



Offer best service

Customer Loyalty Program

How to estimate the value of a customer in the loyalty program, predict if a customer will churn, and manage the customers accordingly?

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Mark3054 Marketing Analysis Report

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Executive Summary

The **FGP loyalty program** has run for eight years in an Asia country. We have witnessed its robust growth, and now consists of a petrol station chain, a grocery store chain, and a fast-food store chain, which are closely related to our daily life. The manager is also creating a strategic roadmap for this loyalty program to attract more customers and collaborate with more merchants to maximise the value of this loyalty program. Our research focuses on the managerial problem: How to estimate the value of a customer in the loyalty program, predict if a customer will churn, and manage the customer accordingly.

This report offers a thorough examination and evaluation of FGP loyalty program consumers. To understand the customer base, descriptive statistics and regression analysis have been completed to provide insights into the customers in the loyalty program. The range of customers across variables are quite unproportionally with factors largely outweighing others. Importantly, we discovered that the best customers account for almost 86% of the revenue contribution, despite accounting for just 36% of our overall customers. In addition, we developed a clear RFM criterion based on our past customer behaviour studies. This enables us to measure our consumers' personal worth and design marketing tactics accordingly. Lastly, we use a prediction model based on the RFM score to figure out the churn rate.

Additionally, to help FGP grow in the future, we will run several redemption campaigns, place a premium on social sentiment, and build distinct marketing methods to appeal to a diverse range of consumers with varying values. Additionally, to continue acquiring new merchants, we must distribute expenses properly to earn more money in the long term.

Introduction/Background & Objective

Research Question 1: What kind of customer does the FGP program attract and how do they rate the loyalty program?

This research question provides managers with an overview of their customer base in the loyalty program. This is a key element for managers as it will help them gain a deeper understanding of their customer demographic and this relation to the satisfaction of the program. Through this, managers can help understand consumer behaviour and perspectives, providing a basis to develop strategies that can help improve the overall satisfaction of their customers. Descriptive statistics will aid in providing a general overview of the consumers. While linear regression can be used to explore the relationship between the customer satisfaction of the program and nominal data variables. By understanding these key elements, managers will gain a general understanding of their customers, hence developing strategies tailored to these findings.

Research Question 2: What are the estimated customer lifetime sales in the loyalty program?

This study can provide managers with an overall picture of customer value in a loyalty program and evidence to persuade the current members to stay with more patience. **Customer Lifetime Sales (CLS)** is used to conduct the analysis, which refers to the total value of the FGP program of a customer over the whole period of the relationship. On the other hand, how does the retention rate affect the expected lifetime sales and the analysis of CLS in each city? This can help managers find more efficient management methods for different cities.

Research Question 3: How can we evaluate customers based on their behaviour and use this as a criterion to segment them for more efficient management?

This research part provides a **RFM criterion** based on the analysis of customer transaction records in the year 2015. It can be used for evaluating the importance of a customer to our program by scoring their purchase recency (meaning the time from their last engagement), purchase frequency (referring to the total number of purchases since the first time) and monetary value (which is considered as the total amount spent since the first transaction). In addition, it aims to provide managers with an insight into create marketing campaigns that target specific groups. More than half of registered customers are segmented into three groups: "Best

Customers", "Potential Growers" and "Weak Customers". Meanwhile, the distribution of these segmented groups in different cities is also being investigated.

Research Question 4: How to use the customer behaviour pattern from last year to predict the probability of churn rate in next year?

This question allows us to estimate each customer's churn rate for the next year, which helps managers better understand their customers' behaviour and respond to the market in a timely manner to retain them.

Methodology

Research Question 1

To address this question descriptive statistics are an essential element in gaining an overview of the customers in the loyalty program. Descriptive statistics are relevant in measuring frequency, central tendency, variation, and position. These categories of measurement will allow managers to summarise their customer base and to initially highlight potential relationships between the given variables (CampusLabs, 2020).

Following the overview provided by the descriptive statistics, linear regression will help identify relationships between variables providing insights for managers to understand key relationships. Analysing the relationship between the dependent variable being the satisfaction of the program and the independent nominal variables such as gender, race, home city, age and gender will help identify how these customers rate the loyalty program, and any key issues and ideas that need to be explored or strategized by managers.

Research Question 2

To find an aggregate customer lifetime sales model, three elements are essential to calculate. The average amount spent in year 2015 by a customer is considered annual revenue. The proportion of active customers in year 2016 is treated as the retention rate, and 10% is employed as an interest rate since the current economic situation is optimistic. Then, make detailed calculations based on the different retention rates and the situation of each city.

Research Question 3

To answer this research question, we use RFM to segment customers. This is because RFM is a segmentation approach that leverages previous transaction data to classify customers based on three variables: recency, frequency, and monetary value. The standard we use for the RFM is based on yearly data in the quartile range.

Research Question 4

To conduct this research, the customer purchase records in year 2015 are chosen as the sample. And the distribution of their average recency, number of transactions and total money spent at individual level are considered as the determination basis of RFM. Besides, 1/10 quantile technique is employed as the number of each scale in RFM criterion. Based on this, full score customers (i.e., 15 RFM score) are segmented into “Best Customers” Group, those who have lowest score (ie. 3 RFM score) are segmented into “Weak Customers” and “Potential Grower” are those who have score in middle (ie. R 3-5, F 3-5, M 3-4).

Result Analysis

Research Question 1

An overview of the FGP loyalty program customers will provide managers with an understanding of their customer base at an individual level. Through the summary of important factors, it provides managers key details into their customer demographic. As shown in Appendix 1.0 and 1.1, the customer distribution of home city is leading by City G, A and B respectively. Altogether, these cities make up 66.82% of their customer base. Race 1 is the most common race amongst customers with more than half of the customers belonging to this race (Appendix 1.2). Additionally, there are slightly more female customers than males with females making up 50.5% of the customers. This summary of the customers provides a general understanding of the customer base to further allow analysis of the relationship between these variables and the satisfaction of the program.

Simple linear regression is used to explore the relationship between the dependent and independent variables. The satisfaction of the program is the dependent variable being tested against nominal data such as gender, home city and race. As shown in Appendix 1.3, the relationship between gender and the satisfaction of the program is quite weak as it concludes a

p-value of $0.967 > 0.05$, showing results are not statistically significant as it is greater than 0.05. This highlights that there is no effect of gender on the satisfaction of the program observed.

The satisfaction of the program has a strong relationship with race, as shown by a p-value of 0.007199 which shows that the results are statistically significant as it is less than 0.05 (Appendix 1.4). The data also highlights that Race 2 is less satisfied than Race 1 by 0.08539 units.

Research Question 2

Our team estimated the aggregate **Customer Lifetime Sales (CLS)**, which refers to the total monetary value of purchases made by a customer with a loyalty program over the relationship by using the average annual monetary per customer based on Y2015 transactions. Over the last year (Y2015), the FGP program has done a nice job of retaining customers, and the **retention rate** is around **75%**. Based on the central bank's active monetary policy and an optimistic economy, 10% is chosen as the interest rate to analyse

Customer Lifetime Sales (aggregate model)				
Interest rate	Retention rate			
	80%	75.14%	70%	
10%	2104.36 ↑ 17.18%	1810.98	1578.27 ↓ 12.85%	

Figure 2.0

CLS. (Refer to Figure 2.0) We found that each registered customer can roughly bring **1810 monetary value** to this program. If some effective marketing campaigns and greater customer service can be provided to existing consumers, they will generate more revenue for us (*a 5% higher retention rate would increase more than 17% in sales*). But it is worth noting that an unpleasant customer experience will quickly affect sales (*a 5% loss in retention rate would decrease sales by 12%*). The calculation process of aggregate CLS model is provided on Appendix 1.1. And how to improve customer experience is provided under Recommendation.

Meanwhile, customer lifetime sales are not homogeneous across each city. (Refer to Figure 2.1)

We observed that City B has the best customer base since the expected lifetime sales can exceed

Customer Lifetime Sales (CLS) for Each City			
City	Average Monetary	Retention rate	CLS
Group I B	877.33	80.47%	3268.09
E	718.93	75.00%	2259.51
Group II F	643.94	75.76%	2068.73
D	510.33	81.28%	1954.60
G	591.52	73.51%	1783.15
Group III A	472.09	74.32%	1455.43
C	356.79	70.26%	987.59

note : interest rate is 10%

Figure 2.1

3268 units (in currency), which puts it firmly on the first throne. Furthermore, three cities (E, F, and D) are classified as Group II and have higher CLS than the average level as well as a higher customer retention rate (75%). There is one city's future development that deserves more attention, which is City D, with the lowest geographic churn rate (less than 19%). In other words, the customer who comes from this city is more loyal and

more likely to respond to a marketing campaign. The remaining cities are segmented into Group III with lower CLS and relatively worse retention rates.

There may be some doubts about Group III, why is the overall performance of these two largest cities (G and A) are not conspicuous? Based on the result comes from research question 1, more than 55% of customers come from here. The main reason behind this is that they have their own characteristics on consumer structures. In terms of City G, they hold many Low Spending Active Loyalty Customers¹. And many weak customers² place on City A.

Research Question 3

To understand customer responsiveness and segment them into specific groups, we developed an **RFM criterion** based on the analysis of consumer behaviour in Y2015. (Refer to Table 3.1 –

RFM			
Score	Recency Scale	Frequency Scale	Monetary Scale
1	a year ago	once a year	≤ 80
2	120 days ago	5 times a year	81 - 130
3	75 days ago	8 times a year	131 - 204
4	45 days ago	11 times a year	205 - 320
5	33 days ago	15 times or more a year	≥ 321

Table-3.1

RFM criterion) We found that more than half of consumers make at least one purchase within 33 days, and the annual frequency is greater than 11 times. In other words, the next transaction is most likely to

happen within a month. Another interesting phenomenon is that customer spending in Y2015 has a normal distribution³ with a median of around 205 monetary values.

(Please refer to Appendix 3.1 – 3.3 for the determination basis of RFM)

In addition, customer value at the individual level can also be evaluated by scoring them based on the RFM criterion. Since a higher RFM score implies the customer is more likely to respond to the marketing campaign and spend good money with us often. Besides, a lower score can indicate that the customer may not have bought recently and will lose them if not reactivated.

Therefore, we segment customers into three groups after scoring them based on the RFM criterion. This can help us have a deeper understanding about our **customer persona**⁴ and tailor our content to their unique needs as well as challenges for boosting their loyalty and conversions.

¹Low Spending Active Loyalty Customers are those who make purchases frequently, but they usually spend few moneys in each transaction. – The segmentation analysis for this group is provided on research question 3.

²Weak Customers are those who make a purchase long time ago and spend few moneys across the year. – a segmentation analysis for this group is provided on research question 3.

³ Normal distribution is a bell shape and continuous probability distribution that is symmetric on both sides of the mean.

⁴ In this report, the customer persona represents the key traits of each segmentation group.

- **Best Customers** – this group consists of those customers who are found in Recency Scale - 33days ago – 5, Frequency Scale – 15 times or more a year – 5 and Monetary Scale - ≥ 321 – 5, meaning that they transacted recently, do so often and spend more than other customers. A shorthand notation for this segment is “5-5-5”, and this will be used going forward.

The number of Best Customers accounts for **35.39%** of total population and contributes **more than 85% revenue** to the loyalty program. Besides, their **retention rate** is **staggering 91.93%** which is well above our average of 75%. But the age of this group is roughly 3 years older than the overall one, increase to 39 years old.

When we researched the redemption of this Best Customers group, a notable finding is that most of the points were redeemed by them in Y2015, which is 96.94%. From here, this group can be judged as the most valuable component of the FGP program since they bring a lot of revenue to our merchants today, and we also need them as a cornerstone to attract more customers in the future.

However, how to effectively manage this group of consumers who have performed very well and find new growth points from them is a difficult thing. We observed that their redemption frequency is kind of low and the ratio of redemption to the transaction is about 1:35, which means our reward model does not stimulate much of their psychological factor to make the next purchase. Thus, a "Head Start Reward" policy is proposed to make the best customers feel valued and appreciated. Head Start Reward policy is provided under Recommendation.

Moreover, we should pay more attention to these cities that have many valuable customers and good market reputations. In the whole loyalty program, the best customers come from the three cities that attract our eyes. (Refer to Table 3.2) More than half of the customers in City B can be segmented into the best group, and the proportion that sits at the top. Another two cities are city D, with 40%, and city G, with 36%. The percentage of best customers in these two cities is also higher than the program level, which is 35%.

Proportion of Best Customers in Each City		
City	Best Customers	
B	51%	> 35%
D	40%	
G	36%	

note: 35% indicates the overall ratio of "Best Customer" in FGP program

Table-3.2

- **Potential Growers** – this group consists of customers who purchase within 75 days, have more than 8 transaction records in Y2015 (Recency and Frequency are scaled between score 3 and score 5), and involved Monetary value between 131 and 320. Meaning that these repeat customers are active and loyal, but they are low spenders. A shorthand notation for this segmentation is “(3, 4, 5) - (3, 4, 5) - (3, 4)”.

The number of potential growers account for nearly 16% of the total population but only contributes 6% of the revenue to the FGP program in Y2015. Their average age is slightly younger than the overall mean, at 34.9 compared to 36.1 years old.

The reason we label those seemingly unremarkable customers as "potential growers" is that they have a **high retention rate of 84.28%**, which is almost 10 percent higher than the overall average. Based on the current calculation, the customer lifetime sales for this segmentation are 941. If they convert into the Best Customers group in the future, we can expect a more than 45% increase in their CLS, and the monetary value will reach 1368. (Some suggestions regarding customer incentives are provided under Recommendation, that can help this program to boost Potential Growers).

Moreover, a good marketing strategy not only considers how to make consumers engage more but also needs to consider whether the merchants can provide these services with guaranteed quality. (Refer to Table 3.3) We found that some cities may suffer from supply chain instability and labour shortages as a result of consumption growth brought on by a marketing campaign. In cities such as City C, City F, and City G, the proportion of potential growers who come from these cities is higher than the proportion of mass customers who come from these places in the whole program. So, having empirically prepared scenarios can help our merchants better solve these problems.

Proportion of Potential Growers in Each City			
City	Potential Growers		
G	31%		> 30.28%
C	13%		> 9.77%
F	7%		> 6.62%

note: the most right column indicates the proportion of customer who comes from these cities

Table-3.3

- **Weak Customers** – this group consists of those customers who make a purchase over 120 days, the transaction records in Y2015 are less than 5 times and the monetary value is no more than 80. Meaning that their last purchase was longer time ago, less engagement and lower spender. A shorthand notation is "1 - 1 - 1".

The number of Weak Customers accounts for **20.64%** of total population but their **contribution to program sales** is merely **1.04%**, and no surprise that the retention rate is only 42.96%, which is far from the average level 75%.

Therefore, how to reconnect with them has become a difficult marketing issue. (Refer to Table 3.4) We found that around 45% of weak customers come from either city A or city

Proportion of Weak Customers in Each City		
City	Weak Customers	
A	34.47%	> 27.63%
C	11.65%	> 9.77%

Table-3.4

C. In-depth market research between these two cities may help us unravel the direction.

Research Question 4

Based on the purchasing behaviour of consumers in 2015, we have designed the important criteria of the FGP program. It helps us best segment the customers and advises us to use different marketing strategies to deal with different groups. In addition, RFM is a good indicator for us to predict the churn rate of customers in the next year, which helps us better react to the market and retain customers with a high probability because customer acquisition costs are higher than customer retention costs.

The model is the simple logistic regression model, and its independent variable is the score of RFM, while the dependent variable is whether the customer will churn in 2016 or not. The result is a number between 0 and 1. The closer it gets to 0, the higher the probability of churn it will be. The formula is presented as following: $0.387102 + 0.0363 \times \text{RFM score} = \text{retention rate}$ which is statistically significant (see Appendix 4.1). Based on retention, we can quickly get the churn rate. The formula for the churn rate is: $1 - \text{retention rate}$. Since the minimum score is 3 of our RFM criteria, the minimum retention rate is 49.6%. According to the model, every increase in RFM score will result in a 3.63% retention rate. So, the higher the score, the higher the retention rate.

Based on what we have discovered, our suggestion is that we focus on the group of people whose retention rate is less than 60%. Since through the model, we see that when the retention rate is less than 60%, the probability of the consumer leaving is 53%. As a result, we can determine the churn rate of customers by using the RFM score. This helps us best manage the customers. More importantly, our RFM model needs to be renewed yearly to make our predictions more accurate.

Recommendations

Improve satisfaction of customers

As observed, race has a significant relationship with the satisfaction of the program, with Race 2 less satisfied than Race 1. It is recommended to improve the satisfaction of customers based on race to introduce personalisation measures. For example, customers may be able to earn additional loyalty points based off a given religious or cultural season. This may make customers more satisfied to earn loyalty points, feeling as if the loyalty program is tailored to their culture and interests.

Improve customer experience

In order to ensure customer experience, FGP could collect more feedback from customers about how they are satisfied with each transaction. This helps FGP managers best understand their customer's pain points and needs. More specifically, FPG can conduct post-purchase feedback to drive repeat purchases. Customers may express their ideas and settle any difficulties with a post-purchase survey. This also enables FGP to get feedback that may be used to increase the likelihood of a consumer purchasing from FGP again. Once a consumer has made a purchase, FGP can rapidly identify individuals who are dissatisfied with their purchase or overall experience, as well as delighted consumers who may help promote FGP in the future. FGP can help with this by launching a post-purchase review program where customers may score their purchasing experience. The goal of this campaign is to maintain the best customers, reduce churn, and encourage them to purchase more.

Offer more incentive for customers

Customers are rewarded by brands for engaging brand-building activities. Reward points, discounts, freebies, early access to freshly announced items, and exclusive specials are just some of the options. Whatever shape these consumer incentives take, they're all designed to encourage customers to engage in and repeat behaviours that benefit business (Huhn 2021). FGP should provide customers with choices for redeeming their hard-earned points to increase the attraction of program participation and thus increase the customer value. For the best customers, FGP can offer discounts or rewards for high-spending customers. Customers may obtain a discount if they spend a certain amount of money. For example, if they spend \$500, they will get 10% off their next purchase. Also, if customers recommend their friends to purchase from FPG, they can also get rewards in return, which encourages referrals. And new

customers can also get discounts at the same time. In addition, FGP could cooperate with dry-cleaning businesses since it is also a high-demand service for customers. FGP could offer some dry-cleaning coupons to drive customers' purchases in dry-cleaning stores.

Manage relationship with customers

Customer relationship management is essential for customer retention and loyalty. As a result, it reduces the amount of work necessary to convince customers to purchase from FGP and increases the likelihood that they would make further purchases in the future (Stradling 2022). Firstly, creating a customer-centric culture at FGP is the first step in ensuring excellent customer connections. This means focusing on the long-term success of the customers as well as identifying and implementing solutions (Stradling 2022). Anticipating customers' requirements at various stages of the relationship, using customer service tools and technology, and thinking about the client connection beyond the purchase are some of the techniques that may help a firm become more customer centric. FGP may also use the Surprise and Delight Strategy, which is a marketing strategy that uses interactive experiences, surprising presents, or prizes, and tailored content to attract and nurture clients through the lead pipeline (Stradling 2022). For example, FGP can give some gifts to customers on special holidays such as their birthday. This makes customers feel warm and happy, and it is an effective method of relationship management.

Bonus suggestions: Allocate the operation cost to the balance of each merchant and manage the customer accordingly

Background: This section may help Jennifer handle the complaints from current merchant members. According to the scenario, her assistant informed her that one merchant member believed his company was much more valuable to consumers than the other two, and that the other two companies should compensate by paying more of the loyalty program expenditures. Thus, redistributing the cost among those three merchants aids in the resolution of this issue. From the previous sections, we have already determined the loyalty program's core customer, the customer value of various segmentations, and the churn rate prediction for those customers. Thus, this section investigates whether the satisfaction of each individual

merchant played a big role in the overall satisfaction of the loyalty program. This way, we can get a better picture of how the loyalty was accepted.

Firstly, we use the datasets "Sat_Program", "Sat_FastFood", "Sat_Grocery" and "Sat_Petrol" to compare the customers' overall satisfaction rating of the program with their mean or median rating of each individual merchant. And we also compare the total redemption of each merchant with their sales performance as well. However, the multiple regression ($\text{Overall satisfaction} = -2.072 + 0.248 (\text{Sat_FastFood}) + 0.727 (\text{Sat_Petrol}) + 0.248 (\text{Sat_Grocery})$) shows that petrol stations contribute the most satisfaction with 0.727 compared to the other two stores (Appendix Bonus 1). Meanwhile, petrol stations accounted for 71% of total sales, followed by grocery stores (23%), and fast food (6%) (Appendix Bonus 2). But the fast-food merchant received 331745 redemptions, which is 64% of total redemptions, followed by the gas station with 188992 redemptions, which is 36%, and the grocery shop with 0% redemptions. Both the satisfaction result and the sales and redemption results show the imbalanced contribution among the three merchants.

Recommendation: Use customer profitability analysis (CPA) to best allocate the cost:

In fact, it is unreasonable to allocate the cost directly based on which merchants perform well in sales performance. It is more reasonable to allocate the cost based on customer profitability. Although CLV is also a measurement of customer profitability, CPA can help managers better optimise the allocation of resources and pricing decisions since it is based on historical performance. For this reason, an examination of the multiple activities and expenditures connected with catering to a specific customer is known as a customer profitability study (Customer Profitability Analysis 2022). FGP could first calculate the gross margin less discounts and allowances, then FGP should determine the different expenses associated with serving a particular customer, either in an undefined revenue approach or an ABC approach according to the method given by the Managing Customer Value and Relationships section, seminar 7, ACCT3583. After that, FGP should calculate an undefined profit for each customer group. Given the result of the customer profitability by using the CPA method, FGP can map the CPA customer profitability based on 2X2 metrix to divide customers into passive, savvy, cheap, and aggressive. This helps FGP to make strategic direction to focus on customers by optimising allocation of scarce resources and better pricing. As a result, Jenifer should employ the CPA method to reallocate the cost based on 2X2 metric customer segmentation rather than base it on the contribution of each merchant, which helps FGP succeed in the long run.

Conclusion & Limitations

Firstly, the purchase records are incomplete. The dataset only provides 2015 purchase data, which makes it difficult to comprehend the consumer's entire lifetime cycle. Some consumers, for example, enrolled in the program in 2010, but churn in 2016. We didn't sure what to anticipate over the next five years, but his departure will be a significant blow to our program. In addition, the dataset didn't contain information about new customers in 2015, so we had to ignore them when we calculated the retention rate. Furthermore, we only have the redemption data for petrol and fast food, but we don't have the data for grocery stores. However, we have the sales data for grocery stores, which didn't make sense. The lack of data is largely due to the loss of information. Futhermore, descriptive statistics and simple linear regression analysis has provided insights into the customers of the FGP loyalty program. There are a diverse range of customers, although figures aren't proportional highlighting a potential to increase customer base in these areas. Applying the recommendations provided to help increase the satisfaction of customers based on their race in order to lessen the variation in satisfaction. A limitation is that the sample has to be a true representation of the population.

Reference List

CampusLabs, 2020, Types of Descriptive Statistics, viewed 5 April 2022, <<https://baselinesupport.campuslabs.com/hc/en-us/articles/204305665-Types-of-Descriptive-Statistics>>.

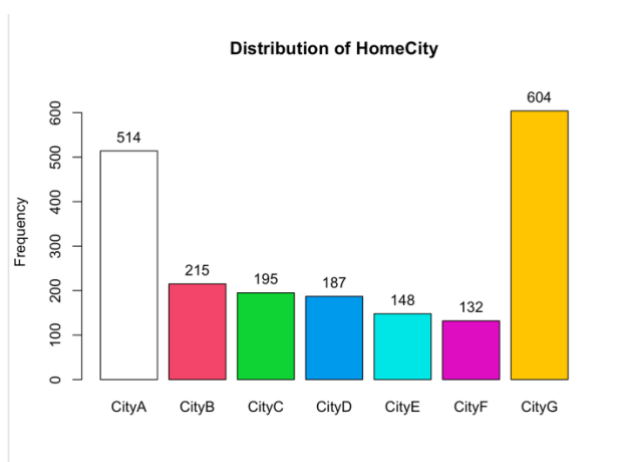
Corporate Finance Institute. 2022. Customer Profitability Analysis. [online] Available at: <<https://corporatefinanceinstitute.com/resources/knowledge/accounting/customer-profitability-analysis/>> [Accessed 6 April 2022].

Huhn, J., 2021. The Top 5 Benefits of Running Customer Incentive Programs. [online] Referral Rock Blog. Available at: <<https://referralrock.com/blog/customer-incentive-program/>> [Accessed 5 April 2022].

Stradling, J., 2022. The Surprise and Delight Strategy Improves Customer Loyalty. [online] Eminent SEO. Available at: <<https://www.eminentseo.com/blog/surprise-and-delight-strategy-to-improve-customer-loyalty/>> [Accessed 6 April 2022].

Appendix

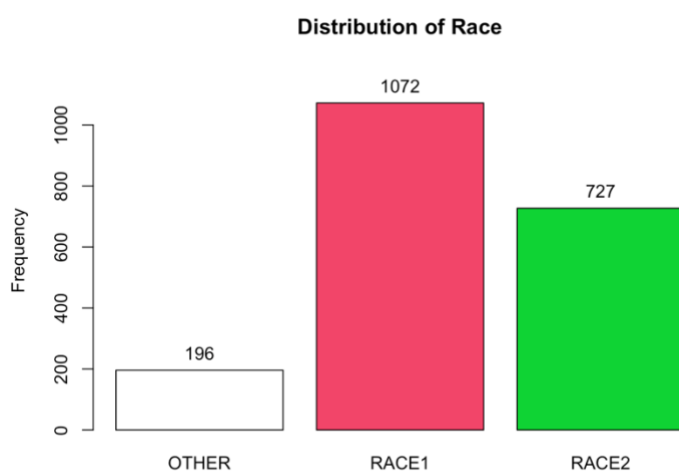
Appendix 1.0



Appendix 1.1

Top 3 Cities	
G	30.28%
A	25.76%
B	10.78%

Appendix 1.2



Appendix 1.3

```

Call:
lm(formula = Sat_Program ~ factor(Gender), data = Book1)

Residuals:
    Min       1Q   Median       3Q      Max
-6.2642 -1.2611 -0.2611  0.7389  2.7389

Coefficients:
              Estimate Std. Error t value Pr(>|t|)
(Intercept)    7.264151   0.051362  141.432  <2e-16 ***
factor(Gender)M -0.003017   0.072985  -0.041   0.967
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 1.63 on 1993 degrees of freedom
Multiple R-squared:  8.576e-07, Adjusted R-squared:  -0.0005009
F-statistic: 0.001709 on 1 and 1993 DF,  p-value: 0.967

```

Appendix 1.4

```

lm(formula = Sat_Program ~ factor(Race), data = Book1)

Residuals:
    Min       1Q   Median       3Q      Max
-6.3666 -1.2092 -0.1238  0.8762  2.8762

Coefficients:
              Estimate Std. Error t value Pr(>|t|)
(Intercept)    7.20918   0.11616  62.062  <2e-16 ***
factor(Race)RACE1  0.15742   0.12633   1.246   0.213
factor(Race)RACE2 -0.08539   0.13089  -0.652   0.514
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 1.626 on 1992 degrees of freedom
Multiple R-squared:  0.004941, Adjusted R-squared:  0.003942
F-statistic: 4.946 on 2 and 1992 DF,  p-value: 0.007199

```

Appendix 2.1

Customer Lifetime Sales (CLS) Formula:



$$CLS = \frac{1 + r}{1 - P + r} * R$$

r represents interest rate (assumed as 10%)

P refers to retention rate (average one is 75.14%)

R means the revenue (average monetary value is 573.92)

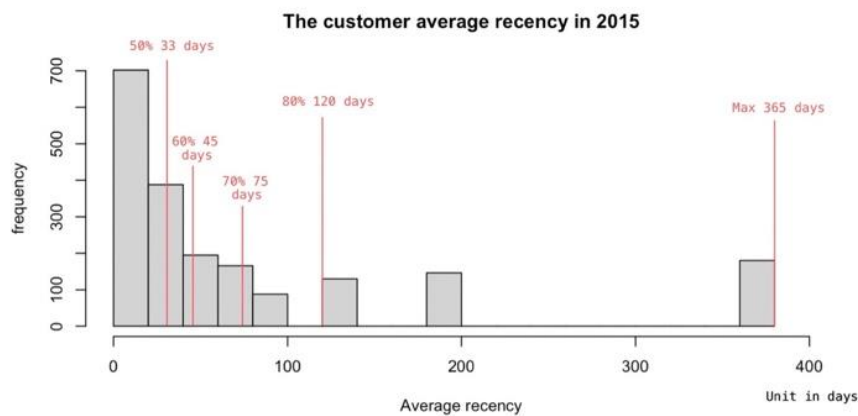
The result around 1810.98

Appendix 3.1

The determination basis of RFM:

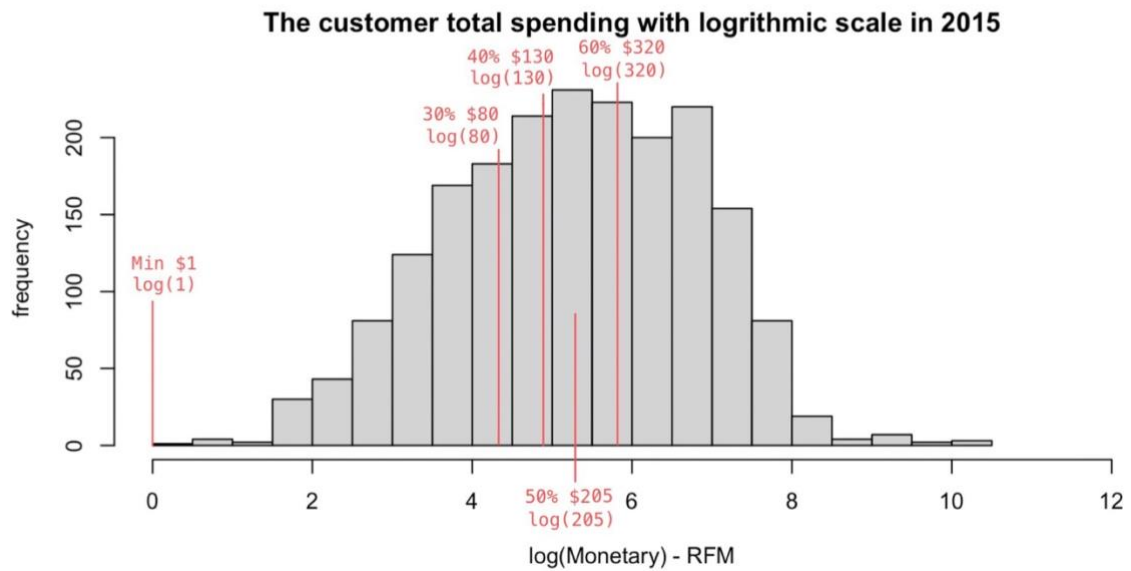


By Quantiles – Recency



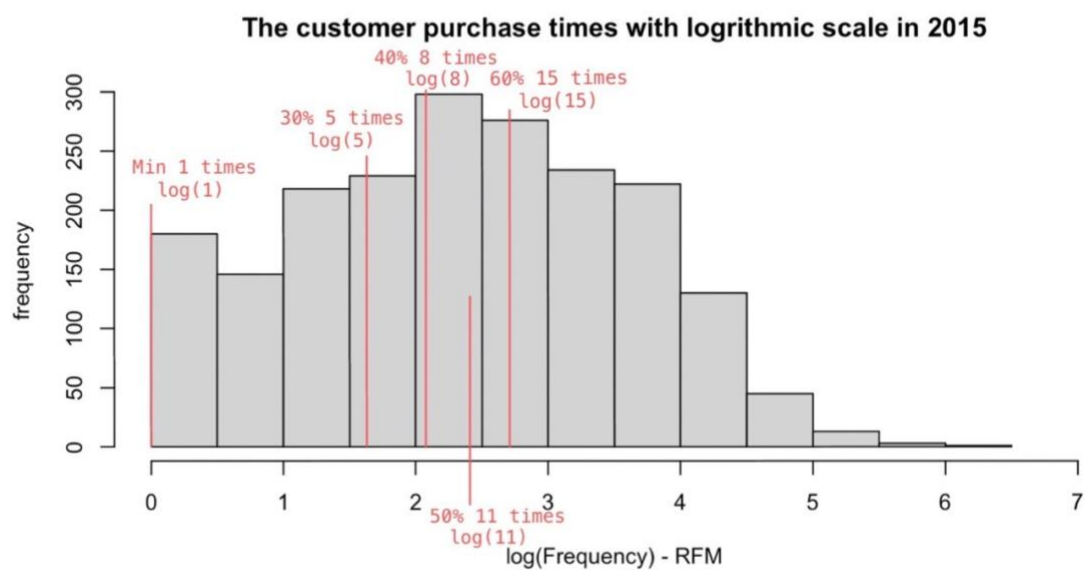
Appendix 3.2

By Quantiles – Monetary



Appendix 3.3

By Quantiles – Frequency



Appendix 4.1

The prediction model of
customer retention rate:

Call:
glm(formula = Active2016 ~ RFM, data = Data)

Deviance Residuals:

Min	1Q	Median	3Q	Max
-0.93161	0.06839	0.06839	0.24990	0.50400

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	0.387102	0.020165	19.20	<2e-16 ***
RFM	0.036300	0.001807	20.09	<2e-16 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

(Dispersion parameter for gaussian family taken to be 0.1554971)

Null deviance: 372.68 on 1994 degrees of freedom
Residual deviance: 309.91 on 1993 degrees of freedom
AIC: 1952.6

Number of Fisher Scoring iterations: 2

Appendix Bonus 1: Multiple regression result of satisfaction

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	-2.07172	0.25723	-8.054	1.37e-15 ***
Sat_FastFood	0.24822	0.01775	13.984	< 2e-16 ***
Sat_Petrol	0.72680	0.02606	27.887	< 2e-16 ***
Sat_Grocery	0.24809	0.01932	12.842	< 2e-16 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 1.23 on 1991 degrees of freedom
Multiple R-squared: 0.431, Adjusted R-squared: 0.4302
F-statistic: 502.8 on 3 and 1991 DF, p-value: < 2.2e-16

Appendix Bonus 2: Sales Pie chart

