

(TEMP) Online Video Game Monetization Schemes and Its Relationship to the Consumers*

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Abstract

Advertisement and monetization schemes are essential to obtaining a stable revenue stream and ensuring the continued survival of an online video game. We obtain data through a survey distributed in several online communities for the massively multiplayer online game known as Black Desert Online and analyze it through several graphs, tables, and a model in this paper. (TODO) Sentence about findings. (TODO) Sentence about implications. (TODO) Keywords:

1 Introduction

Just a decade or two ago, singleplayer-driven content was the predominant focus in the video game industry. This was mostly a product of the time, as the infrastructures needed to support online-based video games were yet to be fully developed. More importantly, what this also meant was a lack of post-launch updates being delivered for a game, as developers also lacked means to deliver constant updates effectively into the hands of the consumers. As a result, most video games received little to no post-launch updates aside from one or two major expansions to their games that contained sufficient content to be put on the shelves as add-ons to the original purchase. Despite this, consumers back then were generally content with the amount of content they received for their purchases.

As the years went by and networking structures matured, however, more and more video game developers started focusing more on the online aspects of gaming. The number of multiplayer-focused video games in the market started to steadily increase. Now, in an era of live service online video games, developers are pressured to continuously produce and deliver new and exciting content on a consistent schedule in order to compete with other products. This need to create more content for a game means that development resources are constantly required, and online focused games can no longer afford to charge their consumers a simple upfront fee; live service video games must find an effective and profitable monetization scheme in order to fund their continued development.

The most prominent examples of live service online video games are the massively multiplayer online role-playing games (MMORPG), a genre of video games known specifically for its focus on multiplayer. Due to their focus on progression-based gameplay, developers of MMORPGs must constantly create new and refreshing content to add to their games. To subsidize the development costs that go along with it, developers have created a variety of monetization models to ensure a steady revenue stream. For example, World of Warcraft, one of the biggest MMORPGs, relies primarily on a monthly subscription from its players. Others, such as Lost Ark, adopt a mix of strategies with a monthly subscription that grants massive boosts in-game and an in-game cash shop that allows players to purchase items for a variety of purposes using real world currencies. If done properly, an analysis on the monetization schemes of MMORPGs could have meaningful

*Code and data are available at: https://github.com/zhan7818/bdo_monetization

implications for future MMORPG developers on how they should monetize their video games to maximize revenue.

This paper primarily focuses on the MMORPG known as Black Desert Online, commonly and henceforth referred to as BDO. as it is MMORPG that utilizes a of mix of upfront cost, subscription and in-game cash shop. Pearl Abyss, the developers behind Black Desert Online, never published any official statistics that touch upon the revenue of Black Desert Online. As such, the following analysis will rely on data collected by the author of this paper.

The remainder of this paper is organized as follows: Section 2 covers the survey design, sampling and preliminary analyses of the dataset used in this paper. Section 3 details the model used to find possible correlations between variables in the dataset, the results and implications of which will be covered in Section 4. Any limitations or possible extensions of this paper will be discussed in Section 5.

All tables and graphs presented in this paper are produced using the statistical programming language R (R Core Team 2020). The `knitr` (Xie 2021) and `kableExtra` (Zhu 2021) packages are used for tables, and the `ggplot` (Wickham 2016) package is used for graphs.

TODO: add in some references that support claims about general transition from singleplayer to multiplayer in video game industry.

2 Data

2.1 Survey Design

Due to the lack of APIs provided by Pearl Abyss that concerns the subject of this paper, convenience sampling is used to collect data from the general playerbase for the game. The survey is created in Google Forms and is distributed to Black Desert Online players on Steam discussion, Black Desert Online forum board, and the Black Desert Online subreddit on Reddit. The survey consists of questions mostly regarding the respondents' amount of spending in the various monetization models employed by Black Desert Online, as well as some general background information regarding each respondent and their in-game characters. The survey questions could be largely divided into the following set of topics:

- Background characteristics such as age, gender and playtime
- Upfront spending for the game such as the purchase of game packages
- Spending for in-game subscription-esque items using either in-game or real world currencies
- Opinion on in-game subscription-esque items
- Spending for other general cash shop items in-game using either in-game or real world currencies

In the post containing the survey on each of the distributed sites mentioned above, efforts were made to be as transparent as possible with the participants: respondents were informed of the intended usage for the data collected and were assured that no information that can be used to identify them will be collected nor included in the survey and final paper.

2.2 Dataset Cleaning and Description

A total of 212 responses were collected from the survey. The data was exported to excel (Microsoft Corporation 2022-03-30) where the columns names were shortened to be readable. Two new columns were created from the responses: `* packages_usd`: amount in USD spent on purchasing game packages `* packages_free`: binary indicator of whether the respondent received the game for free

The dataset is then cleaned using the statistical programming language R (R Core Team 2020) and the `janitor` (Firke 2021) and `dplyr` (Wickham et al. 2022) package. The `pointblank` (Iannone and Vargas

2022) package is used to set up validation tests for the class and the content of the dataset. A new variable, `age_group`, is constructed based on the ages of the respondents. The final dataset consists of the following variables:

- `age`: age of the respondent
- `age_group`: age group of the respondent
- `gender`: gender of the respondent; male, female or other
- `character_total`: respondent's total number of characters in Black Desert Online
- `character_female`: respondent's total number of female characters in Black Desert Online, excluding the character classes Tamer and Shai
- `playtime_total`: respondent's total playtime in Black Desert Online
- `playtime_main`: respondent's playtime on their primary character in Black Desert Online
- `gender_main`: gender of respondent's main character; male or female
- `packages`: the game packages purchased by the respondent
- `packages_usd`: the amount in USD spent purchasing game packages by the respondent
- `package_free`: binary indicator of whether the respondent received the game for free
- `importance_vp`: respondent's rating on the importance of Value Pack to their enjoyment of the game
- `importance_bkom`: respondent's rating on the importance of Blessing of Kamasyrve and Secret Book of Old Moon to their enjoyment of the game
- `cm_vp_count`: number of Value Packs purchased on the central market by the respondent
- `cm_bkom_count`: number of Blessing of Kamasyrve and Secret Book of Old Moon purchased on the central market by the respondent
- `ps_vp_usd`: amount in USD spent by the respondent purchasing Value Packs in the pearl shop
- `ps_bkom_usd`: amount in USD spent by the respondent purchasing Blessings of Kamasyrve and Secret Books of Old Moon in the pearl shop
- `cm_outfits`: number of outfits purchased on the central market by the respondent
- `ps_cosmetic_usd`: amount in USD spent by the respondent purchasing cosmetic items in the pearl shop
- `ps_functional_usd`: amount in USD spent by the respondent purchasing functional items in the pearl shop

Typically, players in Black Desert Online will consider one character as their primary character and spend considerably more time on that character than their other characters. As such, playtime for the main character and total playtime were surveyed separately.

There are two methods to purchase premium items in this game: through the **central market** or through the **pearl shop**. Pearl shop is BDO's cash shop, accessible to every player, where players could use **pearls**, a currency converted from real world currencies, to purchase premium items for cosmetic and functional purposes. Furthermore, players who purchased premium items in the pearl shop could list these items onto the central market for sale. Other players could then use **silver**, the primary in-game currency, to purchase the said premium items. This system serves as a way for some players to obtain more silver using real world currencies, and for other players to obtain premium items without ever spending any real world currencies to do so.

There are 3 subscription-esque items in the game: **Value Pack**, **Blessing of Kamasyrve**, and **Secret Book of Old Moon**, henceforth referred to as **VP**, **BK**, and **OM**. VP existed as an item since the launch of BDO, and BK and OM were introduced later on. Each of these 3 items offer unique bonuses and to players such as shortcuts and quality of life buffs to certain in-game systems to make them easier to use. Typically, VPs can be purchased for 30 days, 60 days, and 90 days, and BKs and OMs can be purchased for 15 days (exceptions occur in bundles and/or event sales including the said items). Because of this, these 3 items are usually bought once or twice per month so that a player can consistently maintain the buffs they provide. As such, they could be reasonably considered as a pseudo-subscription model employed by BDO.

Outside of the 3 subscription items, there are other premium items offered in the pearl shop, some of which are permanent while others are consumables. These items can be mostly categorized into two types: cosmetic

Table 1: Summary of Average Playtime and Spending in Upfront and Cash Shop Categories in Black Desert Online

Age Group	Gender	Has Free Package	Average Spending (USD)		Avg Playtime (hrs)
			Pearl Shop	Game Packages	
13-22	Female	0	521.7	45.0	3262.7
13-22	Female	1	183.3	0.0	2883.3
13-22	Male	0	987.5	74.8	5374.3
13-22	Male	1	162.0	8.7	2411.1
23-32	Female	0	1798.3	83.3	6802.2
23-32	Female	1	420.0	70.0	15000.0
23-32	Male	0	2182.3	91.7	11258.5
23-32	Male	1	745.4	47.0	5623.9
33-42	Female	0	1437.5	127.5	9400.0
33-42	Female	1	400.0	80.0	2482.0
33-42	Male	0	1973.0	73.0	19018.1
33-42	Male	1	450.0	0.0	10000.0
43-52	Female	0	1750.0	160.0	1250.0
53-62	Female	1	100.0	0.0	1500.0
53-62	Male	0	278.5	30.0	8500.0
63+	Male	1	430.0	0.0	19990.0

(e.g., character outfits, home furnitures, dyes, etc) and functional (e.g., camping tent, energy potions, pets, etc). Most of the cosmetic items can be listed on the central market just like the subscription items, but functional items are generally only purchasable through the pearl shop.

2.3 Preliminary Analysis

Table 1 showcases a summary of the average spending of the respondents, categorized into age groups, gender, and whether the respondent obtained the free package for the game, in USD. Pearl Abyss, the developer and publisher of BDO, frequently employs events and/or utilize collaborations with other companies (e.g., twitch prime, anniversary event, etc) to hand out free packages for the game, which simply allows a player access to the game but grants no other benefits or items (Other package tiers grant players various items and benefits).

Already, we observe that there is a noticeably higher average for spending in the pearl shop compared to upfront package purchases. Note that this difference could be potentially misleading; The large majority of players do not spend much money in the pearl shop, and the exceedingly high average pearl shop spending is inflated by a select few players who have invested massive amounts of real world currency into the game. This issue is further elaborated upon in Section 5.

Due to having a variety of ways for consumers to spend real world currencies in BDO, a considerable variation of money spent on the game is expected for respondents of the survey. This is demonstrated in Figure ??, where we can see that the majority of respondents spend less than \$1000 USD in the pearl shop, but there are also quite a few respondents that fall outside of that range by a substantial amount. Note that it is unwise to simply categorize these responses as simple outliers and exclude them from the dataset, as we must consider the phenomenon of “whales.” This idea is also further explored in Section 5.

Figure 2 plots the rated importance of VP, and BK and OM. We can observe that there is a considerable number of respondents who consider VP as extremely critical to their enjoyment of the game. At the same time, we can see a large number of respondents consider BK and OM largely unimportant to their enjoyment of the game. This shows that subscription-esque items are not universally regarded as equally valuable by the respondents.

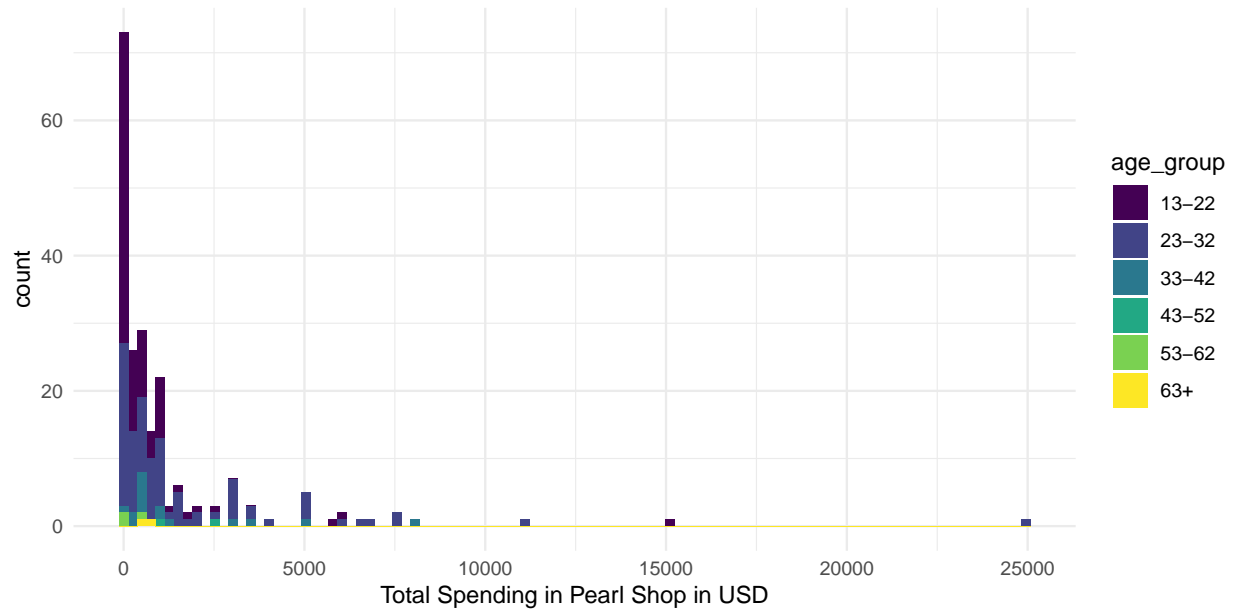


Figure 1: Spending in Pearl Shop in USD

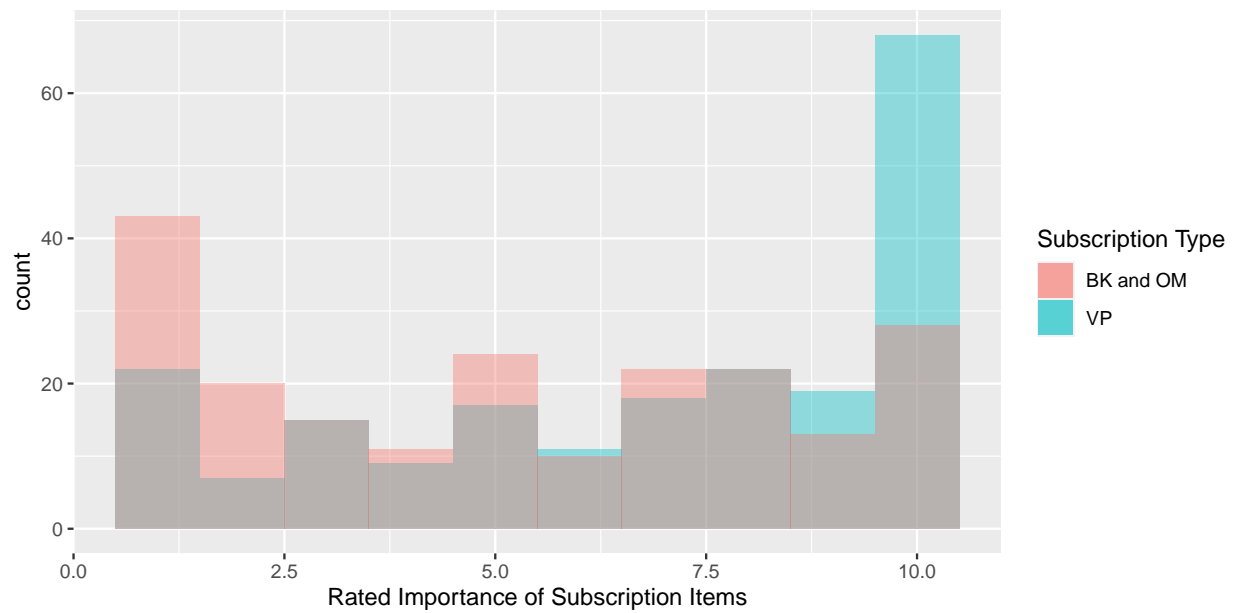


Figure 2: Rated Importance of Value Pack, and Blessing of Kamasylve and Secret Book of Old Moon

2.3.1 Supply and Demand

An important aspect of the central market in BDO is the issue of supply and demand: Despite being able to list most cosmetic items onto the central market, there is generally always more demand for these cosmetic items than the supply. To combat the issue of price inflation, most items that can be listed on the central market in BDO—including value packs—have a price ceiling as dictated by the developers of the game. When that price ceiling is reached (i.e., the highest pre-order price placed for the item is the maximum price point), any further listings of the item will instead **randomly** choose a player with a max-priced pre-order placed and sell the item to the said player.

Because of the mechanic described above, an item pre-ordered at its price ceiling does not follow a first-come first-serve basis and the central market instead relies on randomness to decide which player to sell the item to. This means for items with drastically higher demand than supply (such as a value pack), players are never guaranteed to obtain the item, regardless of how long they have placed the pre-order for the said item already. This often leads to cases where a player could place a pre-order for an item for an extensive period of time (months or years) yet never successfully purchases the item from the central market.

Figure 1 showcases this issue: For respondents who claimed that having a VP active is crucial to their enjoyment of the game, only a few reported having consistent success purchasing VPs from the central market. Because of this, respondents could be pressured into relying more on purchasing VPs through the pearl shop.

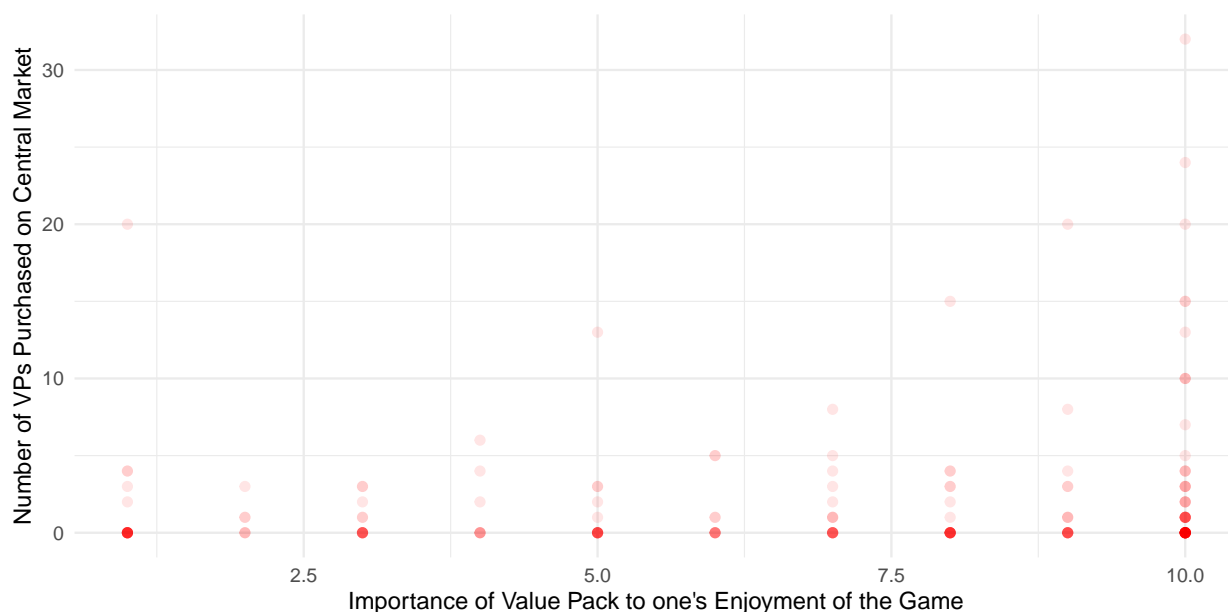


Figure 3: Rated Importance of Value Pack Versus Number of Value Packs Purchased on Central Market

This line of thinking is echoed by the observations in Table 4, where the vast majority of respondents report spending a considerable amount of real world currencies on purchasing VPs through the pearl shop. For reference, a 30-day value pack in the pearl shop costs 1500 pearls (the equivalent of \$15.00 USD).

2.3.2 Gender of players and Characters

Gender-based appeal is a deep-rooted design pattern in most Korean MMOs. (FIND SOME SOURCE FOR THIS SHIT) Most cosmetic options are designed to appeal to the general playerbase and often forfeits any semblance of practicality. This issue is very apparent in female armor designs in Korean MMOs, and Black

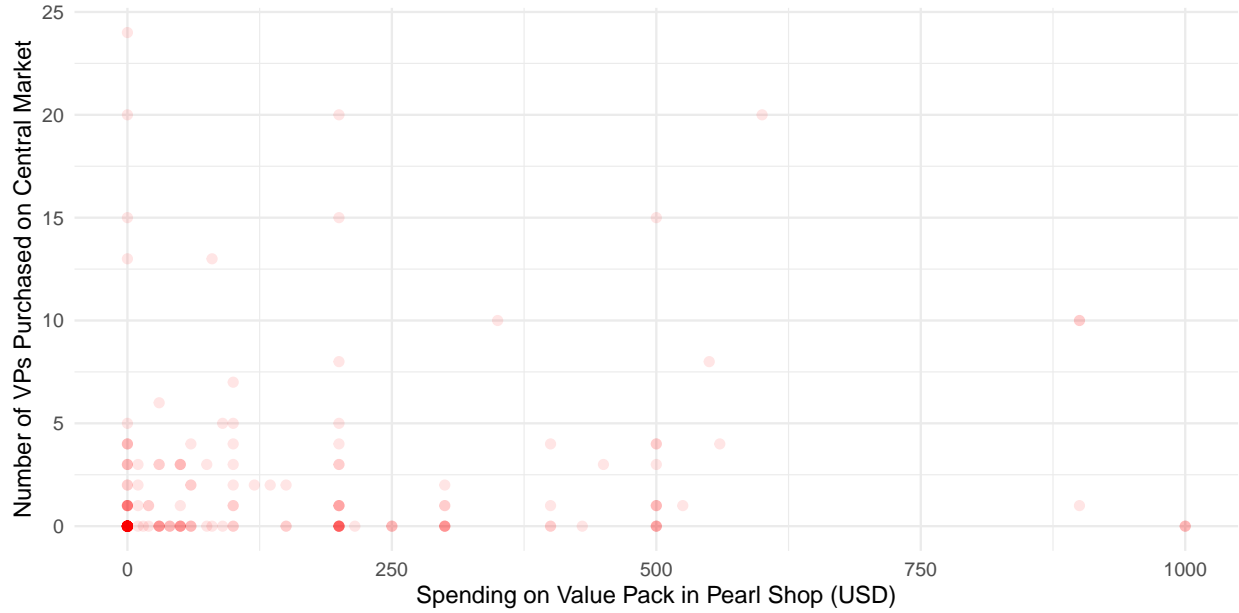


Figure 4: Spending on VPs in Pearl Shop Versus Number of VPs Purchased on Central Market

Desert Online is generally not an exception to this. There are 13 adult female characters in BDO and 9 adult male characters. To see if these appeal-based design decisions truly have any merit behind them, data was collected on the number of adult female characters that each respondent has. The intent is to compare it with their spending in cosmetic items, as briefly demonstrated in Figure 5.

It can be observed in Figure 6 that there are more respondents whose main character in BDO is female than male at all age groups. This statistic may not be surprising, given that male respondents similarly dominate all age groups, as shown in Figure 7. Nevertheless, this may grant some insight into the targeted audience of Black Desert Online.

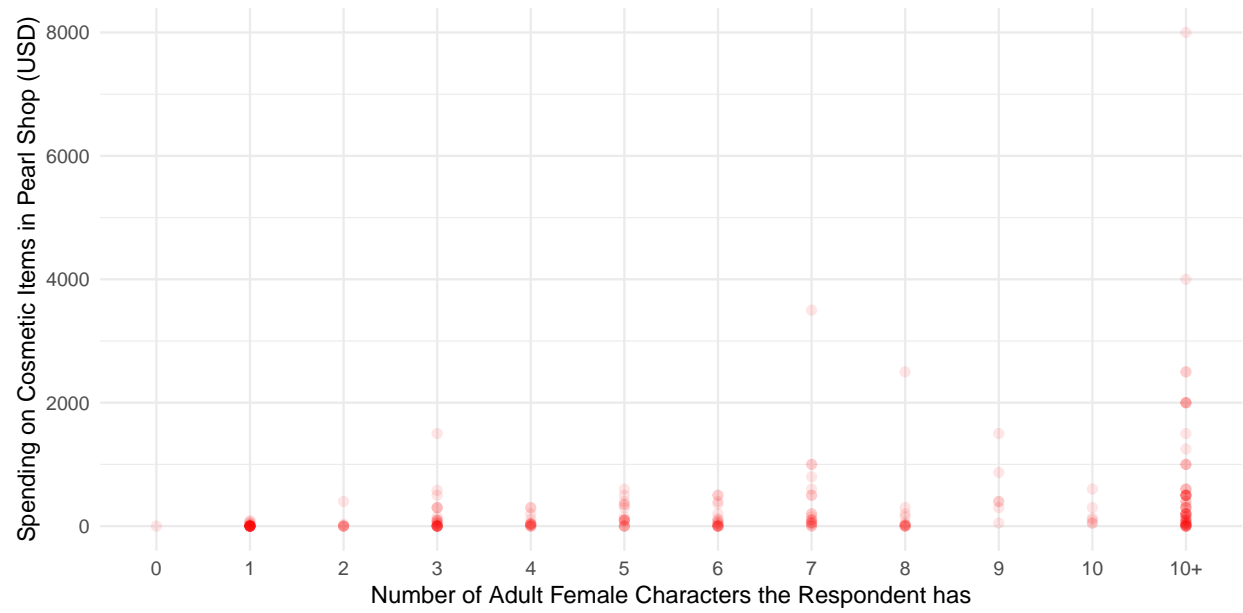


Figure 5: Number of Female Characters Versus Total Spending

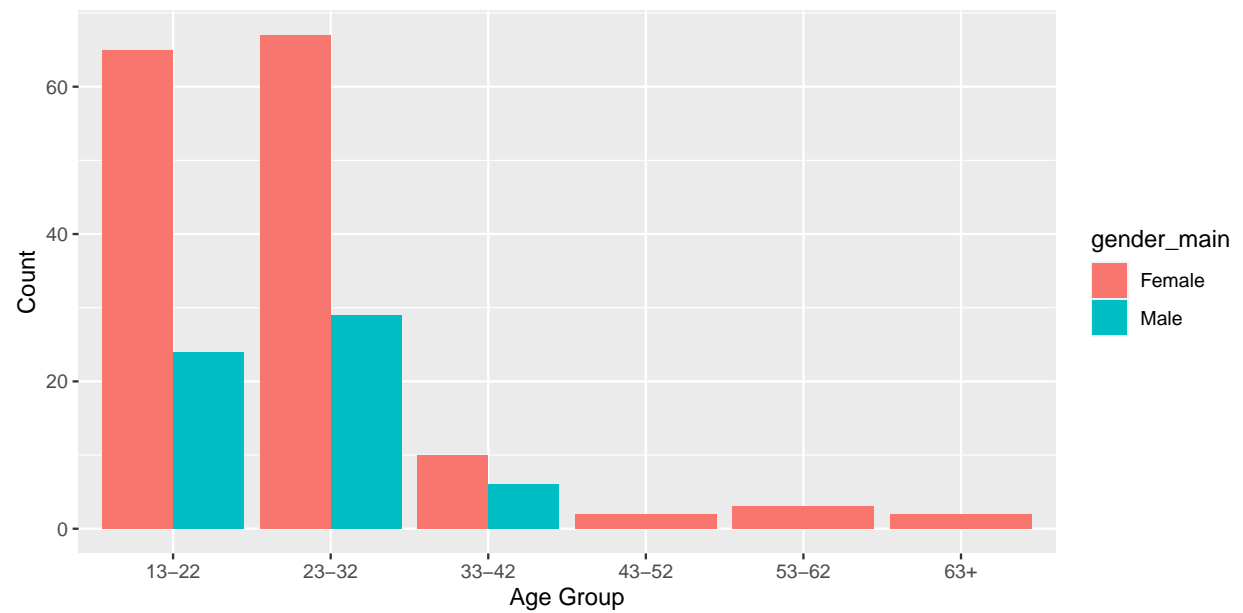


Figure 6: Gender of Main Character Across Age Groups

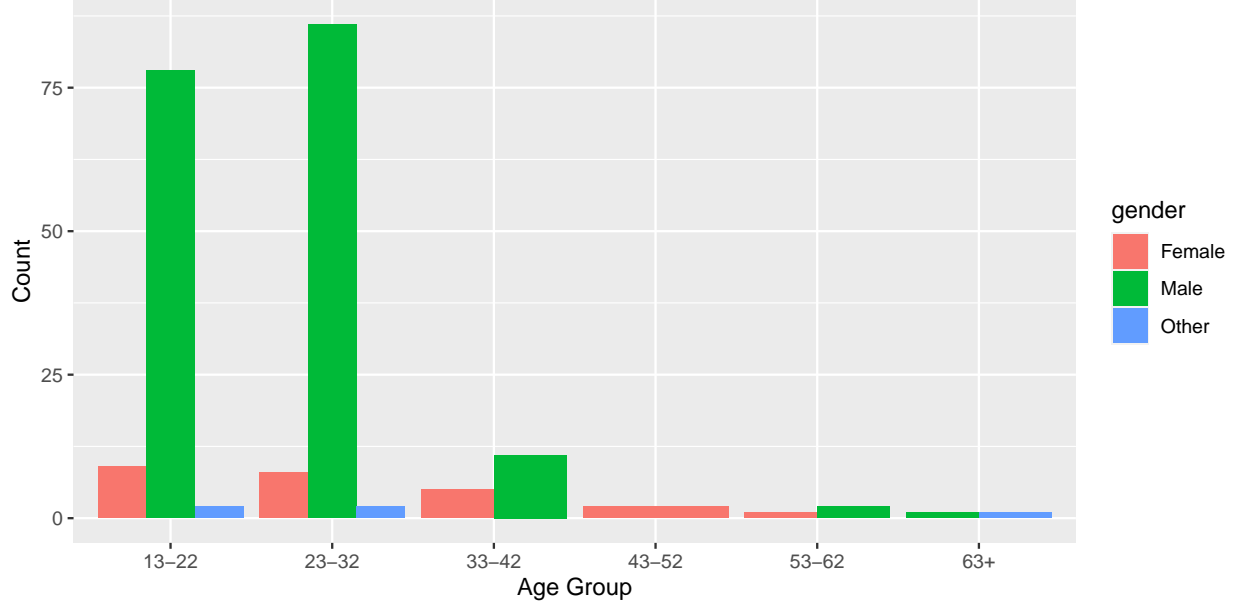


Figure 7: Gender of Respondent Across Age Groups

3 Model

Since the dependent variable is continuous, a linear model is considered instead of a logistic model. We will be considering both the player’s rated importance of VP and BKOM, the number of female characters they have, and their total playtime as explanatory variables as part of a multiple linear regression model. For the analysis in the rest of this section, the dataset is split 80%/20% for training/testing purposes. The statistical programming language R (R Core Team 2020) is used to run this model and present the findings from it.

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 \quad (1)$$

The general assumption behind the consideration of this model is that as a player spends more time in BDO, the more likely they are to spend more real world currencies in exchange for in-game items. This could be due to their need to continue using subscription-esque items that grant them boosts, or due to the creation of more content in the game that requires real world currencies to purchase (such as cosmetic items). Given the context of gender-based appeal in Korean MMOs such as BDO, there could also be a connection between number of female characters and a player’s spending in the pearl shop. The model therefore seeks to explore whether there really is a statistically significant connection between the total amount of money spent in-game and the factors mentioned above. Equivalently,

$$H_0 : \beta_1 = \beta_2 = \beta_3 = \beta_4 = 0 \quad (2)$$

Equation (1) represents the model used in this paper, where Y , the dependent variable, is a player’s total spending in pearl shop, β_0 is the intercept, X_1 is the covariate of total playtime, X_2 is the covariate of number of female characters the player has. X_3 is the covariate of the player’s rated importance of VP. X_4 is the covariate of the player’s rated importance of BK and OM. $\beta_1, \beta_2, \beta_3, \beta_4$ are the coefficients of the variables.

The diagnostic plots of the model are shown in Figure 8. The fitted values vs. residuals graph (top-left) shows a roughly horizontal line without noticeable patterns, which indicated a linear relationship between the dependent and independent variable.

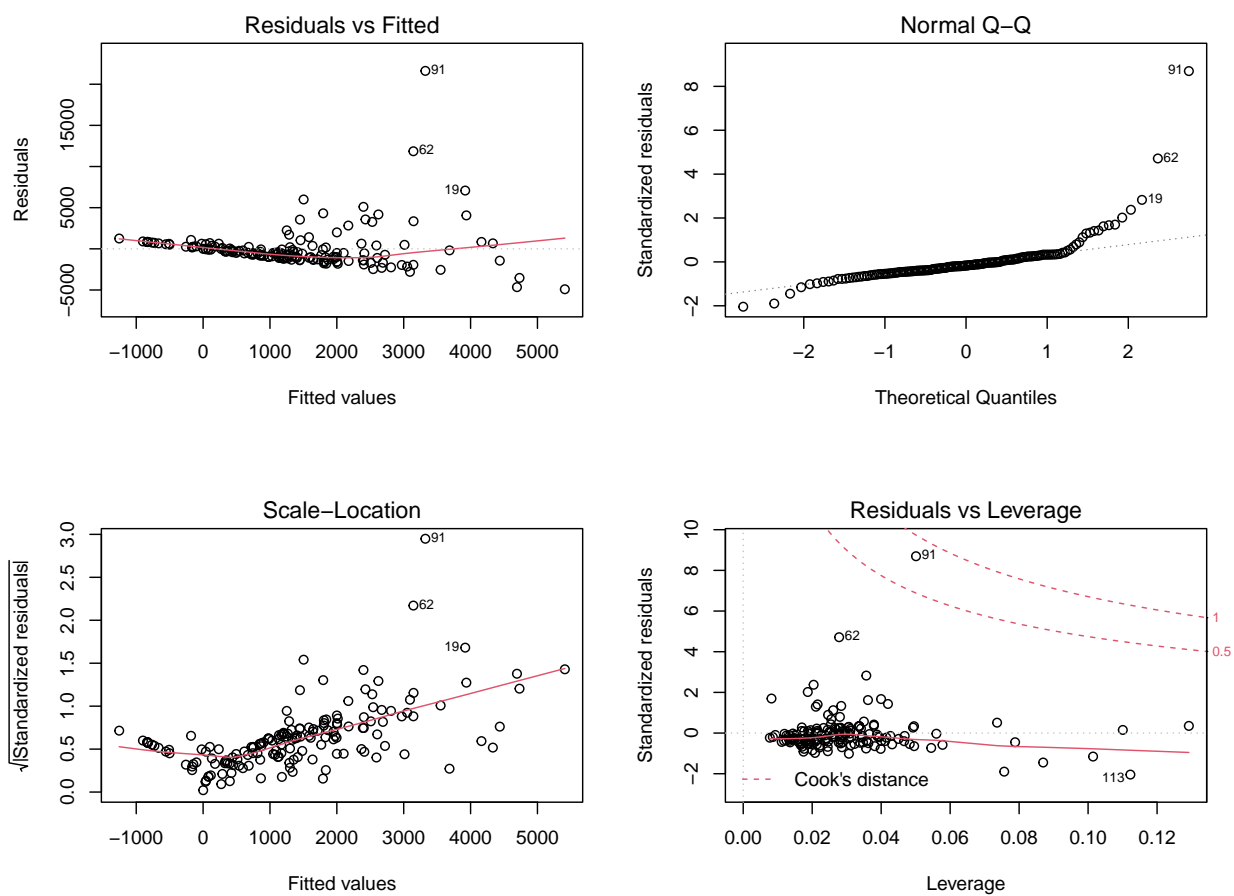


Figure 8: Model Diagnostic Plots

The Normal Q-Q plot (top-right) shows most points falling on the dashed line, though there are also a considerable number of points that fall off the dashed line on the right tail end, suggesting that the residuals may not be entirely normally distributed.

The Scale-Location plot (bottom-left) shows a red line that is not horizontal, meaning that the variance of the residual varies as the fitted value changes. This suggests that there may be a violation of the homoscedasticity assumption which assumes that variance of residuals is the same for all X values. An alternative model with square-root transformation of the dependent variable was attempted, but heteroscedasticity remained.

Note that points 91, 62 and 19 are all marked as possible outliers in the three plots mentioned above, suggesting that their inclusion impacts the linear model greatly. As such, they were removed in the final model. The diagnostic conclusions remained similar to the ones above after the removal of the said points.

The residuals vs. leverage plot (bottom-right) identifies two outliers that greatly exceed the Cook's distance—points 91 and 62—and one influence point at point 113. The removal of point 66 did not greatly affect the overall trend shown by the red line in the same plot, thus it was kept in the final model.

The model is used to predict pearl shop spending using the test dataset and arrives at a mean squared error value of 967085.46. This large MSE may be due to outliers similar to the ones removed during the model diagnostics section.

4 Results

4.1 Model Summary

A summary plot shown in Table 2 is generated using the `modelsummary` package (Arel-Bundock 2022) in R (R Core Team 2020). Model 1 is the model including the outliers and Model 2 is the final model.

Table 2: Model Summary of Pearl Shop Spending Based on Rated Importance of VP, BK and OM, Number of Female Characters, and Total Playtime

	Model 1	Model 2
(Intercept)	-1067.40 (538.45)	-785.22 (307.75)
importance_vp	246.37 (79.40)	91.71 (46.05)
importance_bkom	-79.55 (75.03)	69.28 (43.63)
character_female	66.38 (64.64)	58.63 (36.96)
playtime_total	0.08 (0.02)	0.06 (0.01)
Num.Obs.	166	163
R2	0.203	0.279
R2 Adj.	0.184	0.260
AIC	3082.3	2843.4
BIC	3101.0	2862.0
Log.Lik.	-1535.146	-1415.714
F	10.271	15.253
RMSE	2550.96	1453.89

The coefficient estimates shown in Table 2 for the final model is equivalent to the following, shown in Equation (3):

$$\hat{Y}_i = -785.22 + 0.06X_{1i} + 58.62X_{2i} + 91.71X_{3i} + 69.28X_{4i} \quad (3)$$

Summary of the model shows that only the rated importance of Value Pack and the total playtime were statistically significant predictors at $\alpha = 0.01$ significance level. The rated importance of Blessing of Kamasylve and Secret Book of Old Moon, and the number of female characters were not statistically significant predictors.

4.2 Character Gender Inequality

As alluded to in Section 2.3.2, gender-based aesthetics are a major selling point of Korean MMOs such as BDO. Figure 9 plots the respondents' total spending in the pearl shop against the proportion of the said spending contributed to cosmetic items. The graph shows that on average, a player with a female main character spends a higher proportion of their pearls on cosmetic items. Specifically, on average, players with a female main character spends roughly an additional 9.23% percent of their total pearl shop spending when compared to players with a male main character. This implies that for games focused on adding more cosmetic content to their in-game cash shop, these cosmetics attract more customers if they were created for female playable characters.

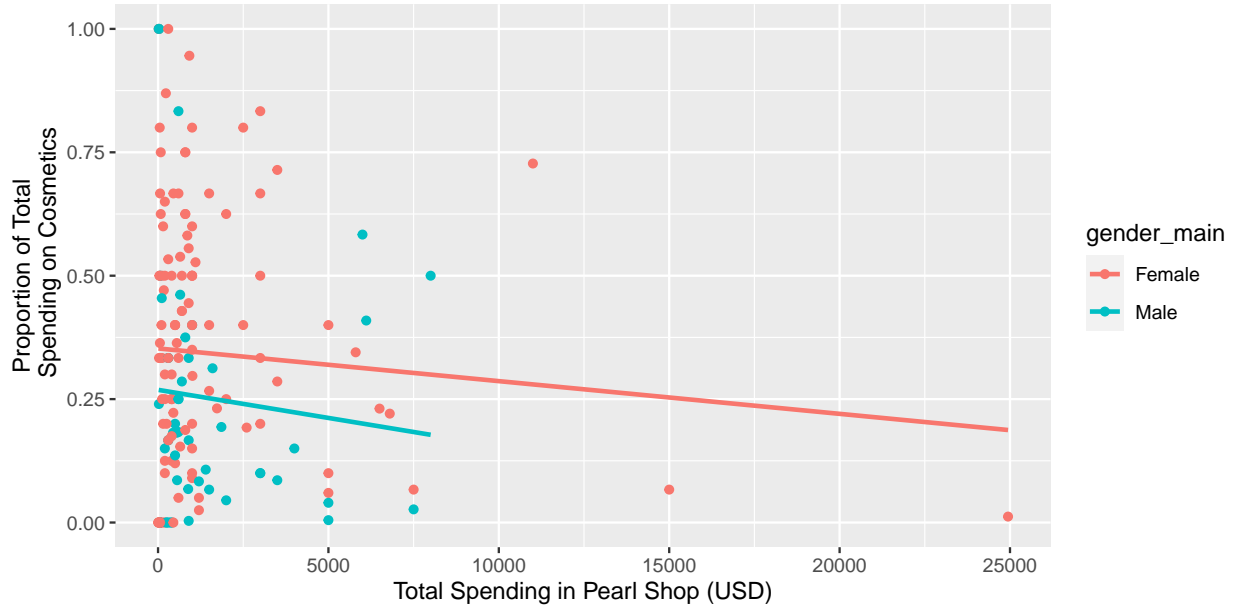


Figure 9: Cosmetic Spending Versus Functional Spending in Pearl Shop

4.3 Free Game Package

As shown in Table 1, some of the respondents had obtained the free package for the game, which were frequently given out through various methods by the developer and publisher of BDO, as described in Section 2.3. Out of the 67 respondents who obtained the free package of the game, 23 of them remained completely free-to-play and did not spend any real world currency to purchase in-game items nor other game packages. The other 44 respondents—almost double those who remained completely free-to-play—either purchased in-game items on the pearl shop or other game packages.

Table 3: Summary of Average Playtime and Spending in Upfront and Cash Shop Categories in Black Desert Online Based On Free Package Acquisition

Spending Status		Average Spending (USD)		Average Proportion of Total Spending		
Completely Free	Partially Free	Pearl Shop	Packages	Packages	VP	BKOM
no	no	1574.75	83.40	0.05	0.11	0.04
no	yes	631.48	39.77	0.06	0.15	0.05
yes	no	0.00	0.00	NaN	NaN	NaN

This is further elaborated upon in Table 3, which summarises the dataset based on whether the respondent’s spending status is considered **completely free** if they obtained the free package for the game and did not spent money on other game packages nor in the pearl shop, and **partially free** if they obtained the free package for the game but spent money on other game packages and/or in the pearl shop. We can see from Table 3 that despite having a lower average spending in both the pearl shop and game packages, the “partially free” players still spent a substantial amount of money on further purchases for the game: On average, for “partially free” respondents, the amount of money spent on game package purchases accounts for only 6% of their total spending on BDO. We observe a similar statistic for players who did not obtain a free package for the game, whose spending on game packages accounts for only 5% of their total spending on BDO.

4.4 Subscription Items

As discussed in 2.3, Figure 2 suggests a difference in importance as regarded by the respondents. This is supported by the statistics shown in Figure 10, which show a stronger positive linear correlation between rated importance of VP and spending on VP when compared to the correlation between rated importance of BK and OM and spending on BK and OM. On average, respondents spend \$148.0288 USD on purchasing VP from the pearl shop, and spend \$49.1202 USD on purchasing BK and OM from the pearl shop.

Table 3 shows that on average, VP accounts for 11% of a respondent’s total spending on BDO (15% for partially free respondents). BK and OM accounts for 4% of a respondent’s total spending on BDO (5% for partially free respondents).

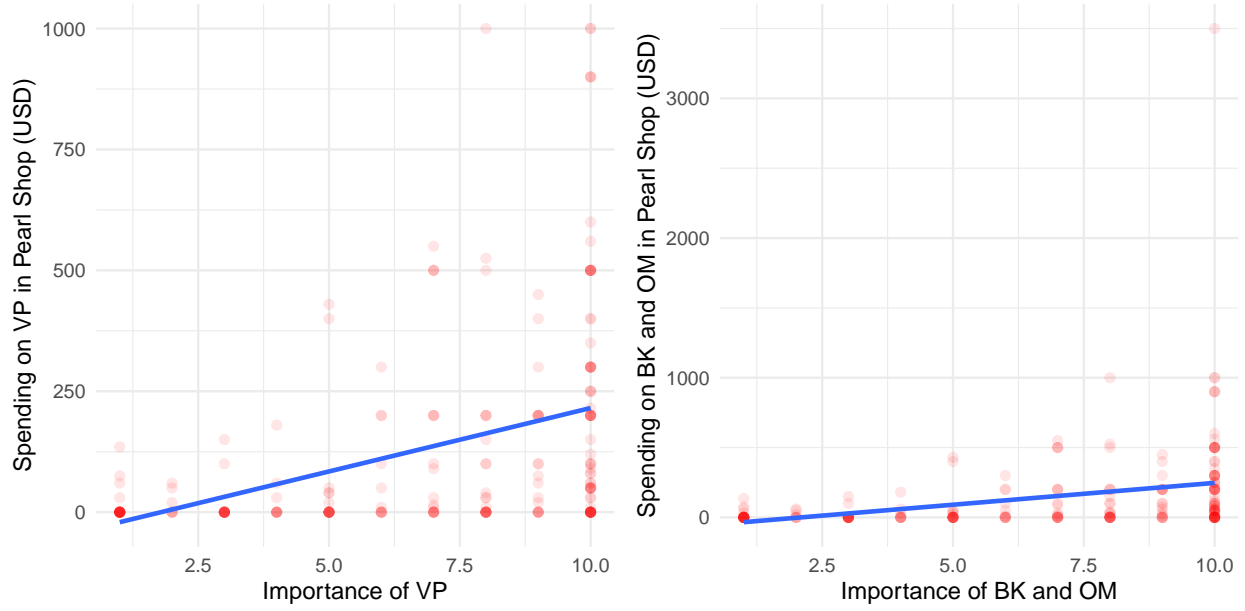


Figure 10: Rated Importance of Subscription Items Versus Spending on the Said Items

5 Discussion

5.1 Free Game Versus Upfront Cost

The statistics presented in Table 3 suggests that the amount of revenue obtained from game package purchases is relatively minuscule compared to other sources of income. Therefore, publishers of MMORPGs should forgo charging an upfront fee for their games in order to draw in more players so that they can browse the much more profitable in-game cash shop instead.

TODO; speculations as to why we saw a particular trend, its implications. Limitations. Further Directions.

Appendix

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