First to 5G
First to tomorrow

verizon

The Next Step for Verizon: The 5G Revolution

Section 2
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Executive Summary

Verizon Communications Inc., a U.S. multinational telecommunications conglomerate, was seeking to transform its wireless business and take full advantage of current trending 5G technology. The purpose of this study was to target profitable customers by segmentation, to offer the top segments constructive promotions, and to yield more profit for Verizon.

After conducting a hybrid of Hierarchical and K-Means Cluster Analysis from 226,129 transaction records of 100,000 random U.S. customers, we found our target customer segments based on four variables (Order Numbers, Profit, Recency, and Quantity). Specifically, we aggregated transactional data to generate usable customer data. Then, in the first data set, we conducted hierarchical analysis under Ward's and Furthest Neighbor methods to figure out the initial seeds for K-Means Cluster Analysis. Eventually, after comparing four analysis results from two random data sets, we finalized six clusters of customers.

Among the final six clusters, we identified five types of customers and selected the top three target segments, and then we proposed three tailored and pragmatic strategies. To retain the highest profitable Premium VIP Customers, the Vault Strategy offered strongest promotions, private hotlines and birthday gift surprises; to maintain and encourage VIP Customers to upgrade, the Sweets Strategy provided progressive levels of discounts and cashback; to develop Regular Customers into a leading force to increase revenue, the Snowball Strategy aimed to offer affordable basic new 5G plans and cellphones. Moreover, we also gained further insights into target customers' purchasing preferences and practical managerial implications for Verizon's upcoming 5G marketing campaigns, from post - hoc analysis of customers' payment methods, purchase channels, and search interests from Google Trends and Think with Google.

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Introduction

Given the current trend of wireless network, Verizon took an active approach to offering the 5G network services to its customers. “In 2018, Verizon was the first in the world to launch commercial 5G with residential broadband deployments beginning in Los Angeles, Sacramento, Houston, and Indianapolis.” (Verizon, “2018AnnualReport” 5, 10) Ever since the very beginning, Version tried to gain a first player advantage in this market against other competitors. “Verizon was also the first carrier to roll out 5G in the United States.” Besides, “The other 5G offering from Verizon, which launched on April 3, 2019, is for mobile devices.” (Fisher, “Verizon 5G: When & Where You Can Get It”) Today, looking at Verizon’s standing in the telecommunications industry, we believed that it is facing company reconstruction to better lead the new game in the 5G wireless network. Therefore, the main objective of our project was to segment Verizon’s customers for the upcoming 5G marketing campaigns, based on total order numbers, profitability, recency of latest purchase, and quantity of total purchased items. On the basis of our final six segments, we could identify profitable segments to promote 5G wireless network products and services to yield more profit. Another motive behind our strategy was that despite Verizon’s growing operating revenue, it’s operating income was decreasing due to an increased operating expense, specifically marketing costs from services and SG&A expenses. Therefore, by identifying and targeting specific profitable customer segments beforehand, we also aimed to cut down marketing costs during our promotions of Verizon’s new 5G network services. (Verizon, “2018AnnualReport” 9, 13)

There were two significant challenges that Verizon was facing. First, Verizon needed to change its operating income decreasing trend. While Verizon’s operating revenue kept increasing every past three years, which increased from 125,980 million dollars in 2016 to

130,863 million dollars in 2018, its operating income still decreased, from 29,249 million dollars in 2016 to 22,278 million dollars in 2018. (Verizon, "2018AnnualReport" 10) The shrunken wireline market and increased operating cost account for the drops in operating income. Second, 5G—the fifth generation of wireless technology soon would be on the market. Verizon expected 5G technology would provide a significant opportunity for growth in the industry in 2020 and beyond. The fact that lots of new technology like Super-connected autonomous cars, smart communities will rely on 5G made more and more telecommunications companies try to gain 5G users' market share. To increase competitiveness, Verizon built more momentum for Verizon's 5G network and 5G labs to keep tech innovation. However, such plans also increased costs drastically. After our customer segmentation, Verizon would be able to efficiently devote more valuable resources to target customers during marketing campaigns.

This study sought to identify Verizon's most profitable and promising customer segments and to design different suitable marketing strategies for the upcoming 5G game in the U.S. telecommunications industry. Based on four chosen variables (Order Numbers, Profit, Recency, and Quantity), we found our target customer segments. To be specific, first, we aggregated transactional data to generate applicable customer data, then in the first data set, we used hierarchical analysis with Ward's and Furthest Neighbor methods to figure out initial seeds for K-Means Cluster Analysis. Finally, after comparing four analysis results from two random data sets, we confirm out six target customer segments.

We identified five types of customers from six final customer segments, after conducting a hybrid of Hierarchical and K-Means Cluster Analysis to and 226,129 transaction records (12/16/04 to 9/17/12) in all channels (phone, web, and mail), reflecting 137,576 orders and 100,000 random U.S. customers. These five types of customers were: Premium VIP Customers,

VIP Customers, Insider Customers, Regular Customers, and One-time Purchase Customers. And Premium VIP Customers, VIP Customers, and Regular Customers were three main segments that we targeted to promote Verizon's newest 5G plans, 5G smartphones, and other products and services. Then we suggested three tailored and practical strategies (the Vault, the Sweets, and the Snowball) to retain and develop these target customers to gain more profit.

Although Verizon had already announced that it rolled out 5G in four U.S. cities in Sep 2018, according to Google Trends and Verizon's 5G availability check, Verizon still needed much more time to promote 5G services for its customers. As the Google Trends showed, web search interest results of Verizon and its major competitors had low correlation with the "5G" term (See Figure A in Appendices) over the last year in the U.S... Consumers seemed not to realize what was really happening with today's 5G technology, let alone these telecommunication companies' ongoing 5G campaigns (See Figure B in Appendices). Our analysis yielded specific and pragmatic managerial implications for Verizon's 5G marketing campaigns to stand out from its main competitors, such as AT&T, T-Mobile, and Sprint (On Nov 6, 2019, FCC officially approved the merger of T-Mobile and Sprint, which promised they would cover 97% of the U.S. population with 5G services within 3 years).

Background

1. Market

Verizon is in the telecommunications industry. “In 2019, fifth-generation (5G) wireless technologies are virtually certain to dominate the thinking of providers across the telecommunication industry.” (Deloitte, “2019 Telecommunications Industry Outlook” 2) Therefore, in order to lead the game in the 5G wireless network, industry players are focusing on devising new business models to monetize 5G and other derived opportunities. To be more specific, as mentioned, “One of the main opportunities could come from consolidations and partnerships, especially in the areas of cable and content.” (3) observing a trend among customers preferring video streaming services over cable subscriptions, industry players are considering integrating content and media with communication services to fulfill customers’ constantly changing needs. In addition, “two other key revenue-generating opportunities for telecom providers will be mHealth and mPayments.” (3) In mHealth, industry players are targeting customers who have adopted wearable devices for monitoring their health conditions.

On the other hand, in mPayment, industry players play the role of an integrator, integrating mobile communications, mobile applications, payment methods and etc. Therefore, for Verizon to keep or expand its market penetration, it is crucial that Verizon continues developing its business in the 5G wireless network and pays attention to integrating content and services it offers.

2. Customers

Key customers come from two main groups: wireless and wireline. While in wireless the customers are primarily residential, in wireline there are more enterprises and businesses. Under wireless, customers subscribe to either post-paid or pre-paid. Based on the fees of either service,

customers fell under the low-income group pick pre-paid largely over post-paid which is usually priced higher. (Sheffer, "Key Customers in The Telecom Industry") However, generally speaking, a majority of the wireless customers choose post-paid service to avoid high switching fees. On the other hand, under wireline, a majority of the customers come from businesses. Due to the need to maintain high network solutions and multinational coverage, customers usually "need a fixed-line infrastructure for their dedicated lines". (Sheffer) Therefore, they usually "have a high fixed cost component. They also have a longer-term contract. "

As a conclusion, based on our customers from these two main groups, it is crucial for Verizon to extend their service lines and devise different promotional strategies to cater to customers' needs. In addition, Verizon should pay attention to the current hot trend of 5G. As more and more customers expressed interested in adopting 5G wireless service, it is beneficial for Verizon to extend service lines relevant to 5G so that they can retain and attract more customers.

3. Competitors

Verizon (VZ), along with its competitors AT&T (T) and Sprint (S), are the large integrated telecom companies, all of which are publicly-traded companies. They provide wireless and wired services. T-Mobile (TMUS), another major competitor of Verizon, is a listed national wireless operator. Traditionally, regional wireline players—like CenturyLink (CTL), Frontier Communications (FTR), and Windstream Holdings (WIN)—are the other key telecom companies listed in the US.Verizon has the largest market share in the US among all carriers. As of Q3 in 2018, Verizon accounts for 34.91% of the entire market, closely followed by AT&T, which is 34.07%, and then T-Mobile and Sprint, which are 17.51% and 12.13%. However, if we take a closer look at their performance, AT&T's revenue in 2018 is 170.72 billion while

Verizon's is 130.86 billion. (Statista) At a glance, it seems that Verizon needs to improve its profitability to keep up with its main competitor AT&T (See Figure C in Appendices).

4. Products and Services

Verizon Communications Inc. through its subsidiaries, provides communications, information and entertainment products and services to consumers, businesses and governmental agencies. Its segments include Wireless and Wireline. The Wireless segment offers communications products and services, including wireless voice and data services and equipment sales, to consumer, business and government customers across the United States. The Wireline segment offers voice, data and video communications products and services, such as broadband video, data center and cloud services, security and managed network services, and local and long-distance voice services. The Company has combined Yahoo! Inc.'s operating assets with its existing AOL Inc. business to create a new subsidiary, Oath Inc., owns a diverse house of more than 50 media and technology brands. The Oath portfolio includes HuffPost, Yahoo Sports, AOL.com, MAKERS, Tumblr, Yahoo Finance and Yahoo Mail. (Reuters)

Methodology and Data Analysis

1. What Did We Do in General?

At first, we aggregated all 226,129 transactional data to customer data. Since the data set is too large, we cannot run a hierarchical analysis with all the data directly. We picked 4% of total customer data individually as random subset one and random subset two. In each data subset, we run the hierarchical ward's method and hierarchical furthest neighbor method based on three variables (order number, profit, and order quantity) to identify the initial seeds. Then we removed the filter and ran K-Means cluster analysis. In each data subset, we compared the

K-Means cluster analysis outputs made by the Ward's method and Furthest Neighbor method, and then we picked one output for each data subset. Finally, we compared the outputs of two data subsets and picked one as our final clusters.

2. Data Analysis

With the given transactional data at hand, we needed to aggregate them to customer data. In step1, we used aggregate data function, break CUSTNO variable, then put ZIP, CHANNEL, COST, REVENUE, PAT_METHOD, QUANTITY, ORDER_DATE variables into aggregated variables part. For each aggregated variable, we used different functions.

Table 1 Aggregate Data--Chosen Variables and Functions

Variable	**Function**	**Reasons**
Zip	Last	The last zip should be where customer live now
Channel	Last	The last channel is more likely to be the channel customer use now
Cost	Sum	How much cost has this customer generated
Revenue	Sum	How much revenue has this customer generated
Payment Method	Last	Last payment method is likely to be the method that customers use now
Quantity	Sum	How many units' orders ordered by each customer
Order Date	Last	How recently this customer bought our product
Order Number	Unweighted	How many orders are ordered by each customer

After aggregating the data, we created two new variables (profits and recency). For the profit variable, we used compute variables function in SPSS via the sum of revenue minus the amount of cost. For the recency variable, we used the Date Difference function to calculate out how many months are between the customer's last order and current date. Then we decided to use four variables for our hierarchical analysis.

Table 2 Chosen Variables in Hierarchical Analysis

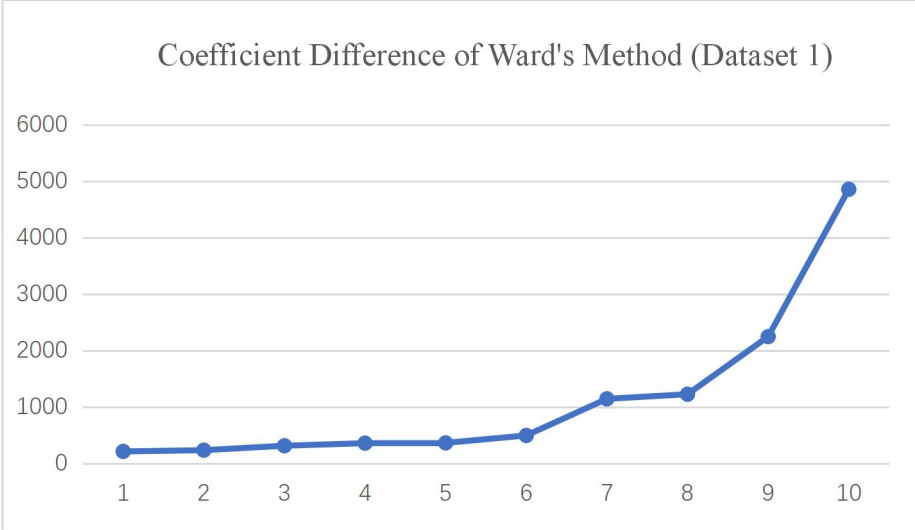
Variable	**Reasons**
Order Number	The more products that customers ordered, the more likely that they are profitable customers
Profit	Our target customers are who have higher profit
Recency	The more recently customers buy our product, the more likely they are our loyal customers
Quantity	More quantity ordered by this customer, more likely they are profitable

Then we chose the first dataset (4% of total data) to run a hierarchical analysis.

First, we used the descriptive function to form all four variables that we selected into standardized values. Then we chose all four values to run a hierarchical analysis (Ward's method).

Second, after comparing the coefficient difference, we found that last five points have relative larger differences. So, we chose four to six as the range of our clusters.

Figure *1 Coefficient Difference of Ward's Method*



In table 3. We compared the result differences between four clusters and five clusters, and we thought five clusters is better because the 2nd cluster in four clusters (Panel A) is divided into 2nd cluster and 4th cluster in five clusters (Panel B). The 2nd cluster in five clusters (Panel B) is what we want since it has relatively high order numbers. So, we chose five clusters.

Table 3 Comparing Four Clusters and Five Clusters Using Ward's Method

Panel A – Ward's Method with Four Clusters

	Ward Method (Dataset 1)							
	1		2		3		4	
	Mean	Count	Mean	Count	Mean	Count	Mean	Count
Order Number	4	190	1	2173	1	1629	10	17
Profit	391	190	99	2173	58	1629	1061	17
Quantity	9	190	2	2173	1	1629	26	17
Recency	27	190	26	2173	63	1629	31	17

Panel B – Ward's Method with Five Clusters

	Ward Method(dataset1)									
	1		2		3		4		5	
	Mean	Count	Mean	Count	Mean	Count	Mean	Count	Mean	Count
Order Number	4	190	2	780	1	1629	1	1393	10	17
Profit	391	190	170	780	58	1629	59	1393	1061	17
Quantity	9	190	4	780	1	1629	1	1393	26	17
Recency	27	190	36	780	63	1629	20	1393	31	17

In Table 4, we compared the result differences between five clusters and six clusters, and we thought six clusters is better because the 2nd cluster in five clusters (Panel A) is divided into 2nd cluster and 4th cluster in six clusters (Panel B). The 4th cluster in six clusters (Panel B) is what we want since it has relatively low recency, which means they ordered our product recently. So, we chose six clusters.

Table 4 Comparing five clusters and six clusters using Ward's method

Panel A – Ward's Method with Five Clusters

	Ward Method(dataset1)									
	1		2		3		4		5	
	Mean	Count	Mean	Count	Mean	Count	Mean	Count	Mean	Count
Order Number	4	190	2	780	1	1629	1	1393	10	17
Profit	391	190	170	780	58	1629	59	1393	1061	17
Quantity	9	190	4	780	1	1629	1	1393	26	17
Recency	27	190	36	780	63	1629	20	1393	31	17

Panel B –Ward's Method with Six Clusters

	Ward Method(dataset1)											
	1		2		3		4		5		6	
	Mean	Count	Mean	Count	Mean	Count	Mean	Count	Mean	Count	Mean	Count
Order Number	4	190	2	393	1	1629	2	387	1	1393	10	17
Profit	391	190	168	393	58	1629	171	387	59	1393	1061	17
Quantity	9	190	3	393	1	1629	4	387	1	1393	26	17
Recency	27	190	56	393	63	1629	17	387	20	1393	31	17

Using the method mentioned above, we decided to use six clusters, and then we used four standardized variable values to run the hierarchical analysis again and get the initial seeds of the ward's method (Dataset 1)

Table 5 Data Seeds of Ward's Method

	Ward's Method					
	1	2	3	4	5	6
	Mean	Mean	Mean	Mean	Mean	Mean
Standardized (order number)	2.80270	0.50155	-0.36093	0.59928	-0.36093	8.33742
Standardized(profit)	1.63004	0.37383	-0.24550	0.38970	-0.23910	5.40162
Standardized(recency)	-0.55963	0.60181	0.87088	-0.97962	-0.84683	-0.39455
Standardized(quantity)	2.27198	0.37642	-0.30312	0.55443	-0.33137	8.07830

Then we use these seeds to run K-Means analysis. We used standardized four variables and iterated 100 times. Then we got the K-Means result of Ward Method of Dataset 1. (Panel A)

Table 6 Comparing Ward's Method and Furthest Neighbor Method of Dataset 1

Panel A – K-Means Analysis Result of Ward's Method (Dataset 1)

	K-Means analysis result of Ward's Method(dataset1)											
	1		2		3		4		5		6	
	Mean	Count	Mean	Count	Mean	Count	Mean	Count	Mean	Count	Mean	Count
Order	6	1412	2	10561	1	40896	3	6570	1	40371	12	87
Profit	749.39	1412	177.87	10561	55.60	40896	289.02	6570	70.24	40371	2861.81	87
Recency	23.82	1412	52.79	10561	63.33	40896	20.90	6570	19.08	40371	20.79	87
Quantity	15.87	1412	4.13	10561	1.39	40896	6.48	6570	1.61	40371	44.41	87

Panel B – K-Means Analysis Result of Furthest Neighbor Method (Dataset 1)

	K-Means analysis result of Furthest neighbor Method(dataset1)											
	1		2		3		4		5		6	
	Mean	Count	Mean	Count	Mean	Count	Mean	Count	Mean	Count	Mean	Count
Order	1	46082	5	2399	1	40535	3	10636	10	243	4	2
Profit	66.09	46082	563.27	2399	68.90	40535	240.85	10636	1655.46	243	20278.65	2
Recency	63.03	46082	24.15	2399	19.60	40535	30.90	10636	20.19	243	37.00	2
Quantity	1.63	46082	12.29	2399	1.59	40535	5.37	10636	31.08	243	165.00	2

With the same method, we can get the K-Means result of the Furthest neighbor method of Dataset 1. (Panel B)

Then we compared the result of these two methods. We thought the ward's method result is much better because 6th cluster of the Furthest neighbor method is too small to represent our customers and offer any meaningful information.

After getting the final cluster result of Dataset 1. In order to avoid the result difference made by a random data set. We started to choose the second data set (4% of the total data set) and run the analysis again to make sure we didn't miss any valuable data. With the same method, we got the K-Means analysis result of Ward's method and Furthest neighbor method for Dataset 2.

Table 7 Comparing Ward's Method and Furthest Neighbor Method of Dataset 2

Panel A – K-Means Analysis Result of Ward's Method (Dataset 2)

Ward's - Dataset 2														
Variables	1		2		3		4		5		6		7	
	Mean	Count	Mean	Count	Mean	Count	Mean	Count	Mean	Count	Mean	Count	Mean	Count
Order	1	36687	1	45377	2	12045	2	2909	8	454	5	2415	20	10
Profit	64	36687	65	45377	164	12045	427	2909	1256	454	422	2415	7944	10
Recency	20	36687	63	45377	26	12045	43	2909	20	454	22	2415	14	10
Quantity	1	36687	2	45377	4	12045	9	2909	25	454	10	2415	97	10

Panel B – K-Means Analysis Result of Furthest Neighbor Method (Dataset 2)

Furthest Neighbor - Dataset 2										
Variables	1		2		3		4		5	
	Mean	Count	Mean	Count	Mean	Count	Mean	Count	Mean	Count
Order	1	47316	3	9113	1	42529	4	2	7	937
Profit	70	47316	304	9113	74	42529	20279	2	994	937
Recency	63	47316	28	9113	20	42529	37	2	22	937
Quantity	2	47316	7	9113	2	42529	165	2	20	937

After comparing, we thought the K-means analysis result of Ward's method is better because the 4th cluster of Furthest Neighbor represents a small percentage of our sample; this cluster is too small to have any meaning for us. Thus, we chose the ward's method result as the outcome of Dataset 2. Then we compare the cluster result of Dataset 1 and Dataset 2.

Table 8 Comparing Outputs of Dataset 1 and Dataset 2

Panel A – K-Means Analysis Result of Ward's Method (Dataset 1)

	K-Means analysis result of Ward's Method(dataset1)											
	1		2		3		4		5		6	
	Mean	Count	Mean	Count	Mean	Count	Mean	Count	Mean	Count	Mean	Count
Order	6	1412	2	10561	1	40896	3	6570	1	40371	12	87
Profit	749.39	1412	177.87	10561	55.60	40896	289.02	6570	70.24	40371	2861.81	87
Recency	23.82	1412	52.79	10561	63.33	40896	20.90	6570	19.08	40371	20.79	87
Quantity	15.87	1412	4.13	10561	1.39	40896	6.48	6570	1.61	40371	44.41	87

Panel B – K-Means Analysis Result of Ward's Method (Dataset 2)

Ward's - Dataset 2														
Variables	1		2		3		4		5		6		7	
	Mean	Count	Mean	Count	Mean	Count	Mean	Count	Mean	Count	Mean	Count	Mean	Count
Order	1	36687	1	45377	2	12045	2	2909	8	454	5	2415	20	10
Profit	64	36687	65	45377	164	12045	427	2909	1256	454	422	2415	7944	10
Recency	20	36687	63	45377	26	12045	43	2909	20	454	22	2415	14	10
Quantity	1	36687	2	45377	4	12045	9	2909	25	454	10	2415	97	10

Finally, we chose to use the result of dataset1 because the result of Dataset 2 have 7th cluster which just has 10 customers, the 6th cluster of dataset1 already has high enough profit and we decided to give those customers highest premium standards, such a small cluster(7th cluster) in dataset2 is not very meaningful for our managerial decisions.

Key Findings and Managerial Implications

1. Key Findings

- **By segmenting customers, we could achieve the goal of increasing Verizon's operating income and lowering the costs of services and SG&A (Selling General and Administrative) expenses.** According to Verizon's 2018 annual report, the operating revenue kept growing since 2016; however, the operating income was decreasing meanwhile. The reason behind this problem was an increasing operating expense resulting from high costs of services and SG&A expenses. With customized promotional strategies for target customer segments, we sought to implement more efficient and effective 5G marketing campaigns to reduce costs and yield more income.
- **Facing the current hot trend of the 5G wireless network revolution, Verizon should take the initiative in transforming the wireless business from technology-driven to customer-focused.** In the past, Verizon followed the traditional track of dividing customers into wireless and wireline by service lines. However, this approach was proven inefficient in today's business world because almost everything is going mobile and wireless. To be proactive, Verizon merged its services with the trending 5G and seized the chance. "The goal of Verizon is to streamline its network operations to serve all types of customers, especially as next-generation 5G networks replace both legacy wireless and wired

connections." (Jasinski) Therefore, to achieve this ultimate goal, "the realignment of Verizon's segments began in April and included two new divisions, Consumer and Business, to replace Wireless and Wireline." Under the Consumer division, there are consumer wireless and consumer wireline business, which accounted for 68% of Verizon's $131 billion revenue in 2018. By transforming the business to be more customer-focused, Verizon would be able to monetize 5G technology and other derived opportunities, to obtain another gold mine soon.

- **We identified five types of customers from six customer clusters,** after we conducted a hybrid of Hierarchical and K-Means Cluster Analysis from 226,129 transaction records of 100,000 random U.S. customers. These five types of customers were: Premium VIP Customers, VIP Customers, Insider Customers, Regular Customers, and One-time Purchase Customers. Furthermore, Premium VIP Customers, VIP Customers, and Regular Customers were three main segments that we targeted to promote Verizon's 5G marketing campaigns.
- **We suggested three customized strategies for the top three target customer segments to conduct Verizon's upcoming 5G marketing campaigns.** The Vault Strategy aimed to retain the highest profitable Premium VIP Customers (Cluster 6), the Sweets Strategy aimed to maintain and encourage VIP Customers (Cluster 1) to turn into Premium VIP Customers, and the Snowball Strategy aimed to develop Regular Customers (Cluster 5) into a powerful main force to increase sales.
- **We learned that customers preferred VISA, Master Card, and American Express as primary payment methods, and making purchases via cell phones and websites; also, there were ideal specific regions, and top five choices of featured products and services for 5G campaigns.** After we conducted post-hoc analysis of customers' payment methods,

purchase channels, and search interests in “5G” and “Verizon 5G” terms distributed by geographics in the U.S. Northern, Central, and Eastern states seemed to have great interest in “Verizon,” which could be pilot target markets to test outcomes of our campaigns. Then, Verizon could consider trending customer-interested search terms as featured products and services of 5G campaigns, such as trade-in discounts and monthly payment plan on Apple iPhone 11 and Samsung Note 10, strong call filters for new 5G cellphones, and one year of Disney Plus streaming services included in Verizon’s unlimited plans.

2. Managerial Implications and Recommendations

- **Five Types of Customers and Top three Choices from six Customer Clusters**

We identified five types of customers sorted from six customer clusters and 226,129 transaction records (12/16/04 to 9/17/12) in all channels (phone, web, and mail), reflecting 137,576 orders and 100,000 random U.S. customers. These six customer segments were shown as below in the Table 10: green stands for excellent performance, red stands for poor performance of variables’ means, and blue data bars are counts of variables (like battery bars). We chose the top three segments (1, 5, 6) to conduct our 5G marketing campaigns.

Table 9 Final Six Customer Clusters (Including Top Three Segments)

Ward's - Dataset 1

Variables	1(Top 3) VIP Customers		2 One-time Purchase Customers		3 One-time Purchase Customers		4 Insider Customers		5 (Top 3) Regular Customers		6 (Top 3) Premium VIP Customers	
	Mean	Count	Mean	Count	Mean	Count	Mean	Count	Mean	Count	Mean	Count
ORDER_NO_nu	6	1412	2	10561	1	40896	3	6570	1	40371	12	87
PROFIT_sum_sum	749	1412	178	10561	56	40896	289	6570	70	40371	2862	87
Recency_last_last	24	1412	53	10561	63	40896	21	6570	19	40371	21	87
QUANTITY_sum_sum	16	1412	4	10561	1	40896	6	6570	2	40371	44	87

Five types of customers are shown in the Table 10, yellow stands for top three segments and green stands for outstanding attributes:

Table 10 Attributes of Five Types of Customers

Customer Type	Profitability (Profit)	Loyalty&Purchase Frequency (Recency)	Purchase Volum (Quantity&Order Numbers)	Customer Group Size (Counts)
Premium VIP Customers	Very High	High	High	Very Small
VIP Customers	High	High	Medium	Medium
Insider Customers	Medium	High	Low	Large
Regular Customers	Low	High	Low	Very Large
One-Time Purchase Customers	Medium	Low	Low	Very Large

- **Three Tailored Strategies for Top three Customer Segments (1, 5, 6) to Conduct 5G Marketing Campaigns**

a. The Vault Strategy (Premium VIP Customers - Segment 6)

What managers should do: This was the highest profitable (Profit: 2862) segment, just like a vault filled with gold that we had to retain and secure. Since this customer group size (Count: 87) was the smallest among six segments, the manager could consider offering the strongest promotions and incentives of high-end 5G plans, new 5G cell phones and specialized customer services, such as in-person holiday greetings from marketing managers, private hotlines and birthday gift surprises.

b. The Sweets Strategy (VIP Customers - Segment 1)

What managers should do: Again, this segment was another highly profitable (Profit: 749) customer group with a relatively small size (Count: 1412). The manager should offer these customers medium-high end promotions and incentives, and try the best to retain and encourage these customers to turn into Premium VIP Customers with more and more "sweets," such as

additional discounts or cashback for sending invitations and referrals to friends and family members, and different progressive levels of coupons or cashback when they reach specific amounts of purchases.

c. The Snowball Strategy (Regular Customers - Segment 5)

What managers should do: Even though this segment's customers had low profitability (Profit: 70), the group size (Count: 40371) was too big to overlook, and this segment could become a gold mine for the upcoming 5G campaigns. We suggested the manager offered affordable entry-level 5G plans, new discount 5G cell phones with old cell phones trade-in, and other fair supporting services. Because these customers had strong loyalty to us and purchased our products or services frequently, they would be a reliable, stable and main force to snowball sales during 5G marketing campaigns.

- **Payment Methods and Purchase Channels Insights from Post-hoc Analysis**

a. Payment Methods Insights (See Figure D in Appendices)

We conducted a post-hoc analysis and recoded payment method variables, and eventually generated 4 types of payment methods (VI - VISA, MC - MasterCard, AX - American Express, OT - Others), representing our customers' newest payment methods from the top three segments. According to the results, we can partner with VISA, MasterCard, and American Express to promote Verizon's further 5G marketing campaigns, such as launching collaborative advertisements on Verizon's and major banks' mobile apps.

b. Purchase Channels Insights (See Figure E & F in Appendices)

Moreover, we summarized three types of purchase channels (PH - Phone, WE - Web, ML - Mail), representing our customers' newest purchase channels from the top three segments. According to the results of post - hoc analysis, customers from the top three segments preferred

purchases made through phones and websites, resulting in mail soon would be obsolete. As for the interesting Consumer Insights from Think with Google (Data collected from the U.S. 18+ users between Nov. 2017 to Jan. 2018), we found that **93%** of shoppers said they had **used online resources** in the past week; more than **50%** deal seekers **used a mobile phone** to shop even while they were in a store, and **six in ten** of the online purchases deal seekers made were **made on mobile**; more than **50%** of people said they wouldn't consider purchasing from a brand that had a poorly designed **mobile site**. So Verizon's 5G campaigns should emphasize utilizing well-designed mobile apps and sites that could make easy and valid contact with current and potential customers.

- **Geographic Insights from Google Trends for Campaign Decision-Making (See Figure G in Appendices)**

From Google Trends' geographic "5G" term comparison of Verizon and Verizon's main competitors, we learned at least 2 constructive insights. First, Northern (e.g., Wyoming, Montana, North Dakota), Eastern (e.g., New York, New Jersey, Virginia) and Central (e.g., Nebraska, Iowa) States in the U.S. have great interest in "Verizon." We can leverage these regions as first pilot target markets to test outcomes and to boost our further 5G campaigns with experience.

Second, the top 5 Verizon's customer-interested products or services in the U.S. are: Verizon Call Filter, Verizon Note 10, Verizon iPhone 11, Verizon Disney Plus and Verizon Call Filter Free. We should consider including these trending products as featured products and services of 5G campaigns, such as free and premium call filters for 5G cellphones, trade-in discounts and monthly payment plan (e.g. 24-month at 0% APR and use Apple Card as payment

method to get 3% Daily Cash) on Apple iPhone 11 and Samsung Note 10, and including 1 year of Disney Plus streaming services with Verizon's unlimited plans.

Conclusions

In conclusion, to increase operating income and to lower cost by segmenting customers for the upcoming Verizon's customer-driven 5G marketing campaigns, on the one hand, we identified five types of customers after conducting a hybrid of Hierarchical and K-Means Cluster Analysis, from 226,129 transaction records of 100,000 random U.S. customers. From these five types of customers, we selected the top three target segments and proposed three customized and practical strategies for retaining and developing more profitable customers. Furthermore, we conducted post hoc analysis of customers' payment methods, purchase channels, and search interests in terms such as "5G" and "Verizon 5G" distributed by geographics in the U.S. Then we gained further insights into target customers' purchase preferences and practical managerial implications for Verizon's upcoming 5G marketing campaigns.

On the other hand, we were aware of several limitations of our analysis, such as relatively outdated transactional data with long timespan, not utilizing all variables, and lack of understanding on target customers' overall attitudes to Verizon's new 5G services. Finally, we explored the major causes and possible solutions to future research.

Limitations and Future Research

Based on our current study, we believed that we had several limitations that managers must consider when interpreting our results. First, our data was relatively outdated; it ranged from 2004 to 2012, differing the timeline of Verizon's industry from our conducted analysis. To

be more specific, the 5G wireless service trend became hot in 2018. Therefore, it would be better if we could access more updated data with shorter timespan, regarding our managerial implications for Verizon's current performance in the telecommunications industry.

Second, there were limitations in the analysis we conducted from our given variables. For instance, we had variables such as quantities of returning and shipping that were not suitable to conduct further analysis, since most of Verizon's products and services are intangible like monthly plans of cellphones. Moreover, transactional data such as orders that included pencils, notebooks and detergent, was not valuable enough to Verizon's 5G campaigns. We believed that our analysis was sufficient for our current study, but we did not make the most of the data given.

Lastly, we could not be sure how much our customers would be interested in Verizon's 5G wireless services from the transactional data given. Despite customer insights from Google Trends and Think with Google that we had already gained, a further step we could take was to devise surveys for customers to fill out so that we could understand customers' overall attitudes to 5G, to guide our promotional strategies and other managerial implications better.

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Appendices

Figure A Web Search Interest Results of Verizon, its Major Competitors and 5G Term

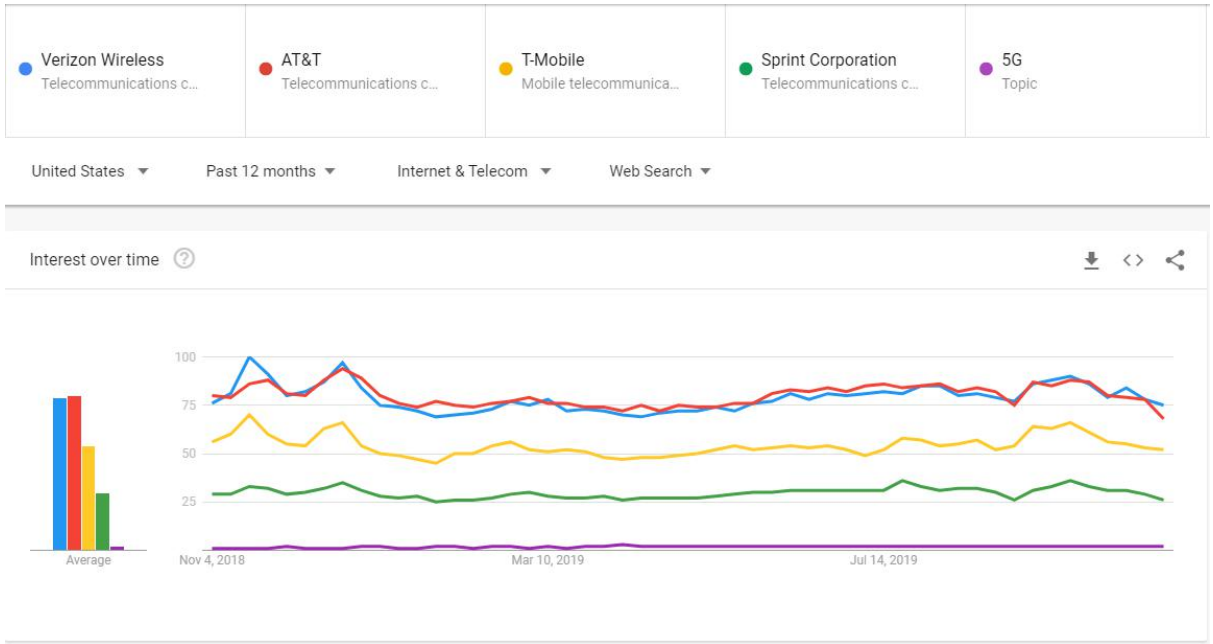


Figure B

Web Search Interest Results of Verizon and its Major Competitors attached with 5G Term

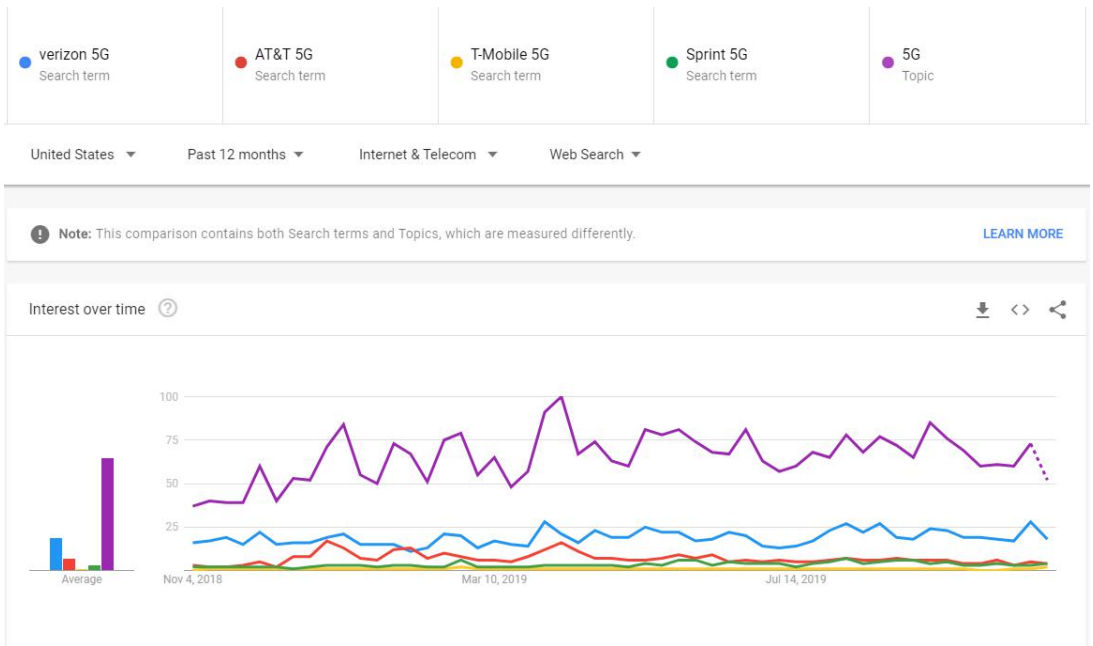


Figure C Market Share of Major U.S. Telecommunication Companies

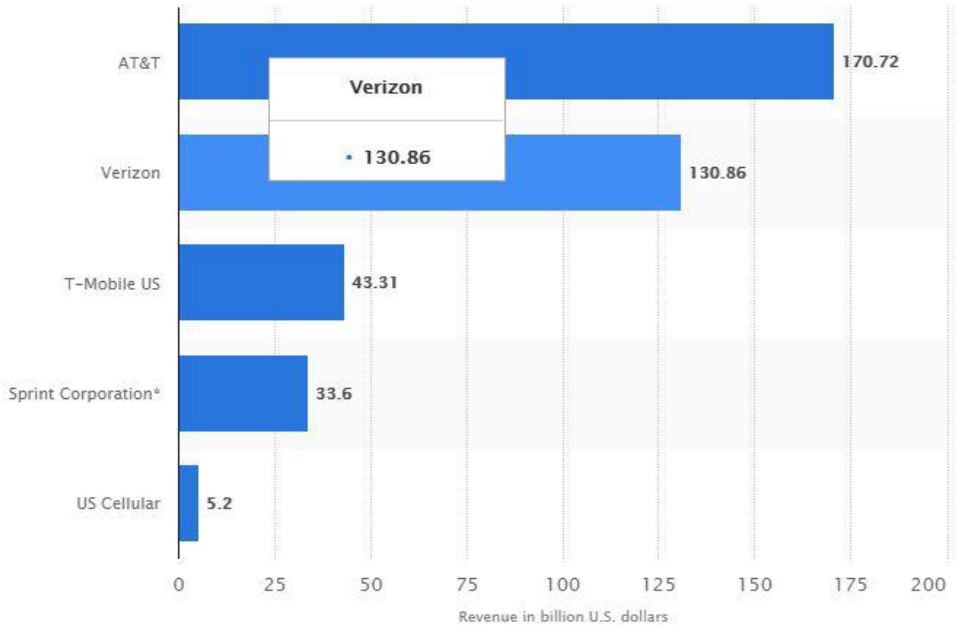


Figure D Last Payment Methods Percentage of Top Three Segments

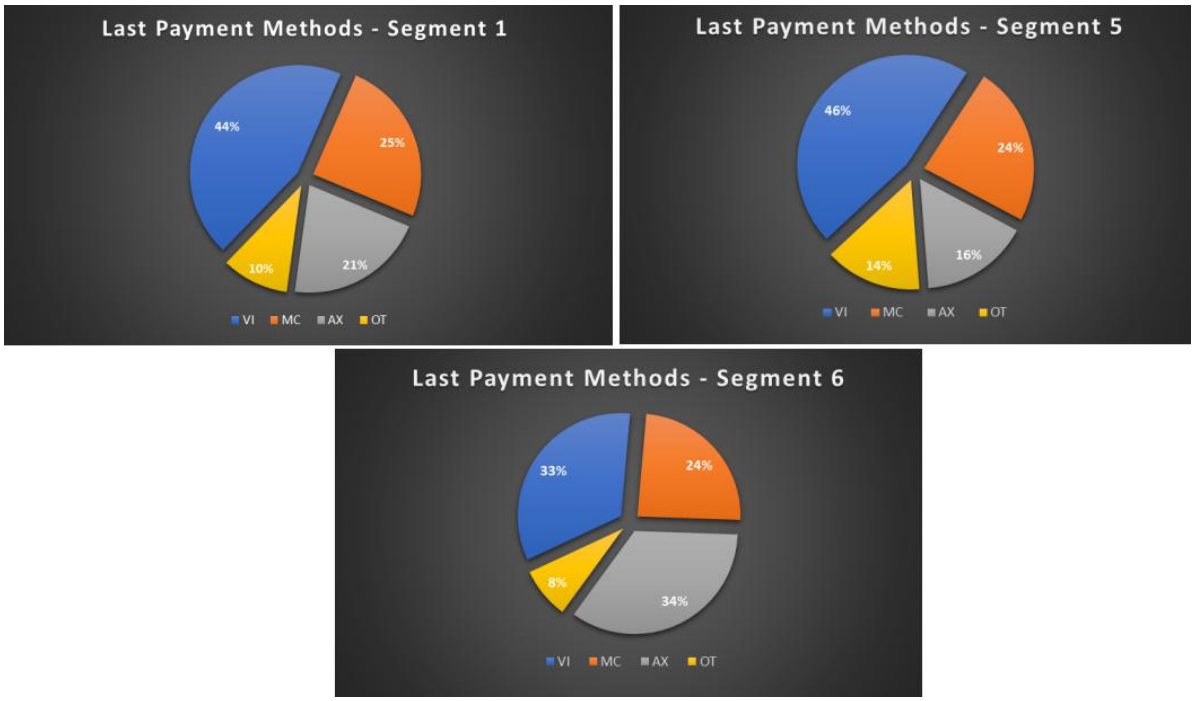


Figure E Last Purchase Channels Percentage of Top Three Segments

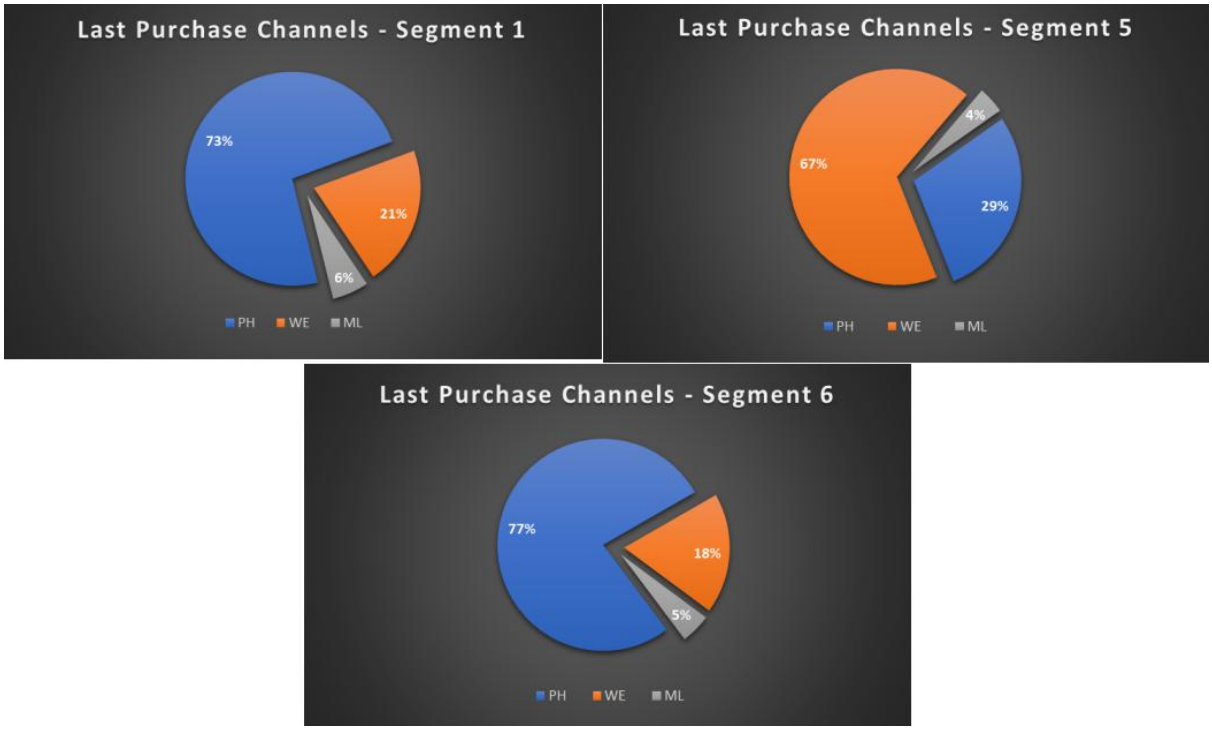


Figure F Consumer Insights into Mobile and Apps from Think with Google

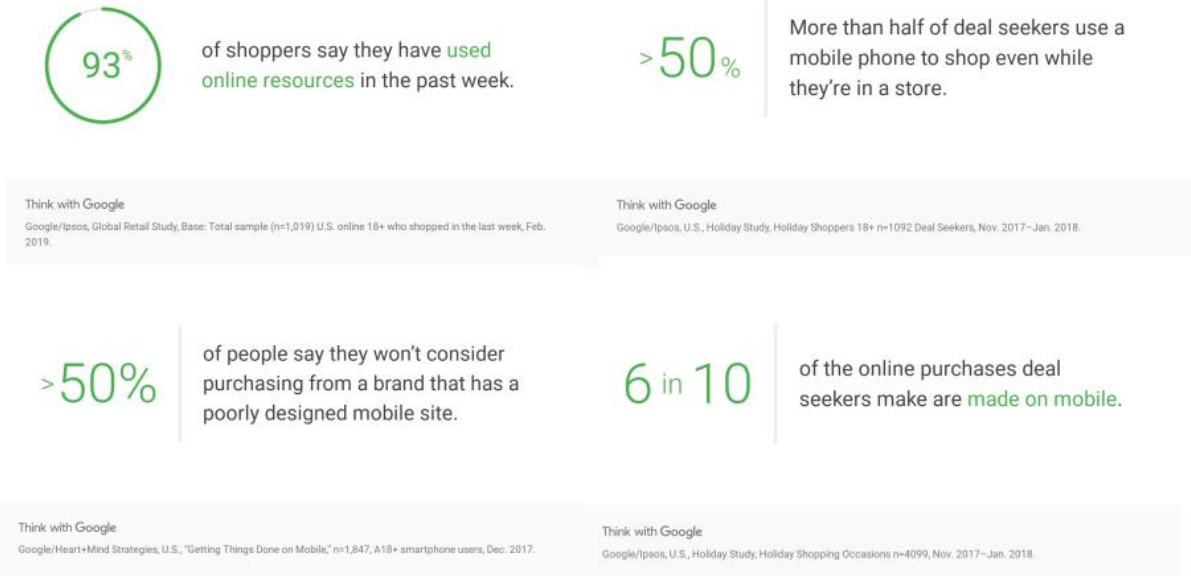


Figure G Geographic Insights into "Verizon" and "Verizon 5G" from Google Trends

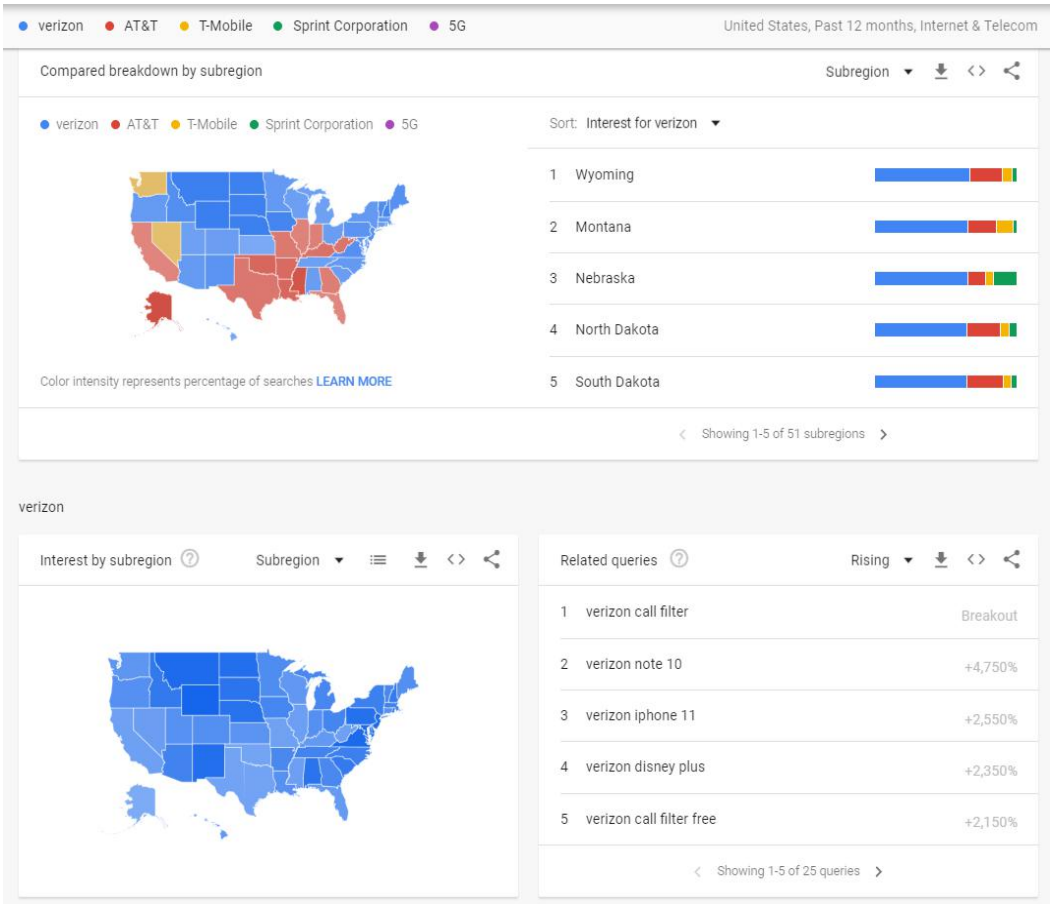
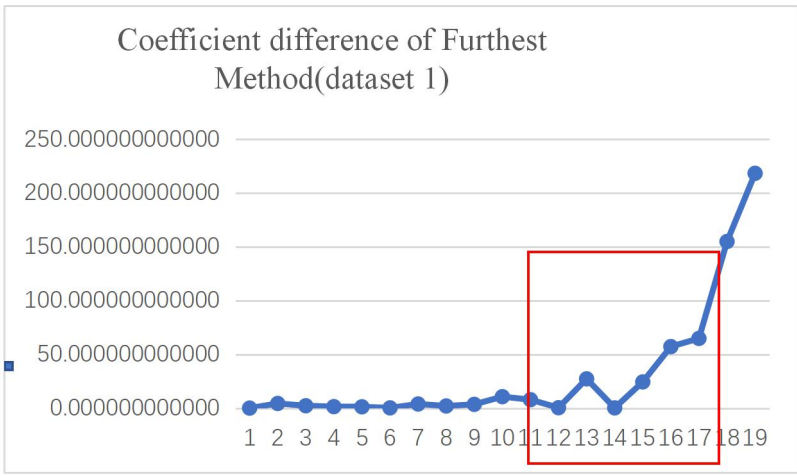
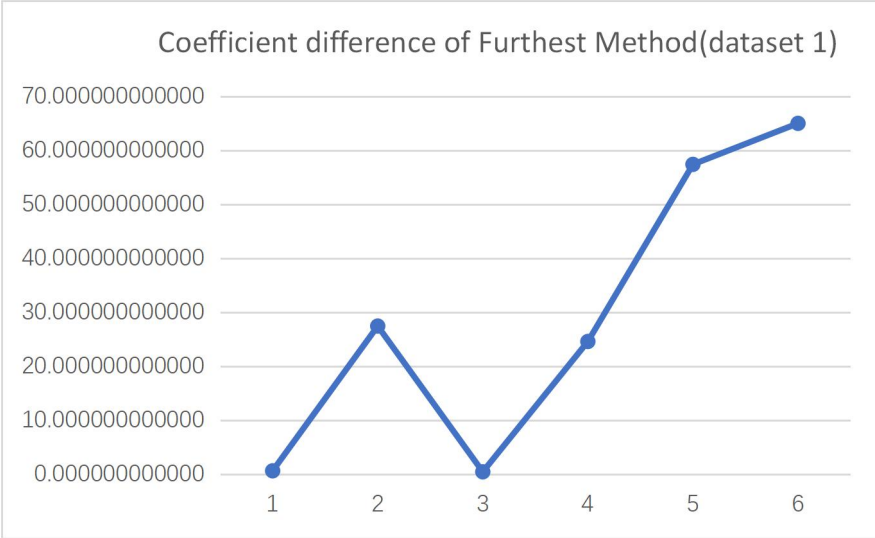


Figure H Coefficient Difference of Furthest Method (Dataset 1) (Original)



Because two points (18 and 19) are too different from the other points, so we delete those two points and draw a new chart.

Figure I Coefficient Difference of Furthest Method (Dataset 1) (Later)



As it is shown in Figure I, we decided to use five to seven as the range of our clusters.

Table A Comparing Different Cluster Result of Furthest Method

Panel 1 Five Cluster Result with Furthest Method(Dataset 1)

	Complete Linkage									
	1		2		3		4		5	
	Mean	Count	Mean	Count	Mean	Count	Mean	Count	Mean	Count
Order	1	3982	9	22	2	2	11	2	8	1
Profit	95	3982	830	22	775	2	1083	2	3639	1
Recency	41	3982	20	22	72	2	5	2	56	1
Quantity	2	3982	19	22	36	2	52	2	36	1

Panel 2 Six Cluster Result with Furthest Method(Dataset 1)

	Complete Linkage (best)											
	1		2		3		4		5		6	
	Mean	Count	Mean	Count	Mean	Count	Mean	Count	Mean	Count	Mean	Count
Order	1	3963	9	22	3	19	2	2	11	2	8	1
Profit	91	3963	830	22	903	19	775	2	1083	2	3639	1
Recency	41	3963	20	22	28	19	72	2	5	2	56	1
Quantity	2	3963	19	22	12	19	36	2	52	2	36	1

Panel 3 Seven Cluster Result with Furthest Method(Dataset 1)

	Complete Linkage													
	1		2		3		4		5		6		7	
	Mean	Count	Mean	Count	Mean	Count	Mean	Count	Mean	Count	Mean	Count	Mean	Count
Order	1	3963	9	22	3	19	2	2	12	1	9	1	8	1
Profit	91	3963	830	22	903	19	775	2	581	1	1585	1	3639	1
Recency	41	3963	20	22	28	19	72	2	1	1	9	1	56	1
Quantity	2	3963	19	22	12	19	36	2	62	1	41	1	36	1

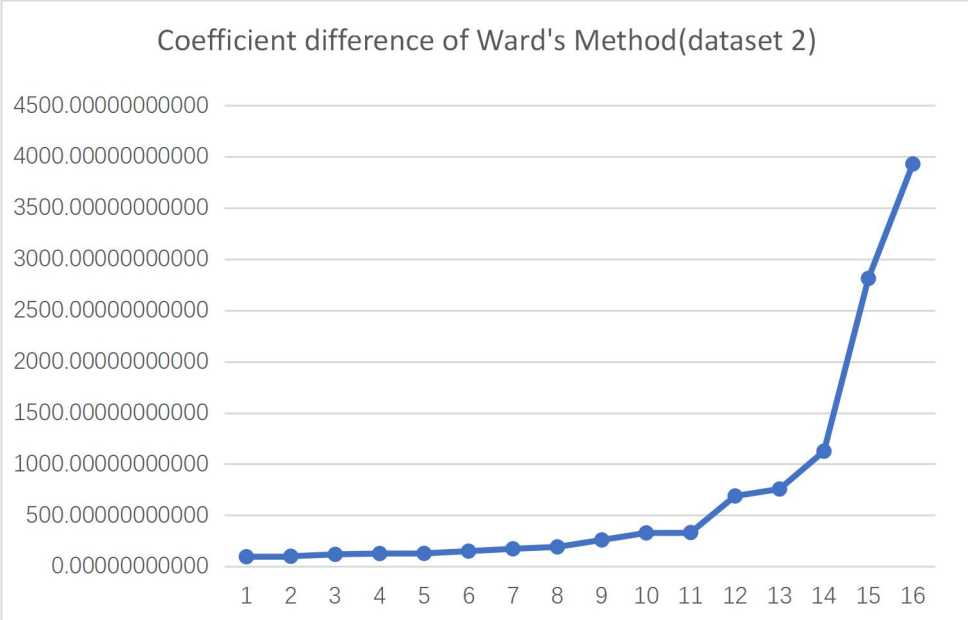
After we compared the result of different cluster numbers, we thought the result of six clusters is better, so we decided to use six clusters in our K-Means analysis.

Table B Data Seeds of Furthest Method (Dataset 1)

	Complete Linkage					
	1	2	3	4	5	6
	Mean	Mean	Mean	Mean	Mean	Mean
Zscore(Order Number)	0.05176	7.66990	1.25626	0.59928	8.76104	6.36053
Zscore(Profit)	0.06263	4.09850	4.51253	3.79001	5.52596	19.91272
Zscore(Recency)	0.00309	0.85725	0.53660	1.24652	-1.44295	0.60426
Zscore(Quantity)	0.07031	5.60449	3.40878	11.15572	16.53874	11.32394

We used these data seeds to run K-Means analysis of Furthest Method (Dataset 1)

Figure J Coefficient Difference of Ward's Method (Dataset 2)



As it is shown in the graph, the first six points have significant differences. So we chose five to seven as the range of our number of clusters.

Table C Comparing Different Cluster Result of Ward's Method(Dataset 2)

Panel 1 Five Cluster Result with Ward's Method (Dataset 2)

	Ward's Method									
	1		2		3		4		5	
	Mean	Count	Mean	Count	Mean	Count	Mean	Count	Mean	Count
Order Number	1	1902	1	1887	4	181	8	24	13	1
Profit	86	1902	71	1887	358	181	954	24	4389	1
Recency	20	1902	63	1887	32	181	23	24	1	1
Quantity	2	1902	2	1887	9	181	18	24	80	1

Panel 2 Six Cluster Result with Ward's Method (Dataset 2)

	Ward's Method											
	1		2		3		4		5		6	
	Mean	Count	Mean	Count	Mean	Count	Mean	Count	Mean	Count	Mean	Count
Order Number	1	1312	1	1887	2	590	4	181	8	24	13	1
Profit	51	1312	71	1887	165	590	358	181	954	24	4389	1
Recency	19	1312	63	1887	23	590	32	181	23	24	1	1
Quantity	1	1312	2	1887	3	590	9	181	18	24	80	1

Panel 3 Seven Cluster Result with Ward's Method (Dataset 2)

	Ward's Method(best)													
	1		2		3		4		5		6		7	
	Mean	Count	Mean	Count	Mean	Count	Mean	Count	Mean	Count	Mean	Count	Mean	Count
Order Number	1	1312	1	1887	2	590	2	63	8	24	4	118	13	1
Profit	51	1312	71	1887	165	590	472	63	954	24	297	118	4389	1
Recency	19	1312	63	1887	23	590	41	63	23	24	28	118	1	1
Quantity	1	1312	2	1887	3	590	12	63	18	24	7	118	80	1

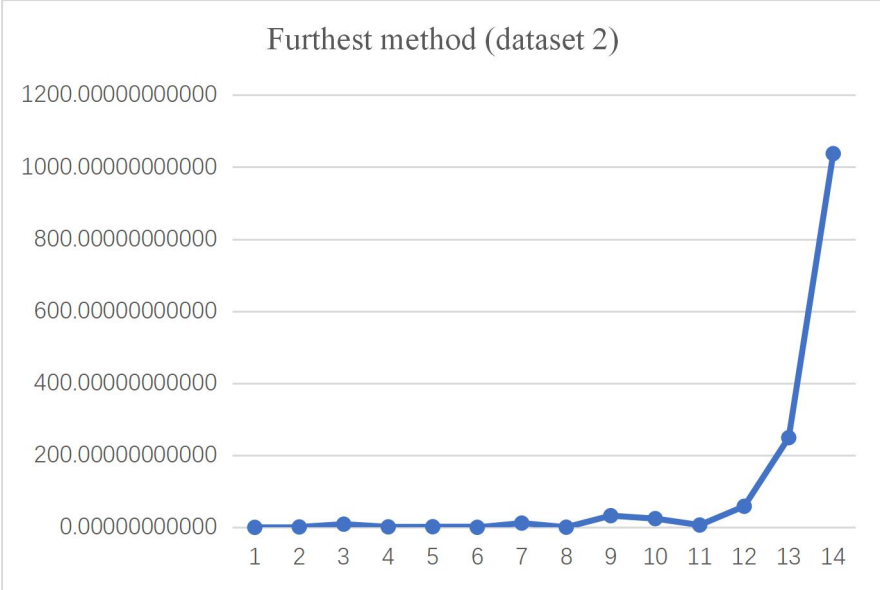
After comparing, we thought seven clusters of Ward's method is best. Since the 4th cluster in panel 2 is divided into 4th cluster and 6th cluster ,and 4th cluster is the segment of customers that we want.

Table D Data Seeds of Ward's Method (Dataset 2)

	Ward's Method						
	1	2	3	4	5	6	7
	Mean	Mean	Mean	Mean	Mean	Mean	Mean
Zscore(Order Number)	-0.36093	-0.26475	0.51628	0.82790	5.96044	2.89401	11.16156
Zscore(Profit)	-0.28817	-0.17486	0.35656	2.08248	4.79525	1.09995	24.13286
Zscore(Recency)	-0.86311	0.88559	-0.73905	-0.01124	-0.73212	-0.53365	-1.60352
Zscore(Quantity)	-0.34114	-0.19912	0.36004	3.15329	5.26805	1.55012	26.12723

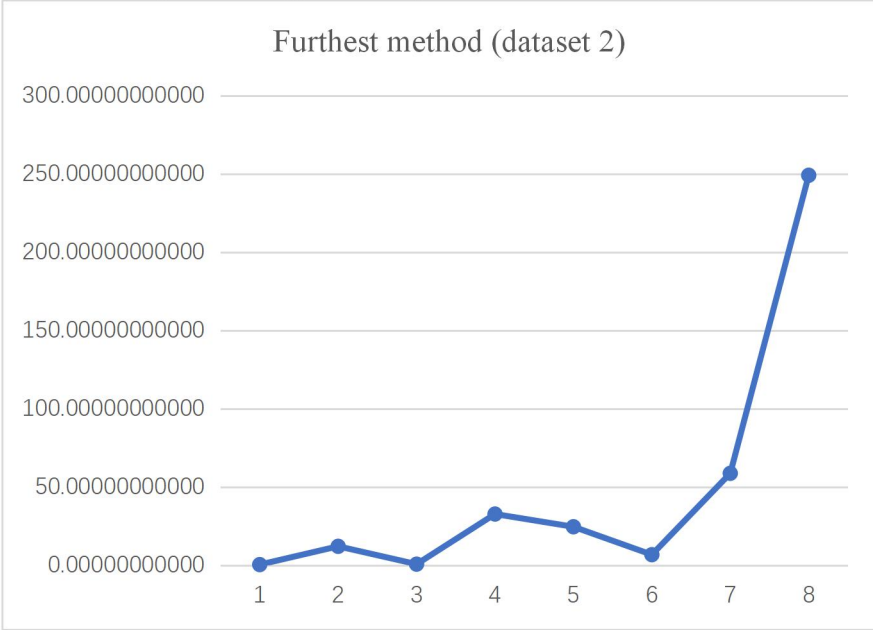
We used these data seeds to run K-Means analysis of Ward's Method (Dataset 2)

Figure K Coefficient Difference of Furthest Method (Dataset 2) (Original)



Because the point (14) has a huge difference from other points, so we deleted 14 and drew a new table.

Figure L Coefficient Difference of Furthest Method (Dataset 2) (Later)



It seems like the first five points have a relative huge difference, so we decided to use three to five as our cluster range.

Table E Comparing Different Cluster Result of Furthest Method (Dataset 2)

Panel 1 Three Cluster Result with Furthest Method (Dataset 2)

	Complete Linkage					
	1		2		3	
	Mean	Count	Mean	Count	Mean	Count
Order Number	1	3982	9	12	13	1
Profit	93	3982	1071	12	4389	1
Recency	41	3982	19	12	1	1
Quantity	2	3982	20	12	80	1

Panel 2 Four Cluster Result with Furthest Method (Dataset 2)

	Complete Linkage							
	1		2		3		4	
	Mean	Count	Mean	Count	Mean	Count	Mean	Count
Order Number	1	3982	9	11	13	1	17	1
Profit	93	3982	1023	11	4389	1	1592	1
Recency	41	3982	18	11	1	1	29	1
Quantity	2	3982	19	11	80	1	31	1

Panel 3 Five Cluster Result with Furthest Method (Dataset 2)

	Complete Linkage(best)									
	1		2		3		4		5	
	Mean	Count	Mean	Count	Mean	Count	Mean	Count	Mean	Count
Order Number	1	3925	9	11	5	57	13	1	17	1
Profit	86	3925	1023	11	573	57	4389	1	1592	1
Recency	41	3925	18	11	21	57	1	1	29	1
Quantity	2	3925	19	11	12	57	80	1	31	1

After comparing, we thought 5 clusters of Furthest method is best.

Table F Data Seeds of Furthest Method (Dataset 2)

	Complete Linkage				
	1	2	3	4	5
	Mean	Mean	Mean	Mean	Mean
Zscore(Order Number)	-0.10870	6.88428	3.58098	11.16156	15.00239
Zscore(Profit)	-0.08615	5.18829	2.65046	24.13286	8.39131
Zscore(Recency)	0.01968	-0.93571	-0.79013	-1.60352	-0.47956
Zscore(Quantity)	-0.09242	5.57390	3.31435	26.12723	9.64175

We used these data seeds to run K-Means analysis of Furthest Method (Dataset 2)