

# EXPLORING THE REASONS OF USER'S PURCHASE IN VIRTUAL WORLD: AN EMPIRICAL ANALYSIS IN AN ONLINE GAME

*Research-in-Progress*

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## Abstract

*We empirically test how users' behaviors in virtual world relate to purchase digital products. According to the theories of consumption values, we classify users' behaviors as utilitarian component and social component. The key objective is to analyze whether utilitarian and social behaviors influence on purchasing two types of items; functional and decorative goods. The functional item is about improving efficiency in content and the decorative item is for ornamenting avatars. We use an individual-level playing-game data from a leading game company in Korea. We observe the utilitarian components strongly affect purchasing behavior towards functional goods while the social components influence on decorative purchase. In particular, according to our in-depth study, we find that those corporations that represent group activities have both utilitarian and social leverage. This paper contributes to the academic by analyzing a highly reliable "objective data set" and by describing users' economic behavior in the virtual world.*

**Keywords:** Virtual World, Online Game, Theory of Consumption Values, Digital Product

## Introduction

In recent years, the virtual world has become much more popular and has grown up rapidly, especially with social network maturing and mobile booming. In 2010, the worldwide revenue of virtual goods came to \$7.3 billion.<sup>1</sup> And the virtual goods market in the United States alone is set to reach \$2.9 billion in 2012.<sup>2</sup> Even though economic growth is clearly taking place in the virtual world, there are few studies about the reasons why people purchase digital products, found in the virtual world, with real money. Even though there are some recent studies about intention to purchase virtual items (Animesh et al. 2011; Kim et al. 2012), all of these are either survey-oriented or conceptual studies without the support from empirical evidence.

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<sup>1</sup> [http://news.cnet.com/8301-13506\\_3-20022780-17.html](http://news.cnet.com/8301-13506_3-20022780-17.html)

<sup>2</sup> <http://techcrunch.com/2011/12/07/us-virtual-goods-market-to-hit-2-9-billion-in-2012-with-facebook-games-maturing-mobile-booming/>

This paper is the first research which empirically analyzes the economics of the virtual world by using an objective data set. According to the theories of consumption values in a traditional market, customers purchase products with different needs or values such as utilitarian, social, emotional, and so on. From among that range, we limit our focus only on two elements: the utilitarian and the social.

The utilitarian component is related to the functional and focuses on instrumental expectations. Therefore, the utilitarian component in a virtual world is connected with the productive aspects of the content itself. On the other hand, the social component is related to symbolic meanings and focuses on conspicuous consumption values. That is, the social component in the virtual world is not about the content itself: instead this component sets up virtual relationships with others.

In this paper, we test whether utilitarian and social components do influence purchasing of digital products in a virtual world. We categorize each digital product purchased as: a functional item, related with improving efficiency in content, and a decorative item, solely for ornamenting avatars and not connected with improving efficiency of content. And then we further analyze the effects depending on whether the product type is functional or decorative.

To examine our hypotheses, we use individual-level playing game data collected from a leading online game company in Korea. In our analysis, we use data spanning 3 months from May to August 2010 and this data base tracks the behavior of 18,040 users.

We observe the utilitarian elements strongly affect purchasing behavior and especially the purchasing behavior towards functional goods. The social components also have a positive influence on the purchase decision and especially on the decorative purchase. In particular, according to our in-depth study, we find that those corporations that represent group activities have both utilitarian and social leverage.

This paper contributes to the academic field by analyzing a highly reliable “objective data set” and by describing users’ economic behavior in the virtual world. In addition, we apply the theory of consumption value to the virtual world and discover how consumption depends on product types. When it comes to business practice, furthermore, the paper draws attention to various practical implications. Our analysis should help companies to understand the virtual world more and hence to formulate suitable sales strategies based both on customer behavior in the virtual world and product types. Moreover, the results of our analysis can be applied to other fields using similar pricing schemes such as in-app purchasing of mobile commerce field today.

## **Literature Review**

### ***Virtual Economy***

Recently, virtual worlds are observed in several articles as an important emerging business or a significant test bed for research. Similarly virtual economy which means economy in virtual world has also become a good object to be analyzed.

Lately, some survey based researches have started discussion about why people buy virtual item (Animesh et al. 2011; Kim et al. 2011; Kim et al. 2012; Guo and Barnes 2009; Lehdonvirta 2009). Even though they mention several attributes influencing on purchasing virtual items, we categorize these into two major causes: one is for productivity of the content and the other is for social relationship in virtual world. These can be explained as utilitarian and social motivations examined in related studies.

### ***Utilitarian vs. Social Values of Consumption***

Consumption values are important concept in marketing strategy since various consumption needs influence consumers’ choice behavior. Sheth (1983) proposes two purchasing motives, one is about functional needs and the other is related to nonfunctional one. In the following literatures, the motivations or values are divided into numerous perspectives (Sheth et al. 1991; Babin et al. 1994; Chandon et al. 2000; Sweeney and Soutar 2001).

In IS field, Kim et al. (2011) and Lehdonvirta (2009) adopt the theory of consumption values into purchasing process of virtual item. Both use three dimensions of consumption value: utilitarian, emotional/hedonic, and social. In this paper, we use utilitarian and social values and exclude emotional value. Since emotional value is related with feeling of customer, we can’t measure with our objective data.

## Data

We use individual-level data from a top game company in Korea. It has detailed information of play, purchase, and users for 6 months from February to August in 2010. However, we use data for 3 month from 27th of May to 26th of August since the game officially commercialized on 27th of May after period of beta test. In given data, total number of users is 129,558.

We select users who registered from 27th of May to 26th of June and logged on for more than one week. And we analyze their daily behavior until 28th of August. Table 1 shows a summary of those statistics. Total number of users analyzed in this paper is 18,040 and on average they are 23.95 years old and the number of male users is twice as much as the female users. In our chosen period, people logged on for the game close to 2 weeks on average.

There are four variables which indicate a user's game playing activities. Battle time and Number of deaths are the utilitarian component, while Number of co-workers and Number of times visiting others' planet—a private site designed for social networking in the game—are related to social aspects. Battle time is hours per day when users do battle with virtual monsters to get points for moving a level up in the game. On average, users do battle 30 minutes per day when they log in to play a game. Number of deaths is the number of cases when virtual characters die while engaging with monsters. We regard number of deaths is a good proxy variable of difficulty; and a user is killed 3.173 times a day on average.

**Table 1. Summary Statistics**

Variable	Observations	Mean	Std. dev
Customer Characteristics			
Age	18,040	23.95	13.08
Gender (Male = 0, Female = 1)	18,040	0.32	0.47
Play Days	18,040	15.81	13.65
Daily Average of Play Activity			
Battle Time (hours)	285,285	0.540	0.777
Num of Death	285,285	3.173	7.994
Num of Co-worker	285,285	26.833	64.131
Num of Visiting Others	285,285	0.434	2.332
Daily Average of Purchase Activity			
Purchase	285,285	0.043	0.203
Purchasing Decorative	285,285	0.021	0.142
Purchasing Functional	285,285	0.028	0.165

Number of co-workers is the number of people brought in to help fight the battle. Users can utilize the co-work system to fight the monster, and especially when a monster is difficult to deal with, people prefer to have others to collaborate with them. On average, players brought in 26.833 collaborators for a day. Number of visiting others indicates a user's number of visits to other users' planets. In this game, each user has a planet, a private area such as wall of Facebook and mini homepage. On each visit to another's' planet the player leaves a message or give gifts. This is a social activity in the game, and a user visits others 0.434 times a day.

The purchase activity refers to an actual purchase with real money, and not with virtual money or by using points from the game. The items traded for cash are totally different from items traded in the game. Since our study focuses on not how many items are sold but whether people decide to purchase an item per day, we summarize purchase activity as a daily binary choice. On average, people decided to purchase 4.3% per day: 2.1% for the functional item and 2.8% for the decorative item.

## Model and Hypothesis

### *Effects of Utilitarian vs. Social Elements on Purchasing Digital Goods*

We use a binary discrete choice model to analyze the utilitarian and social components in a game on purchasing digital good, one per day basis.  $Purchase_{i,t}$  is a binary variable where customer  $i$  purchases item at day  $t$  with real money and  $Purchase_{i,t-1}$  is purchase variable at  $t-1$ . Since our analysis is focusing on purchasing behavior, not on intensity of purchase, we represent the purchase variable as binary action, and not by the number of items purchased.

There are two variables which indicate the utilitarian component. *BattleTime* shows how users' spending time to enjoy contents in the game that essentially what the game offers, and the *NumOfDeath* indicates level of difficulty of contents.

The second aspect, the social element, has two variables; *NumOfCoWorker* and *NumOfVisitOthers*. *NumOfCoWorker* means the number of other characters who play together with a user to assist in completing given missions. It shows that people enjoy the virtual world not only alone but also together with others ready to lend a hand. *NumOfVisitOthers* is the variable displaying how many times a user visits another's private area to communicate or give gifts. It is a good indicator showing of the social relationship in the virtual world.

Four main variables are user  $i$ 's variables at time  $t$ . In addition,  $\omega_i$  is user specific dummies,  $\varphi_t$  is time specific dummies and  $\varepsilon_{i,t}$  is user and time specific error terms.

The basic model is as follow:

$$Purchase_{i,t} = \beta_0 + \beta_1 Purchase_{i,t-1} + \beta_2 BattleTime_{i,t} + \beta_3 NumOfDeath_{i,t} + \beta_4 NumOfCoWorker_{i,t} + \beta_5 NumOfVisitOthers_{i,t} + \omega_i + \varphi_t + \varepsilon_{i,t}, \quad (1)$$

We assume that spending more time on doing battle and experiencing difficulty with death, indicating utilitarian components, might stimulate purchasing virtual items. In addition, social elements, such as having more co-workers and enjoying virtual human-relationship, would be positive for purchasing digital goods.

*H1a*: The utilitarian components influence people to purchase digital product.

*H1b*: The social elements could stimulate people to purchase digital product.

### *The Effects on Purchasing Functional vs. Decorative Products*

In addition, we classify digital products as functional and decorative. The functional item improves efficiency of content and the decorative item is helpful to beautify characters in the virtual world. We also devise models about purchasing behavior depending on type of item and these are almost the same as the basic model for purchasing behavior. We replace  $Purchase_{i,t-1}$  with  $Functional_{i,t-1}$  and  $Decorative_{i,t-1}$ .

We assume that utilitarian components have positive influence on purchasing functional goods to improve productivity, whereas social components are related with purchase of decorative goods for displaying ostentation to impress onlookers.

*H2a:* The utilitarian components influence people to purchase functional item.

*H2b:* The social elements might not be related to purchasing functional item.

*H3a:* The utilitarian components might not be related to purchasing decorative item.

*H3b:* The social elements stimulate people to purchase decorative item.

## Analysis and Results

### *Effects of Utilitarian vs. Social Elements on Purchasing Digital Goods*

At first, we analyze the effects of utilitarian and social components on decisions to purchase digital goods. The results are shown in Table 2. Model 1 excludes the aspect of social factors, Model 2 rules out the elements of the utilitarian, and Model 3 includes the full range of variables. All of three models show similar results. In the full model, probability of purchase is increased as much as 0.7679 if a user purchased items yesterday. BattleTime and NumOfDeath, indicating utilitarian components, also have positive relationships with purchasing digital item.

NumOfCoWorker, showing the social relationship in the virtual worlds, is not statistically significant in the Model 2 and 3. However, the other social variable, NumOfVisitOthers, is positive on purchasing digital items.

In addition, we also observe the effects of demographic variables, age and gender; as the user is older, the effect to purchase is increasing and female users also tend to purchase items more.

**Table 2. Purchase Analysis**

Variables	Model 1	Model 2	Model 3
Purchase (t-1)	0.7697 (0.0297)***	0.7691 (0.0297)***	0.7679 (0.0297)***
BattleTime (hours) (t)	0.0598 (0.0165)***	-	0.0614 (0.0179)***
NumOfDeath (t)	0.0050 (0.0012)***	-	0.0045 (0.0013)***
NumOfCoWorker (t)	-	0.0002 (0.0001)	-0.0000 (0.0002)
NumOfVisitOthers (t)	-	0.0135 (0.0028)***	0.0079 (0.0031)**
Age	0.0155 (0.0032)***	0.0154 (0.0032)***	0.0153 (0.0032)***
Gender (Female = 1)	0.0890 (0.0373)**	0.0817 (0.0371)**	0.0881 (0.0373)**

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

### *The Effects on Purchasing Functional vs. Decorative Products*

We also analyze purchasing behavior depending on type of items and the results of the analysis are shown in Table 3. Variables, Functional<sub>*i,t-1*</sub> and Decorative<sub>*i,t-1*</sub>, are positive on purchasing both type of products. But, the effects of Functional<sub>*i,t-1*</sub> and Decorative<sub>*i,t-1*</sub> are stronger on one's own variable at *t*.

The utilitarian component, BattleTime, is statistically positive on purchasing functional product at a 0.0748 level of significance, while it is not significant for purchasing decorative products. The other factor of utilitarian, NumOfDeath, is also positive for the functional, but not significant for the decorative item.

Components of social motivation are NumOfCoWorker and NumOfVisitOthers. Interestingly, NumOfCoWorker has the opposite impact on purchasing two types of product. It means that the behavior, co-working, in the purchasing of a functional product, improves the productivity and is considered as a substitute for purchasing a

functional item; the coefficient of purchasing a functional item is negative at the 1 percent significant level, -0.0005. On the other hand, it also shows the human relationship in the virtual world and encourages people to purchase decorative items for better socialization; the coefficient is 0.0007 at the 1 percent significance level. NumOfVisitOthers is positive on decorative good as 0.011, while it is not significant for purchasing a functional good.

**Table 3. Functional and Decorative Purchase Analysis**

Variables	Functional	Decorative
Functional (t-1)	0.7629 (0.0386)***	0.3551 (0.0543)***
Decorative (t-1)	0.5288 (0.0501)***	0.7177 (0.0523)***
BattleTime (hours) (t)	0.0748 (0.0207)***	0.0005 (0.0245)
NumOfDeath (t)	0.0057 (0.0015)***	0.0015 (0.0012)
NumOfCoWorker (t)	-0.0005 (0.0002)**	0.0007 (0.0002)***
NumOfVisitOthers (t)	0.0058 (0.0036)	0.0110 (0.0040)***
Age	0.0104 (0.0038)***	0.0193 (0.0036)***
Gender (Female = 1)	0.0807 (0.0446)*	0.0843 (0.0426)**

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

As a result, all hypotheses are accepted except hypothesis 2b. Users' specific behaviors in a virtual world are related to the purchase of a virtual item and especially to particular types of product.

## Conclusion

In the virtual world, people purchase digital products because of utilitarian and social motivations. To improve the efficiency of the game, users purchase a functional product. In addition, when people develop a social bond in the virtual world, they tend to purchase decorative goods. Moreover, collaboration has a negative relationship with purchasing functional goods since it is considered as substitute for purchasing functional goods. Collaboration as social behavior has a positive impact on purchasing decorative goods.

This paper contributes to both academic and practical fields. Most of all, we empirically analyze our hypotheses with reliable objective secondary data from field transactions to observe purchasing behavior of virtual items in contrast to previous studies which used only survey-based subjective data. We provide new ground of empirical studies about the virtual world and digital products. We apply the theory of consumption values to the virtual world. Moreover, expanding the objective of purchases as decorative and functional goods and analyzing purchasing causes depending on both types are the other academic contribution. Above all things, this paper brings the virtual world into the reality where we can empirically test theories from IS and Economics. Various activities in the virtual world are embodied well in the data set we have from an online game and we can track users' behaviors in detail.

For the business perspective, this paper might be a good strategic guide to game developers who consider how to maximize their profits derived from the virtual products. In addition, it helps to understand users' behavior related with consuming virtual goods. Then, companies can predict a user's purchase in the future from his/her behavior in the virtual world and they can create marketing strategies based on the results. We also see that not only providing valuable content itself but also offering and maintaining the environment for virtual relationships is much more critical, especially for selling decorative goods. Moreover, our results could be applicable to other related businesses like an in-app purchasing method which is the most effective payment system for mobile in these days.

However, this paper has some limitations and restrictions. First of all, we only look at the binary decision of daily purchases and not the monetary value of purchase because the data set does not have the information about the value of purchases. In next study, if the information becomes available, we will be able to analyze the economy of virtual

world in terms of real monetary value. In addition, this data set is game specific and all variables are dependent on the context of the game. So, the generalizability of results from this study may be limited. However, the overall concept is applicable to many cases related to online consumer behaviors and digital contents.

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