Linkage of Virtual Activities with Real Money Spending in Online Games

Completed Research

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Abstract

Online games are one of the fastest growing segments of virtual community platforms with many people gathering together. Several distinct characteristics of online games make them a theoretically interesting research context to examine. First, the dual-currency system of virtual and real money embedded in online games enables developers to implement freemium model. Second, online games allow players to collaborate with others to achieve online game missions. Third, the missions given to players within a game make them utilize various strategies. Along with these three key characteristics of online games, our research aims at understanding the dynamic associations between game players' virtual activities and real money spending. The findings of this research will contribute to the extant literature on virtual economies and bear salient managerial insights for numerous businesses utilizing virtual resources.

Keywords

Online game, avatar, virtual community, virtual collaboration, real money spending

Introduction

A virtual world is a form of network-based simulated environment, which enables individuals to use their cyber avatars to interact each other through an online interface. The expansion of the network bandwidth allows millions of people to socialize with each other in a shared virtual space in a real-time manner. Such virtual worlds have developed as online community platforms. A virtual world has broadened its applicability to many areas. In particular, as the virtual world coupled with realistic-looking graphics (e.g., three-dimension (3D) demonstrations with high-resolution graphics) is applied to online games, online games are known as the most representative type of a virtual world (Kumar et al. 2008). In particular, a massively multiplayer online role-playing game (MMORPG) is one of the most successful online game genres. This new genre of an online game provides platforms where multiple people are able to massively interact with others all around the world. These online games have a staggering number of subscribers. It is reported that over 200 million people have been participating in the top 10 online games. Specifically, over 100 million monthly players participated in League of Legends (LoL) and there were 12.6 million active players in another popular game, DOTA2 in 2016 (Forbes 2016). Consequently, online game service has become the emerging area in online businesses.

The unique and distinct characteristics of online games make them a theoretically interesting research context to examine. In particular, the dual-currency system of virtual and real money embedded in online games enables game developers to implement freemium model. That means, online game developers may charge a subscription fee and/or sell additional virtual goods/items beyond free features and services (Mennecke et al. 2008). By acquiring virtual goods, players can enhance their game play efficiency (e.g.,...
buying resources and acquiring stronger weapons) or decorate their avatars in a virtual world. The virtual goods can be purchased with virtual money players can relatively easily earn in a game or real money. However, since the real-world market of virtual goods has been growing rapidly, the majority of online games take virtual goods sales as the main revenue source for their business. The recent report on virtual goods shows that the market for virtual goods in games was recorded over $50 billion in 2017.3

Given the substantial increase of virtual goods sales, understanding online game players’ buying behavior of virtual goods is an important business topic in an online activity. It has been examined from diverse aspects. Some studies assess psychological factors such as social identity and user satisfaction in an online gaming behavior (Ledonvirta 2005, Guo and Barnes 2007). Other studies address how the structure of virtual worlds affects the demand for virtual goods (Hamari and Lehdonvirta 2010, Animesh et al. 2011). Lim and Seng (2010) and Ho and Wu (2012) examine the functional value of virtual goods (e.g., avatar competency and play advantage). Previous studies identify the factors related to players’ perception and intention in an online game based on survey data. One important question missing from the literature is the linkage of online activities in a virtual world with real-money spending for the online activities.

In this study, we investigate how players’ activities within an online game (i.e., virtual money spending, features of virtual items purchased, and interconnectivity among other players in virtual worlds) affect the purchase of virtual items with real money. Specifically, this study answers the following salient research questions: (1) Does virtual money spending lead to real-money spending?; (2) Does the engagement of group/team plays make players spend more real-money?; and (3) How are the purposes of virtual items (gaming efficiency vs. decoration) associated with players’ gaming style and progress?

We empirically address the research questions by utilizing the data gathered from one of the most popular MMORPGs presented by a leading online game developer. In the dataset collected, we can observe players’ purchase history. Additionally, we can trace the history of team play. We use panel data regression models to verify the effect of collaborative game play on user’s real money spending on virtual goods. We also explore other variables that might affect user’s spending behavior.

Research Context

The socioeconomic structure in the virtual world resembles a real-world economy in many ways (e.g., a supply and demand system of resources), whereas the virtual worlds have some fantasy and imaginary elements (e.g., spell and war against monsters) to attract game players.

There are three virtual items available in the game: (1) virtual money; (2) regular items; and (3) premium items. First, virtual money is called “Marble” and players can earn it as a reward for accomplishing in-game missions (e.g., hunting monsters) or staying longer in the game. Second, players can purchase the regular items with virtual money. There are two types of regular items: gaming efficiency and avatar decoration items. These two types of game items are essential to play because achievement and socialization are the main motivations to play online games (Billieux et al. 2013). The first category is designed to increase game-play efficiency (e.g., armors and weapons). The other one is to decorate avatars and/or the avatars’ virtual space. Particularly, the online game provides players with their own unique virtual space called “MyPlanet” which is a housing system in the game. Players can decorate their planets with regular decorative items (e.g., furniture and wallpaper) and also invite other players to showcase their planets. Third, premium items can be purchased with only real money. As it is shown in regular items, the premium items can also be classified into those for gaming efficiency and those for decoration.

The game players can collaborate with other players to hunt monsters. The main purpose of the team play is to improve gaming efficiency and accomplish challenging missions. A player can send invitation messages to other players and form a team with the players who accept. This form of group is called ‘party’ in the online game. The game supports players who form a team with up to four players. Once a team is formed, players can chat with their team members. They can share interests, activities, backgrounds, or real-life connections, building social relations in the game.

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Literature Review

Overview of Online Gaming Behavior

Motivation of play in virtual worlds is important to identify why users play online games. Based on Bartle’s (2004) classification of online game player’s motivations, the main purposes of playing online games can be broken down into 4 different types: socialization, player-killing, exploration of gaming worlds, and achieving goals in gaming worlds. Choi and Kim (2004) adopted the flow theory and explained that users continue to play online games if they have optimal playing experiences. They mentioned that the optimal experiences can be obtained by appropriate goals and effective personal interactions. Competition between users also gives a positive effect on users’ flow and enjoyment in the game (Weibel et al. 2008).

The basic principle of online game design is how to make game players experience fun and enjoyment in an online game (Koster 2013). Previous research has categorized several features that affect user experience in an online game. In a broad perspective, Hunicke et al. (2004) provided MDA (Mechanic-Dynamic-Aesthetics) framework to identify the key elements in an online game and understand online gaming behavior. Dickey (2007) selected design of avatars and narrative environment as the two primary features in an online game design. Hsu et al. (2009) highlighted challenge, reward, cooperation, and competition that affect user experience and immersion in online games. As shown in the previous studies, most studies consistently show that avatar design, game environment, and social interactions are the major components of online game design.

Buying Behavior of Virtual Goods

Kim et al. (2012) used the theory of self-presentation to explain what motivates people to buy virtual goods under the context of social networking virtual communities. Guo and Barnes (2007) adopted theory of planned behavior (TPB) and technology acceptance model (TAM) to explain intention of purchasing virtual goods. Ho and Wu (2012) empirically showed that game item's price, functional quality, avatar competency, and playfulness significantly affect intention to purchase virtual goods.

Some of virtual goods can be purchased with real money, which is the main revenue model for the game operators. There are several studies highlight the importance of items purchased by real money (premium items). Lo and Wen (2010) show that premium items purchasable with real money are the important factors which can add value in online games. Oh and Ryu (2007) also focused on the design of premium items. In terms of item-selling based payment model, they claimed that balancing between (free) items obtained by virtual money and items purchased by real money is the critical issue for online game design. Other studies attempted to play marketing strategies in virtual worlds for real world products, not virtual item in virtual worlds (e.g., Lui et al. 2007).

To describe why people purchase virtual goods, the previous research has been mostly focused on behavioral perspective. The lack of secondary data might limit the previous research to survey-based or explorative analysis. Instead of the social aspects of virtual goods purchases, our research sheds a light on the economic perspective of purchase intention of virtual goods.

Player Interactions in an Online Game

In addition to fun, enjoyment, and competitiveness of avatars, the social relations with other players is one of crucial predictors of users’ game participation decisions and continuance intention to play online games. As a result, the interaction between users is an important factor in online game design (Salen and Zimmerman 2004). Hsu and Lu (2004) surveyed 233 online game players and showed that the adoption of an online game is affected by a user’s social influence, immersion in the game, and popularity of the online game (i.e., network effects).

Although social network is different from the context of an online game context, several previous studies on this issue show how relationships in social network affect spending money in online spaces. In the literature on social networking, there are several studies to explore the social relations and the buying decision of either virtual or physical goods. Bapna and Umyarov (2012) showed that online friendship
increases the odds of paid subscription in Last.fm. Iyengar et al. (2009) collected the data from a social networking site and showed that the group with moderately connected users showed the positive effect of social interaction on item purchases. On the other hand, the group with well-connected users showed negative effect of social interactions on item purchase. Given the results, we can conjecture that interactions among players may affect players’ buying behavior in an online game.

Ducheneaut et al. (2006) also show that players who are not engaged in team play spend more time on online games than those with team play. Lounis et al. (2014) show that a player’s experienced fun is positively affected if he/she can play as a team with other players with the same goal.

**Hypothesis Development**

**The Dual-Currency System of Virtual and Real Money**

The majority of online games adopt freemium business model (Lehdonvirta and Castronova 2014) based on the dual-currency system (i.e., coexistence of virtual and real money spending). The dual-currencies are matched to two types of virtual items to buy in a game (regular and premium items). Online games are basically free to play except for premium contents. Players can acquire virtual money by playing a game and use the earned virtual money to buy regular virtual goods (Alha et al. 2014). In parallel with the regular items, game players can buy premium items with real money if they want more advanced playing experience. Given that online games separate the use of virtual and real money, we first hypothesize that virtual money spending will eventually lead to the demand for premium items based on the complementary roles of regular item on premium items.

In addition to the economic relationship between regular and premium items in terms of their functions, the co-buying behavior of regular and premium items also depends on game players’ general propensity. Oestreicher-Singer and Zalmanson (2009) show empirical evidence that active players are more willing to pay for premium services. Active players first use virtual money earned by in-game activities because it is free. Players become more immersed in the game as they experience more regular items. As a result, they are likely to purchase premium items because they actively seek for advanced playing experience. Based on the economic relationship and active players’ general tendency, we develop the following hypothesis.

**Hypothesis 1:** The more virtual money an online game player spends the more real money the player spends.

We consider that purchasing both regular and premium items for gaming efficiency is one way of expressing player’s explorative behavior. Regular and premium items improve gaming efficiency in a different way. This means that players might need either regular or premium items to accomplish game missions. However, the gamer disposition explains that players generally tend to explore various ways to complete missions. Purchasing more regular items for gaming efficiency indicates that players are more likely to explore alternative ways of achieving game play efficiency with different game items. In that sense, we expect that players who spend more on regular items for gaming efficiency are more likely to experience efficiency improvement achieved by premium items. Based on this player’s explorative behavior, we develop the next hypothesis.

**Hypothesis 1_1:** The more virtual money an online game player uses for gaming efficiency the more real money the player spends.

Purchasing decoration items is related to social interactions in online games. Lo (2008) shows that a player character’s outward attractiveness (avatar’s appearance) is one of important factors when assessing interpersonal attraction in online games. Therefore, we expect that players who purchase more regular items for avatar decorations emphasize more on social interactions in a game. Regular items for avatar decorations provide lower quality than premium items. Purchasing higher quality items may increases the value of social interaction. In that sense, for avatar decorations, we expect that spending on regular (lower quality) items leads to increases in demand for premium (higher quality) items.

**Hypothesis 1_2:** The more virtual money an online game player uses for avatar decorations the more real money the player spends.
In-game Team Play and Purpose of Real Money Spending

Due to a massive number of online game players in the same virtual space, interactions among players is a unique activity that typical standalone video games do not offer (Shen 2014). In-game team play benefits in various aspects such as enhancing gaming efficiency (i.e., hunting monsters) or strengthening social relationships. However, there is no study to examine whether the interactions affect real money spending on virtual items. Here, we seek to find a linkage between team play and real money spending in an online game.

Purchase of Gaming Items

The in-game team play with other players can increase gaming efficiency, so players can easily accomplish in-game tasks (Ducheneaut 2006; Huang et al. 2009; Moon et al. 2013). An individual avatar’s abilities depend on an avatar’s level and the game items equipped to the avatar. If players make a team for battle against monsters, they can make a stronger troop with integrated abilities of their avatars (e.g., more units and shared armors), if the other conditions hold. As a result, game players have two options to increase the gaming efficiency by (1) purchasing the virtual items or (2) forming a team. Given that players can acquire increased gaming efficiency with team play (that is free) instead of by purchasing premium items (that is not free), we can expect that team play make players spend less real money on virtual items designed to improve gaming efficiency.

On the other hand, team play may increase real money spending for gaming items. Like cases in the research on online social networks, virtual relationships in online games may affect gaming behavior. Kong et al. (2012) show that peer motivation affects players’ intention to learn in online game. Fang et al. (2014) also show that paying neighbors of strong ties increases player’s probability of purchasing game items. This shows that there might be a positive peer effect when purchasing gaming items.

Given the competing explanations, we will assess which one reflects the real situation instead of developing a specific hypothesis on the relationship between in-game team play and real money spending for gaming efficiency items.

Purchase of Decorating Items

Previous studies show that players buy virtual goods because of social influence in addition to the improvement of avatar competency (Guo and Barnes 2009, Park and Lee 2011). Similarly, Kim et al. (2011) show that the decorated avatars represent the players’ social identities and support social relationships in virtual worlds. In sum, virtual items for avatar decorations may enhance players’ social experience and increase the value of players’ identity.

Decorative props and visual appearance are one of the common features of game items (Park and Lee 2011). The purpose of avatar decoration items is to show off visual appearances of a player’s avatar to other connected players. In a social networking services (SNS), the value of visual appearance and self-expression is strongly related to the number of connected friends in a SNS (Kramer and Winter 2008). The number of connected friends can be explained as the chance of showing a player’s virtual identity to other players. Therefore, we can posit that the value of premium items for avatar decorations increases if a player has higher chance of meeting other players in the game. Assuming that players have more chance to meet other players through team play, we posit the following hypothesis.

Hypothesis 2: The more engaged in a team play an online game player is, the more real money the player spends for avatar decorations.

Research Method

Data and Measures

Our sponsoring developer company was founded in 1994 and recorded revenue of around 850 million US Dollars in 2010. This was 12.6% of total market size of online game industry in Korea at that time. The company was distributing total 30 games on its platform in 2010. A half of them were role-playing games that are the same genre as the target game in our research context. The sampled game (henceforth, EP)
was officially released on 18 February 2010 and adopted item-selling based payment model. As a result, this game began to sell some premium game items for real money.

Our data covers the log data of players who had played EP between 18 February and 25 Aug 2010 (27 weeks). The log data from the server records time stamps of avatar’s activities in the game world. The log data records every player’s activities and changes in his/her avatar. The dataset shows the gaming behavior of 4,826 players (a total of 26,824 weekly observations). Some of them spent real money on virtual goods (37.1%). Henceforth, we call them “paying players” while we use the term “free players” for the players who have not spent real money on virtual goods. Those free players are considered as the control group to identify the effect of player activities on spending real money in EP.

The average weeks of game play is similar between paying (5.88 weeks) and free players (5.39 weeks). However, paying players (3.68 hours) played almost 2 times longer than free players (1.85 hours) in terms of play time per week. The average amount of real money spent by an individual player in a week is $2.6 and the largest amount spent is $275. A player hunts on average 1,027 in-game monsters in a week. Out of them, the proportion of solo play is 53%, and 47% is accomplished by team play. Paying players hunt 59% of monsters as a team while free players hunt 39% of monsters with other players. That is, paying players are more likely to hunt monsters as a team than free players are. Both paying and free players stayed on average 0.67 hours per login. The number of avatar’s death per week is 3.05 for paying players, and 2.28 for free players. Except of 11 out 27 weeks in our data, there was at least one event. Marketing activities include both internal (i.e., opening event, cash reward events, 100th Day event, and renewal events) and external (i.e., World Cup 2010 or summer vacation). Events. The set of key research variables extracted from our dataset and their definitions are presented in Table 1.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>RealMoneySpending</td>
<td>Total amount of real money that an avatar spends for premium item during a week</td>
</tr>
<tr>
<td>RealMoneySpendingGame</td>
<td>Total amount of real money that an avatar spends for premium items for game play efficiency during a week</td>
</tr>
<tr>
<td>RealMoneySpendingDeco</td>
<td>Total amount of real money that an avatar spends for premium items for character decorations during a week</td>
</tr>
<tr>
<td>VirtualMoneySpending</td>
<td>Total amount of virtual money that an avatar spends for regular game items during a week</td>
</tr>
<tr>
<td>VirtualMoneySpendingGame</td>
<td>Total amount of virtual money that an avatar spends for regular game items for game play efficiency during a week</td>
</tr>
<tr>
<td>VirtualMoneySpendingDeco</td>
<td>Total amount of virtual money that an avatar spends for regular game items for character decorations during a week</td>
</tr>
<tr>
<td>HuntTogether</td>
<td>The percentage of monsters hunted with other players (team play) out of total number of hunted monsters</td>
</tr>
<tr>
<td>Level</td>
<td>A player character’s level in an avatar development system</td>
</tr>
<tr>
<td>PlayTimePerLogIn</td>
<td>The average play time (hour) between log-in and log-out</td>
</tr>
<tr>
<td>NumDeath</td>
<td>The number of cases that an avatar is killed by monsters during a week</td>
</tr>
<tr>
<td>ActiveUsers</td>
<td>The number of active players during a week</td>
</tr>
<tr>
<td>OpeningEvent</td>
<td>Marketing activities that celebrate the official release of the game</td>
</tr>
<tr>
<td>CashRewardEvent</td>
<td>Marketing activities of giving real money as a reward</td>
</tr>
<tr>
<td>WorldCupEvent</td>
<td>Marketing activities that celebrate FIFA World Cup 2010</td>
</tr>
<tr>
<td>SummerVacation</td>
<td>A period of summer holiday between</td>
</tr>
<tr>
<td>100AnnivEvent</td>
<td>Marketing activities that celebrate 100th day anniversary of the game</td>
</tr>
<tr>
<td>RenewalEvent</td>
<td>Marketing activities that celebrate grand renewal of the game</td>
</tr>
</tbody>
</table>

**Table 1. Definition of Variables**

**Empirical Models**

We use (weekly) panel data regression models to test the hypotheses about virtual and real money spending and team play in online games. Considering each player as the unit of analysis, we use player’s real money spending on premium items as the dependent variables and analyze the effects of independent variables relevant to player’s in-game activities.
(1) \[ \text{RealMoneySpending}_{it} = \beta_1 + \beta_2 \text{VirtualMoneySpending}_{it} + \beta_3 \text{HuntingTogether}_{it} + \beta_4 \text{Level}_{it} + \gamma_1 \text{PlayTimePerLogInit}_{it} + \gamma_2 \text{NumDeath}_{it} + \gamma_3 \text{ActiveUsers}_{it} + \delta_1 \text{OpeningEvent}_{it} + \delta_2 \text{CashRewardEvent}_{it} + \delta_3 \text{WorldCupEvent}_{it} + \delta_4 \text{SummerVacation}_{it} + \delta_5 \text{100AnnivEvent}_{it} + \delta_6 \text{RenewalEvent}_{it} + \alpha_i + \epsilon_{it} \]

The regression model uses an avatar’s total real money spending as the dependent variables and evaluates Hypotheses 1 and 2. The virtual money spending for game items (VirtualMoneySpending) is used for testing Hypothesis 1. To capture the influence of team play on real money spending, the regression model include how to hunt in-game monsters, which is the main part of achieving the maximum level in an avatar progression system. Therefore, our model uses a percentage of monsters that a player hunted with other players (HuntTogether). This is to identify a player’s intensity of team play. We also included a set of important variables concerning (1) game play behavior, (2) network effect, and (3) marketing events that might affect a player’s real money spending into the model. Finally, \( \alpha_i \) represents a player-specific fixed effects term incorporating unobserved heterogeneity among players and \( \epsilon_{it} \) is an unobserved error term in real money spending.

Next, we attempt to evaluate how a percentage of team play affects differently based on uses of virtual goods. For this issue, we separate real money spending on virtual goods into two categories – spending on goods which improve game play efficiency (RealMoneySpending\textsuperscript{Game}) and decorates player characters (RealMoneySpending\textsuperscript{Deco}). In equation (2), we use spending virtual money on regular virtual goods which improve game play efficiency (VirtualMoneySpending\textsuperscript{Game}_{it}) and test Hypothesis 1. Spending virtual money on virtual goods for decorating avatars (VirtualMoneySpending\textsuperscript{Deco}_{it}) is used in equation (3) for testing H1.2. The rest of variables in equation (2) and (3) are the same as those in equation (1).

(2) \[ \text{RealMoney}_{it} = \beta_1 + \beta_2 \text{VirtualMoney}_{it} + \beta_3 \text{HuntingTogether}_{it} + \beta_4 \text{Level}_{it} + \gamma_1 \text{PlayTimePerLogInit}_{it} + \gamma_2 \text{NumDeath}_{it} + \gamma_3 \text{ActiveUsers}_{it} + \delta_1 \text{OpeningEvent}_{it} + \delta_2 \text{CashRewardEvent}_{it} + \delta_3 \text{WorldCupEvent}_{it} + \delta_4 \text{SummerVacation}_{it} + \delta_5 \text{100AnnivEvent}_{it} + \delta_6 \text{RenewalEvent}_{it} + \alpha_i + \epsilon_{it} \]

(3) \[ \text{RealMoney}_{it} = \beta_1 + \beta_2 \text{VirtualMoney}_{it} + \beta_3 \text{HuntingTogether}_{it} + \beta_4 \text{Level}_{it} + \gamma_1 \text{PlayTimePerLogInit}_{it} + \gamma_2 \text{NumDeath}_{it} + \gamma_3 \text{ActiveUsers}_{it} + \delta_1 \text{OpeningEvent}_{it} + \delta_2 \text{CashRewardEvent}_{it} + \delta_3 \text{WorldCupEvent}_{it} + \delta_4 \text{SummerVacation}_{it} + \delta_5 \text{100AnnivEvent}_{it} + \delta_6 \text{RenewalEvent}_{it} + \alpha_i + \epsilon_{it} \]

Results and Discussion

We conducted a set of diagnostic tests to validate our model specification. First, the presence of multicollinearity was tested with Variance Inflation Factors (VIF) for each independent variable in each regression model. The highest VIF value was 3.23, indicating that multicollinearity was not an issue in our models. Second, to evaluate if player-specific fixed effects models provide consistent and efficient estimates, we conducted two formal model specification tests: Breusch and Pagan’s (1979) Lagrange multiplier (LM) test for heterogeneity effects specification and a Hausman specification test (1978) against the random effects model. The test result from Breusch-Pagan LM suggests the model specification should incorporate player-specific heterogeneity. In addition, Hausman test indicates that a fixed effects specification for our models is preferred over random effects approach. Third, to see if time-fixed effects are needed when running a fixed effects model, we conducted a joint test to check if all the time (week) dummies are equal to 0. We reject the null that all time coefficients are jointly equal to zero, therefore time (week) fixed effects are needed in the models. Finally, we performed a modified Wald test for heteroskedasticity in our fixed effect models, and rejected the null hypothesis of homoscedasticity at the 1% significance level. Therefore, we use the robust standard errors clustered by players (Rogers 1993) for all the models.

Table 2 shows the regression results of Models 1, 2, and 3 that specify the relationship between the set of explanatory variables and real money spending.
Virtual Money versus Real Money

The overall results show that virtual money spending gives positive effects on real money spending, which supports Hypothesis 1. The coefficient of VirtualMoneySpending in Model 1 shows that spending a million more units of virtual money on regular items leads to $0.43 (4.78*** in Model 1) more consumption on premium items. The dual-currency system in an online game is used for offering different prices to different customer segments. Offering premium items for real currency differentiates players who want premium contents from regular players. In that perspective, the complementary effects of virtual money spending on real money spending shows the possibility that free players can be transformed into paying players. This result also explains that playing experiences earned by consuming regular items drive demands for premium items. We can expect that more active players are more likely to spend real money in the game.

For gaming efficiency, spending a million units of virtual money increase real money spending by $0.27 (3.02*** in Model 2), which confirms Hypothesis 1.1. The regular items for gaming efficiency such as weapons and armor can improve avatars’ abilities. The premium items for gaming efficiency, on the other hand, temporarily deactivate structural inconveniences designed by game operators.
For avatar decorations, we find a positive association between virtual money spending and real money spending at 0.1% significance level (i.e., 3.28*** in Model 3), which confirms Hypothesis 1_2. Unlike items for gaming efficiency, both regular and premium items for avatar decorations are functionally identical, but the premium items are generally more desirable to players than the regular items. The positive relationship between spending on regular and premium items for avatar decorations explains how players consume items for avatar decorations.

**Team Play and Real Money Spending**

The percentage of team play positively affects the amount of real money spending. The coefficient of *HuntingTogether* shows that 10% point increase in the percentages of team play induces the players to spend $0.028 (303.13*** in Model 1) more on premium items. This shows the complementary relationship between player-to-player interactions and real money spending in online games in overall perspective.

For gaming efficiency, the percentage of team play does not affect significantly the amount of real money spending, although the coefficient shows negative value (-25.01 in Model 2). Regarding online game design, a team play is generally known to give better efficiency in hunting monsters than solo play. However, our result implies that the main purpose of player-to-player interactions in an online game is not mainly about achieving game play efficiency. Instead, players may prefer to focus on making social relationship through team play, similar with the case of making friends in social networking sites (Subrahmanyan et al. 2008). Therefore, the statistical insignificance about the relationship between team play and real money spending for game play efficiency can explained as the small portion of players who seriously care about gaming efficiency.

For avatar decoration, the real money spending on avatar decorations is significantly affected by a team play, which is contrast to the case of game play efficiency. The coefficient tells that 10% point more on team play in the online game leads to $0.022 more spending on premium items (238.39*** in Model 3). Decorating avatars with items in online games can be considered as self-representation in social networking websites. For online game players, team play gives more chances to show their avatar decorations to other players than solo play. As such, we can conclude that the social value from purchasing premium items for avatar decorations increases as the player’s percentage of team play increases.

**Conclusion**

Our research aims at comprehending how player activities in online games can be transformed into real money spending. Under the context of online games, we capture the player’s collaborative game play and real money spending on game items and develop regression models for the analysis. Our research identifies the three main findings. First, we found that virtual money spending on regular game items gives a positive effect on real money spending on premium items. This result implies that spending behavior in a virtual world motivates real money spending in online games. Second, we found that collaborative game play can substitute spending real money on premium game items. In terms of game play efficiency, this shows that a collaboration with other players may help to accomplish in-game missions faster without buying game items. The last main finding is that the effect of user collaboration on real money spending becomes higher when players are playing more difficult in-game contents. Our main findings are useful to segment online game players based on their behavior of user collaboration and level of players.

Our research also has several limitations. First, our data includes over 2,000 regular and 400 premium items. The categorization of those items might be the key point of understanding how activities in the online game affect real money spending. The current analysis only defines two categories for grouping items. We need to specify regular and premium items more delicately for the further research. Second, our analysis is based on the context of online game business, especially MMORPGs. Some of variables such as collaborative game play or the number of avatar’s death contain game-specific information. This game-specific context makes it general to generalize our findings to the context of general virtual world business or even e-business. We need to further develop the framework to generalize our findings.
References


