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The Effects of Discount Pricing Strategy on Sales of Software-as-a-Service (SaaS): Online Video Game Market Context

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Abstract

A discount pricing strategy is one of the most effective marketing tools to enhance sales of products in various market domains. Although it is also extensively used in the information technology (IT) industry, little prior research has examined its effects in the context of IT products. This research investigated the effects of the discount pricing in the context of the online video game market based on Software-as-a-Service (SaaS). Analyzing a large empirical panel data, this research found that the strategy has a positive effect on the sales of online video games. It also illustrated that discount rate and the amount of a discounted price have positive effects on the sales while the number of the competitors utilizing a discount pricing strategy has a negative effect.

Keywords: SaaS, Online Video Game, Discount Pricing, Panel Data, Price Fairness, Perceived Value, Utility Theory, Competition Theory

1. INTRODUCTION

Cloud computing refers to the IT-related services offered through the Internet. It includes the services for networks, servers, storage, and applications (Mell et al. 2011), and infrastructures that provide these services (Armbrust et al. 2010). Due to its effectiveness and convenience, the cloud computing services are extensively adopted in various business domains. A recent survey for IT professionals reported that 95% of the organizations are currently relying on cloud computing services for their business (RightScale 2016). According to Gartner Inc., a research group specialized in IT, and Forbes (2016), while the global market revenue of cloud computing was $58.6 billion in 2009, it reached $175 billion in 2015, recording approximately 300% growth for the last six years.

Cloud computing services can be categorized into three service models by the capability allowed to

users: Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS) (Mell et al. 2011). IaaS provides the highest level of control on the infrastructure to the users. It offers the capability to control the infrastructure including storage, networks, and other underlying computing resources. PaaS offers users the capability to build, manage, and refine the applications in the datacenters of the providers while not offering access for changing the infrastructure. The users of SaaS have the least level of control on the cloud computing infrastructures. They simply have a capability to access to applications of the service providers via a thin client interface.

Among the three cloud computing services, SaaS is the most widely used, and as such is driving the overall growth of the industry. In 2015, approximately 61% of the cloud computing industry revenue was generated from SaaS products such as human capital management, emailing, web conferencing, and web documenting services (Technology Business Research 2015).

The video game industry is one of the IT domains that actively adopt SaaS due to its capability to provide interactions among users and to update game contents. For example, a large portion of mobile game apps based on SaaS allow the users to access to the servers of game service providers via thin clients on mobile devices (Lowthorpe et al. 2013). Conventional console and PC video game markets are also moving from tangible software packages (e.g., CD) to SaaS. As an example, most game software distributed at Steam.com, which generated approximately 15% of the PC video game industry revenue in 2014, are operated through SaaS (Vellanki 2016).

Discount pricing is one of the most commonly employed marketing strategies for increasing product sales (Chen et al. 2012; Dawson et al. 2009; Sheng et al. 2007; Yin et al. 2014). In the literature, it has been an extensively investigated topic in various product domains such as apparel (Alford et al. 2002), food (Mishra et al. 2011), electronics (Della Bitta et al. 1981; Sheng et al. 2007), and automobiles (Goldberg 1996). These studies reported that discount pricing has a positive impact on the sales by affecting the consumer's value perception of the products (Alford et al. 2002; Della Bitta et al. 1981), intention to purchase and purchase incidence (Mishra et al. 2011), and net profit of the product (Lee et al. 1986; Monahan 1984).

Although the effect of discount pricing on sales has been examined in various domains, few studies investigated in the context of the SaaS industry, particularly the online video game domain. Additionally, the prior studies mainly adopted survey methods in a controlled experimental setting (Alford et al. 2002; Mishra et al. 2011; Sheng et al. 2007) or analytical modeling (Lee et al. 1986; Monahan 1984), which could not test its actual impact on sales.

In order to fill the above gap in the extant literature, this study investigates the effects of discount pricing on sales of SaaS products in the context of the online video game industry. Adopting a large panel data including 188,546 observations of 5,867 online video games, particularly, it attempts to address the following questions; (1) *"Is discount pricing effective in increasing sales of SaaS products?"*, (2) *"Does a higher level of discount rate and the amount of a discounted price induce more sales?"*, and (3) *"As more competitors offer their SaaS products at discounted prices, does the effect of discount pricing decrease?".*

The rest of this paper is organized as follows; the literature review section discusses the literature concerning discount pricing and cloud computing. The hypothesis development introduces theories and proposes a set of hypotheses to address the major question of this study. The hypothesis test section describes the data source, empirical models, and analysis results. The discussion and conclusions section discusses the major findings of this study. Lastly, the limitations and contribution section discusses the limitations of this research and contributions to both academia and field practitioners.

2. LITERATURE REVIEW

The purpose of this research is to investigate the effects of discount pricing on the sales of a cloud computing service, SaaS. Therefore, the extant studies on discount pricing and cloud computing are discussed in this section.

Research on Impact of Discount Pricing

The primary focus of the prior studies on discount pricing is the impact of the discount on the perceived value of the product and the buying intention, employing an experimental method or an analytical modeling approach. They indicated that a higher level of price discount rate induces a higher value perception on a certain product and a higher buying intention (Alford et al. 2002; Della Bitta et al. 1981; Nusair et al. 2010). They

also reported that the impact can differ by product type (Mishra et al. 2011), whether bundled with multiple products (Sheng et al. 2007), demographics such as gender, age, and ethnicity (Goldberg 1996), initial price before discount (Coulter et al. 2007), and the level of discount rate (Coulter et al. 2007; Lee et al. 1986; Monahan 1984). However, the contexts of these studies were conventional, tangible product domains, which are different from IT services such as SaaS. Although Ghose and Han (2014) studied the impact of discount pricing on sales of mobile apps, little research investigated it in the context of the SaaS market.

Research on Cloud Computing

The major stream on cloud computing study is the conceptual discussions on a new technology, cloud computing (Armbrust et al. 2010; Buyya et al. 2009; Mell et al. 2011; Qian et al. 2009; Vouk 2008; Weinhardt et al. 2009). These studies introduced novel concepts, systems structures, stakeholders, and potential topics for cloud computing research. In the computer engineering discipline, many studies focused on the technical aspects of cloud computing. They introduced technologies for cloud computing (Ekanayake et al. 2009; Foster et al. 2008; Marinos et al. 2009; Yan et al. 2009; Zhang et al. 2010) and examined their technical performance (Calheiros et al. 2011; Jackson et al. 2010; Ostermann et al. 2009; Yu et al. 2010). In the management information systems discipline, researchers studied the perception of business practitioners on cloud computing (Leavitt 2009; Marston et al. 2011; Pearson et al. 2009), its adoption in business (Behrend et al. 2011; Ercan 2010; Kim 2011; Low et al. 2011; Sultan 2010), and its privacy and security issues (Kaufman 2009; Li et al. 2009; Subashini et al. 2011; Takabi et al. 2010). However, few studies tested the impact of discount pricing on the sales of cloud computing services.

In summary, although numerous studies in multiple disciplines investigated discount pricing and cloud computing, few covered the effects of discount pricing on the sales of cloud computing products or services. Therefore, the results of this study would provide the clarification of the relationship between discount pricing and the sales of cloud computing service, particularly SaaS based video games.

3. HYPOTHESIS DEVELOPMENT

In order to address the aforementioned research purposes, this section introduces specific hypotheses developed on the basis of the theoretical foundations adopted in the prior studies concerning discount pricing such as price fairness, perceived value, utility theory, and competition theory.

Discount Pricing and Sales of SaaS

Prior studies illustrated the effectiveness of discount pricing to increase sales (Chen et al. 2012; Dawson et al. 2009). In the digital marketplaces where SaaS products are distributed, discount pricing is known to enhance the purchase intention of online shoppers (Chevalier et al. 2003; Earl et al. 2000; To et al. 2007) as well as increasing the actual sales of the products (Ghose et al. 2014). They explained the effectiveness with two theoretical viewpoints: price fairness evaluation and utilitarian motivation of consumers.

In the evaluation of fairness of product price, consumers may use two types of price: perceived price and internal reference price (Sheng et al. 2007). Perceived price refers to the price recognized by a consumer, which is generally a listed price of a product, while internal reference price means a price which plays as a scale to evaluate the appropriateness of the perceived price. If the perceived price is lower than the internal reference price, consumers believe it is inexpensive (Kalyanaram et al. 1995; Maxwell 2002). Discount pricing can directly decrease the perceived price so that reduce its distance from the internal reference price. Therefore, consumers are more willing to buy a product when it is offered at a discounted price. In addition, it can indirectly affect the internal reference price. Consumers would perceive a product at a regular price more expensive than a product at a discounted price due to their decreased internal reference price. In both scenarios, discount pricing can provide products a higher chance to be chosen by consumers.

Another standpoint for the effectiveness of discount pricing is a utilitarian motivation of consumers, which is a critical determinant of intention to purchase. Utilitarian motivation refers to a tendency to seek for a rational, efficient, and goal driven decision to complete a task (Batra et al. 1991; Hirschman et al. 1982). Therefore, consumers with the motivation are more likely to purchase a desired product when it is offered at a discounted price because they can satisfy their need at a lower cost.

The discussion above predicts that consumers of SaaS products are more likely to purchase the

service offered at discounted prices and consequently, such products would have higher sales. Therefore, the following hypothesis is suggested;

H1: Discount pricing has a positive effect on the sales of a SaaS product.

Discount Rate and Sales of SaaS

Discount rate is a critical factor to drive the purchase decision of consumers (Chen et al. 1998; Coulter et al. 2007; Heath et al. 1995) by closely addressing the gap between the perceived price and the internal reference price of a desired product. For instance, when the internal reference price of a consumer is $100 for a SaaS product and its initial price (i.e., the perceived price) is $150, 30% discount reduces the difference from the internal reference price more than 10% discount does. As a result, the product would be more likely to be purchased when offered at 30% discount than 10% discount. In terms of utilitarian motivation, likewise, a higher discount rate would encourage the consumer to purchase it more than a lower rate since it allows the consumer to attain benefits from the product at a lower cost.

For the aforementioned reasons, the consumers of SaaS products would perceive a desired product more attractive when it has a higher discount rate. Particularly, given that the SaaS market is a highly competitive domain where multiple vendors provide similar products (Murphy 2015), a high discount rate should be a critical factor to encourage consumers to purchase and to increase the sales of a SaaS products. Thus, the following hypothesis is proposed;

H2: Price discount rate has a positive effect on the sales increase of a SaaS product.

Discounted Price and Sales of SaaS

Another important dimension of discount pricing is the amount of a discounted price, which is an actual saving in the perspective of consumers. The amount is known to generate more interest from potential consumers by increasing the perceived value of the product (Della Bitta et al. 1981). As well as increasing the purchase intention of potential customers, the discounted price stimulates market demands on the product. Prior research concerning the impact of price discounts on supply and demand illustrated that the amount of discounted price has a proportional relationship with the quantity of the product ordered (Hui-Ming et al. 1997; Lee et al. 1986) and overall sales volume (Raju 1992).

The price range of SaaS products varies, from free to higher than $7,000. In the dataset employed in this study, it ranges from $0.5 to $199. Therefore, the impact of discount rate highly differs by its initial price. For example, the saving from 20% discount on a SaaS product at $0.5 is simply $0.1 while it is $1,400 for a SaaS product at $7,000. Therefore, SaaS consumers should consider the amount of discounted price when making their purchase decision. They will be more likely to purchase a SaaS product when its discounted price is larger and therefore, the sales of the product would increase. This discussion introduces the following hypothesis;

H3: The amount of discounted price has a positive effect on the sales of a SaaS product.

Number of Competitors Offering Price Discounts and Sales of SaaS

Competitive intensity refers to the degree of competition in a product category. It should be considered in estimating the impact of price discounts on sales, particularly for the highly competitive SaaS market. It generally has a negative relationship with potential sales increase (Raju 1992), suggesting that if there are more competitors, it is more difficult to achieve sales increase. The effects of discount pricing would be subject to the competitive intensity. As more competitors offer their products at discounted prices, consumers would perceive the discount promotion less attractive and consequently, each product will have less chances to increase its sales (Kopalle et al. 1999).

In the SaaS market, consumers can easily find multiple products offered at discounted prices at their point of purchase such as Amazon Web Services and Microsoft Azure. Similar to consumers in conventional markets, they would perceive discount pricing less attractive as more discounted products are available. Therefore, the following hypothesis shown in Figure 1 is suggested:

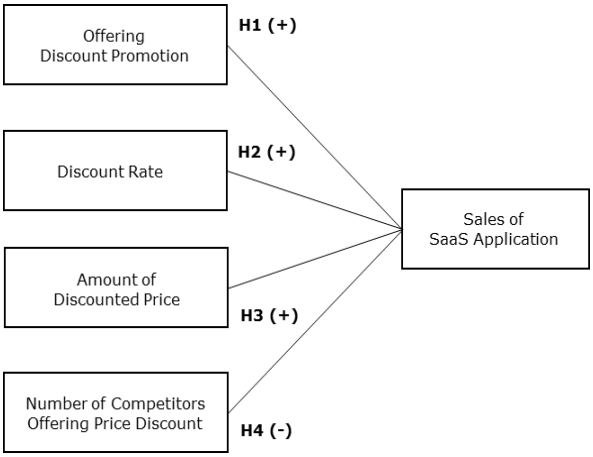

Figure 1: Research Model

Figure 1 illustrates the research model to summarize the hypotheses proposed.

H4: The number of current SaaS products offered at discounted prices has a negative effect on the sales of a SaaS product.

4. HYPOTHESIS TEST

Dataset

The data for this research were collected from two sources: steamspy.com and steamdb.info. Steamspy.com provides a sales tracking service for online video games served by Steam, which is the world largest online video game service provider based on SaaS. The number of active user accounts is almost 40 million, which accounts for more than 50% of downloadable PC games (Chiang 2011; Mudgal 2012; Reinhardt 2012). Steamspy.com has various data including daily sales, total number of owners, price, active players, and average playtime. Although the data are collected by a sampling approach using approximately 100,000 to 150,000 user accounts per day, they are known to be highly accurate within a 0.33% error margin (Gilbert 2015; Orland 2015). The data concerning discount rate and discounted price were collected from steamdb.info offering various information about video games. The data adopted in this study were collected daily for four months, from November 13 2015 to March 11 2016. The dataset includes 188,546 observations of 5,867 online video games based on SaaS platforms.

Empirical Models

Two econometric models are developed to examine the proposed hypotheses. The variables used in the models are $DailySales_{i,t}$, $DiscountDummy_{i,t}$, $Price_{i,t}$, $UserScore_{i,t}$, $Owners_{i,t}$, $DiscountRate_{i,t}$, $DiscountedPrice_{i,t}$, and $TotalPromotions_t$. Table 1 illustrates the definitions of these variables.

Model 1 tests Hypothesis 1, testing the difference in sales between SaaS products offered at discounted prices and those at original prices. The dependent variable of Model 1 is $DailySales_{i,t}$, while its independent is $DiscountDummy_{i,t}$. It also includes three control variables, $Price_{i,t}$, $UserScore_{i,t}$, and $Owners_{i,t}$

Model 1

$$DailySales_{i,t} = a_0 + a_1 DiscountDummy_{i,t} + a_2 Price_{i,t} + a_3 UserScore_{i,t} + a_4 Owners_{i,t} + \varepsilon_{i,t}$$

Variables	Definitions
$DailySales_{i,t}$	Daily sales volume of a SaaS based video game *i* at time point *t*
$Discount\ Dummy_{i,t}$	Whether a SaaS based video game *i* at time *t* at a discounted price (c.f., discounted price =1, original price=0)
$Price_{i,t}$	Actual price listed of a SaaS based video game *i* at time *t*
$UserScore_{i,t}$	The average score of consumer evaluation on a SaaS based video game *i* at time *t*
$Owners_{i,t}$	The total number of owners of a SaaS based video game *i* at time *t*
$Discount\ Rate_{i,t}$	The percentage of price discount applied to a SaaS based video game *i* at time *t*
$Discounted\ Price_{i,t}$	The amount of price discounted for a SaaS based video game *i* at time *t*
$Total\ Promotions_t$	The total number of SaaS based video games offered at discounted prices at time *t*

Table 1: Variable Definitions

Model 2 tests Hypotheses 2, 3, and 4 to examine the impact of discount pricing. While the dependent is $DailySales_{i,t}$, the independents are $DiscountRate_{i,t}$ (H2), $DiscountedPrice_{i,t}$ (H3), and $TotalPromotions_{i,t}$ (H4). It includes $UserScore_{i,t}$ and $Owners_{i,t}$ as control variables.

Model 2

$$DailySales_i = \beta_0 + \beta_1 DiscountRate_{i,t} + \beta_2 DiscountedPrice_{i,t} + \beta_3 TotalPromotions_t + \beta_4 UserScore_{i,t} + \beta_5 Owners_{i,t} + \varepsilon_{i,t}$$

Analysis Results

OLS (Ordinary Least Squares) estimation is initially adopted to test the proposed hypotheses. However, Breusch-Pagan test and Durbin-Watson test indicated heteroscedasticity and serial correlation in the models. This is understandable since the dataset adopted in the analysis is a panel dataset, highly subject to the violation of OLS assumptions. Therefore, GLS (General Least Squares) estimation and OLS with robust standard errors (a.k.a., robust OLS) are conducted to address these issues (Freedman 2012).

The analysis results of Model 1 are illustrated in Table 2, including R-squared, coefficients, and P-values. R-Squared of OLS and robust OLS is 0.3203, indicating that 32.03% of total variance of $DailySales_{i,t}$ is explained by the independent variables of Model 1. The results are consistent in the OLS, GLS, and OLS with robust standard errors. The coefficient for $DiscountDummy_{i,t}$ (α_1) testing Hypothesis 1 is positive and significant at the 1% level. This indicates that a SaaS product tends to have higher sales when offered at a discounted price. Therefore, Hypothesis 1 is supported.

Dependent : *DailySales*	**OLS**	**GLS**	**Robust OLS**
R-Squared	0.3203	-	0.3203
Constant	1056.88**	1056.88**	1056.88**
Discount Dummy	144.66**	144.66**	144.66**
Price (control)	37.81**	37.81**	37.81**
UserScore (control)	2191.62**	2191.62**	2191.62**
Owners (control)	0.0025**	0.0025**	0.0025**

*p < 5%, ** p < 1%

Table 2: Analysis Results of Model 1

Table 3 shows the analysis results of Model 2, testing Hypotheses 2, 3, and 4. R-squared of the OLS and robust OLS of Model 2 is approximately 0.43, indicating that the independents explain 43% of total variance of $DailySales_{i,t}$. The overall hypothesis test results remain constant in OLS, GLS, and Robust OLS. For Hypothesis 2, the coefficient for $DiscountRate_{i,t}$ (β_1) is positive and significant at the 5% level. It suggests that a higher discount rate for a SaaS application has a positive impact on its sales increase, supporting Hypothesis 2. Testing Hypothesis 3, the coefficient for $DiscountedPrice_{i,t}$ (β_2) is positive and significant at the 1% level, indicating a positive relationship between the amount of discounted price and the sales of a SaaS product. It suggests that as the difference between original price and discounted price is larger, its sales tends to increase. This supports Hypothesis 3.

With regard to Hypothesis 4, testing the relationship between the number of competitors offered at discounted prices and sales of a SaaS product, the coefficient for *TotalPromotions* (β_3) is negative and significant at the 1% level. It suggests that as more SaaS products at discounted prices are available for consumers, each SaaS product tends to have lower sales. Therefore, Hypothesis 4 is supported.

Dependent : *DailySales*	**OLS**	**GLS**	**Robust OLS**
R-Squared	0.4296	-	0.4298
Constant	1018.5**	1018.05**	1018.05**
Discount Rate	558.38*	558.38*	558.38*
Discounted Price	12.55**	12.55**	12.55**
Total Promotions	-0.074**	-0.074**	-0.074**
UserScore (control)	25.28**	25.28**	25.28**
Owners (control)	0.0032**	0.0032**	0.0032**

*p < 5%, ** p < 1%

Table 3: Analysis Results of Model 2

Figure 2 summarizes the analysis results of the above hypothesis test.

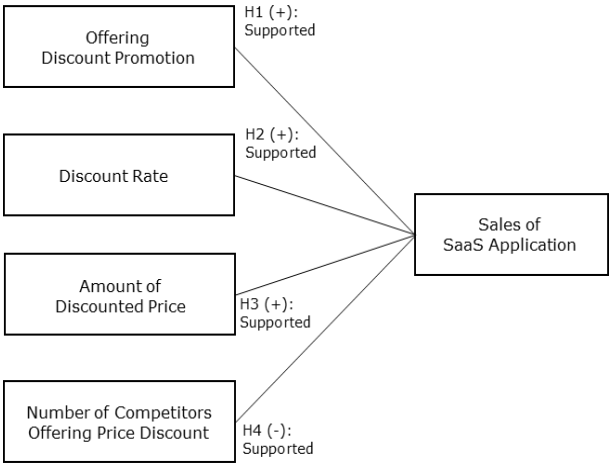

Figure 2: Hypothesis Test Results

5. DISCUSSION AND CONCLUSION

This research investigated the impact of price discounts on the sales of SaaS products in the context of the online video game market. Specifically, it examined the effects of discount rate and discounted price, as well as the number of the competitors offered at discounted prices. The hypothesis test results concerning these factors suggest the following findings.

First, support for Hypothesis 1 shows that SaaS products offered at discount prices tend to have higher sales than those at non-discounted prices. This result is consistent with the findings of the extant literature based on the theories of price fairness evaluation and utilitarian motivation. This also implies that consumers in the SaaS market have a similar consumer behavior with those in conventional market sectors. This also suggests that discount pricing would be an effective strategy to increase sales in the SaaS market. Therefore, practitioners in the domain may consider the strategy to increase the sales of their products.

Concerning the level of price discounts, both discount rate and the amount of discounted price are found to have a positive impact on the sales of SaaS products. Support for Hypothesis 2 indicates that discount rate has a positive relationship with SaaS application sales. Support for Hypothesis 3 implies that the amount of discounted price has a positive relationship with the sales. As well as discount rate, therefore, the amount of discounted price plays an important role in increasing sales of SaaS products. Practitioners in the market need to consider both promotional factors, therefore, when planning their discount pricing strategies.

Support for Hypothesis 4 suggest that the number of competitors offering price discounts has a negative relationship with the sales of SaaS products. Therefore, as the number of the products offered at discounted prices increases, the sales of each product would decrease. This finding provides a meaningful implication to practitioners who consider at what time they should offer a price discount. Discount pricing would be more effective when less competitors are using the same strategy than when more are.

6. LIMITATIONS AND FUTURE RESEARCH

Although this is one of first empirical studies to investigate the impact of discount pricing in the SaaS domain, there are several limitations, particularly with regard to the data used. This study adopted a dataset for online video games based on SaaS. Although they are a type of SaaS, they are categorized into hedonic products, consumed for entertainment and enjoyment. However, the typical SaaS products are used for practical purposes, such as conferencing, and web documenting services, and emailing. Therefore, the analysis results of this study concerning the impact of discount pricing may not be applicable to the other SaaS product types. Testing Hypothesis 4, this study did not distinguish direct and indirect competitors in its analysis. For instance, a video game in RPG (Role Playing Game) genre would not directly compete with those in different genres, nor significantly related to the sales of the other genres of video games. However, they were not separated in the analysis and therefore, the result may be different if estimated with more thoroughly categorized data. Finally, the dataset includes the sales for only four months. Future research may adopt a more comprehensive, large dataset that can provide more generalizable findings and implications from the analysis.

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