novel moderator (i.e., intensity of previous experience). The present study deepens understanding of the impact of frustration and encourages future EC researchers to explore the sophisticated impact of frustration.

Second, in online gaming contexts, Guo and Barnes [2009] found that effort expectancy and performance expectancy could predict virtual item purchase behavior. The present study is in concordance with Guo and Barnes [2009] in examining the impact of expectancy on user behavior but is new in using expectancy disconfirmation and its mediator role in the relation between frustration and continuance intention. The present study contributes to EC literature on the expectancy issue by using expectancy disconfirmation (rather than expectancy itself), breaking new ground for future EC researchers.

Third, the expectancy disconfirmation theory has been used to explain the impact of the voice of the customer [Lee et al. 2014]. Such an explanation indicates the usefulness of the expectancy disconfirmation theory, motivating the present study to make use of it. Compared with the literature [i.e., Lee et al. 2014], the present study is new in examining negative vs. positive expectancy disconfirmation (rather than various expectations, including utilitarian and hedonic expectations, as in Lee et al. 2014), demonstrating a new perspective in the use of this theory. Moreover, the present study linked expectancy disconfirmation to continuance intention, further providing evidence supporting the usefulness of this theory and attracting researchers in a broader area, i.e., the information systems community.

Compared with recent online game studies [i.e., Teng et al. 2012; Teng & Chen 2014], the present study is new in using frustration and expectancy disconfirmation to explain continuance intention (or loyalty) among online gamers, neither of which had previously been examined in such literature. Specifically, existing literature demonstrated the impact of challenge, interdependence, and team participation on gamer loyalty [Teng et al. 2012; Teng & Chen 2014], containing no hypotheses overlapping with the hypotheses in the present study.

5.3. Implications for Managers

This study provides insights for online game providers to manage their gamers. First, this study found that frustration is negatively related to expectancy disconfirmation for gamers with intensive game-playing behavior, further reducing their continuance intention. When gaming tasks are too difficult for gamers who intensively spend many hours overcoming them, gaming providers should provide virtual guiding masters to provide helpful suggestions, hints, and directions to assist gamers in accomplishing challenging tasks. Such guidance should reduce frustration among gamers who spend many hours playing. Reduced frustration of such gamers further contributes to their intention to spend additional hours playing the game. Therefore, this study suggests that providing more helpful guidance to gamers should help build a loyal gamer base.

Second, for gamers spending a few hours playing, frustration is not negatively related to expectancy disconfirmation, leading to the conclusion that frustration can be tolerable for certain gamers. Therefore, it is suggested that online game providers offer short-term online training camps between gaming tasks to help improve gaming skill among gamers who spend relatively few hours in gaming. Moreover, it is suggested that online game providers offer in-game avatar tutorials, which can assist those gamers in improving their gaming skills prior to encountering frustration in the later stages. Such suggestions should assist game providers to prepare their gamers with sufficient gaming skills enabling them to resistance to future frustration.

Third, this study found that expectancy disconfirmation is positively related to continuance intention. This finding is reasonable and also insightful for enhancing gamers' continuance intention. Online game providers should concentrate their resources on creating positive disconfirmations, i.e., surprises, to their gamers. Specifically, after a successful challenge, providers can offer unexpected gaming gifts to gamers. Unexpected gifts can be unique weapons, new treasures, or upgraded equipment. The purpose of giving unexpected gifts serves as a reward or a surprise, which can formulate positive disconfirmation. Positive disconfirmation can consequently strengthen their intention to continue playing the online game. Moreover, online game providers should avoid or reduce negative disconfirmations. Effective means include paying attention to gamers' complaints, solving their problems in a timely way, and reporting what has been done to solve their problems. Specifically, it is suggested that game providers actively browse postings in gaming forums and guilds. Such postings are gamers' real-time evaluations of the game. Moreover, game providers should hire capable game managers who can help solve gamers' problems effectively within hours, whenever they occur. This means likely reduced negative disconfirmation among gamers, and subsequently leads to strong continuance intention among them.

5.4. Research Limitations and Future Research Directions

While the study sample included current online gamers, it was limited from understanding why gamers cease playing a certain game, and future studies could focus on the reasons why gamers quit a game, and aim to offer game providers insights into ways to (re-)recruit them. This study surveyed online gamers about their perceptions of frustration and in doing so provides knowledge about gamers and thus insights for managing online games. Gamers may differ in their tolerance of frustration, indicating a future research opportunity in addressing this issue. Based on our findings, future studies could examine how tolerance for frustration can moderate or affect relationships found in the present study. Moreover, the survey method based on retrospective memory may be less precise. Future studies can adopt a mixed method to increase measurement precision.

This study recruited gamers who played MMORPGs, popular online games in the current era. Such an approach increases the applicability and thus the value of our findings. However, this approach is limited in explaining all types of online games. Although most online games have multiplayer features, some focus on individual play. Therefore, future studies may examine whether gamers who play such individual online games may interpret frustration differently from MMORPG gamers. We infer that MMORPG gamers may cope with frustration by seeking help from other gamers, while gamers of individual online games may not do so. Additionally, mobile games are popular types of online games, indicating fertile ground for future research.

This study used structural equation modeling to examine the relationships among the study constructs, i.e., frustration, expectancy disconfirmation, and continuance intention. This statistical method is adequate because it allows a confirmatory examination of structural and directional relationships. Although results of this study provided evidence supporting the proposed relationships, it was restrained by the capability of its correlational design. Correlational designs are known to have limited capability in claiming and directly examining causality. Therefore, future researchers could consider using longitudinal and experimental designs to provide direct and strong evidence supporting the causality among their study constructs.

The framework of this study excludes the moderators for the impact of expectancy disconfirmation. Although this study has justified such exclusion, future studies may explore whether intensity of experience and history of experience may moderate the impact of expectancy disconfirmation on other interesting constructs, e.g., user co-creation or compliant intention. Such exploration should extend the findings of this study and advance the current knowledge.

6. Conclusions

This study is the first electronic commerce study using the expectancy disconfirmation theory to investigate when frustration does not reduce continuance intention among users. Our findings suggest EC managers could allocate resources to reducing or alleviating frustration among users who intensively spend many hours per week playing, because frustration negatively disconfirms expectations among such users, and subsequently motivates them to discontinue the EC service. It is suggested that future studies replicate this study on various EC platforms and incorporate the unique features of each platform. This approach can assist them in generating more fruitful research.

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