STP Analytics: Ford Ka

Youssef Lahlou, Zonghan Li, Yixuan Zhu, Ziyi Zhou

1. Segmentation: In the early 1990s

In the 1990s, the market was typically segmented by car sizes, engine output, and price. This led car manufacturers to segment consumers accordion to their age and income level. For example, smaller cars usually target younger, lower-income buyers; larger cars target older, wealthier buyers and families.

2. Strategy: Original / Updated Targeting Strategy and Key Problem to Overcome

Originally, Ford aimed to target a wide range of potential customers. On the one hand, Ford continued to sell the original version of small cars that offered basic, cheap transportation ("Basic-B"); on the other hand, Ford also targeted the emerging Trend-B small car category by using different versions of the new small car models to target different market areas.

In response to the introduction of Renault Twingo, Ford changed its strategy and decided to target a smaller market segment among urban and educated customers. Ford added innovative styling, new features, and maneuverability to the old Fiesta before finding the target market.

However, the key problem to overcome is that Ford developed Ka before finding an appropriate target market because of their shortage in time. So they need to identify target customers for the Ka quickly.

3. Market Research: Types of Research and Information

Ford conducted descriptive research through focus groups and structured personal interviews of potential target groups, as the problem of identifying target customers for the Ka is clear.

Through focus groups, Ford collected the reactions and attitudes of three potential target groups (first-time buyers, single-working professionals, and multi-car households). Through interviews, Ford collected customer characteristics and their general attitude to better understand the competitors in the small car market and customer perceptions of the Ka relative to its potential competition.

4. Cluster: Demographic and Preferences

Demographic data can't separate out people Ka choosers and Non-choosers. To determine if the demographic variables can separate out people's preferences on Ka, we performed the Chi-squared Test on the six variables in exhibit 10 with the null hypothesis that: *there is no significant relationship between people's features captured by the listed variable and their preferences over Ka.* As shown in Table 1 in Appendix, none of the p-values is less than 0.05. Thus, we cannot reject the null hypothesis, and different demographic variables cannot separate out "Ka Choosers" and "Ka Non-Choosers."

5. Factors and Clusters

We first estimated all the principal components by performing PCA without rotation. The summary of this is shown in Table 2, and the plot of variance to the component is shown in Graph 1. Notice that the elbow of Graph 2 appears at component = 4. To pick the number of factors where the variance is larger than one, but still, to keep the factors manageable, we set the number of factors to be 3.

We then perform PCA with rotations to help us better describe the factors. The factor scores, communalities, and corresponding questions are shown in Table 3. After examining the questions

with factor scores larger than 0.6 and considering each question's communality, we named RC1 to RC3 as **fashion**, **necessity**, and **freedom concerns**, respectively.

To determine the number of clusters, we plot the elbow plot, increasing the number of clusters and monitoring the inertia. As shown in Graph 2, the elbow appears at #cluster = 4. Thus, we classified the consumers into 4 clusters. To ensure that 4 is the optimal number, we calculated the silhouette score and plotted the silhouette plots for each k from 2 to 5 for the K-means model. As a reminder, the silhouette score calculates how well the clusters formed are dense and well-separated from each other. The maximum score was, as predicted previously, for k = 4. The silhouette plot in graph 3 shows that for k = 3 in comparison to the other k, the silhouette score for each cluster is above the average silhouette score, that each cluster has a similar thickness, and there is no big fluctuation in the silhouette score of each cluster. Finally, we plotted a spatial representation of each cluster in graph 4 to visualize the distance between each cluster and the importance of these in terms of membership. We now know that we have formed the right clusters (dense and well separated from each other).

We then look at each cluster's standardized differences from the overall mean to interpret the cluster. By analyzing the clusters' means in Table 4, we can see that compared to cluster 0, cluster 1 cares more about fashion, cluster 2 values necessity, and cluster 3 is looking for a more individualized and personalized car. We thus name clusters 0 to 3 as the **Traditionalists**, **Trend Chasers, Pragmatic,** and **Non-conformers.**

6. Target: Identify the target buyer

We choose K-means clustering instead of hierarchical clustering because Hierarchical Clustering can stop at any number of clusters by interpreting the dendrogram, which suits the strategy of

“analyze the market first and then design the product.” However, Ford designed KA first, then tried to pinpoint the target customers in the market, which required us to segment the customer and launch a strategy. Therefore, the K-means approach can be implemented to segment the customers.

We combined clusters with demographic data to better identify our targets and generated Table 5. The table shows that the Non-conformer cluster has a higher percentage of people favoring Ka (56%). Although the three other clusters have similar percentages of people favoring Ka (47,44,45%), the Traditionalist Cluster appears to have the second highest percentage but the highest number of people favoring Ka.

For Non-conformers, we focus on people that are: mostly married but don’t have children; Aged 40-44 and trying to buy their second car; Income 200k - 300k. For the Traditionalists cluster, we focus on people: Mostly Male (57%) who are not living with their partner and don’t have a child; Aging 30-34 and trying to buy their second carIncome 250k - 300k.

7. **Potential implementation problems**

Technically, K-means clustering can not correctly cluster non-spherical data, and we didn’t test whether our dataset is suitable for K-means clustering or not. From the business side, Though demographically similar, according to the psychophysical data, the Traditionalists and the Non-conformers have rather different images of their ideal car. As shown in Tables 3 and 4, while non-conformers don’t mind car maintenance and want a car that shows their independence, the Traditionalists favor regulations. If we were to target both clusters, we must find a balance between hippieish and conformist. Otherwise, Ka will have a confusing brand image.

Appendix

Table 1: Demographic and Preferences, Chi-square

	Ka	Non_Ka	p value
Gender_Men	47%	50%	0.78
Gender_Women	53	50	
Age_24	8	4	0.19
Age_29	15	18	
Age_34	19	17	
Age_39	9	15	
Age_44	32	20	
Age_49	17	25	
Marital_Single	57	47	0.11
Marital_Together	12	8	
Marital_Married	31	45	
Children_0	53	63	0.24
Children_1	25	16	
Children_2	22	21	
Children_2+	0	0	
CarPre_0	11	11	0.6
CarPre_1	20	18	
CarPre_2	14	19	
CarPre_3	9	4	
CarPre_3+	47	47	
CarHou_1	41	54	0.07
CarHou_2	48	43	
CarHou_3	9	3	
CarHou_3+	2	0	

Table 2: Summary of PCA without Rotation

	PC1	PC2	PC3	PC4	PC5	PC6	PC7	PC8	PC9	PC10	...	PC53	PC54	PC55	PC56	PC57	PC58	PC59	PC60	PC61	PC62
Sum of Squared Loadings	16.60	10.78	5.79	1.47	1.28	1.21	1.17	1.12	1.01	0.98	...	0.16	0.15	0.15	0.14	0.12	0.12	0.11	0.09	0.08	0.08
Proportion of Variance Explained	0.27	0.17	0.09	0.02	0.02	0.02	0.02	0.02	0.02	0.02	...	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cumulative Proportion	0.27	0.44	0.54	0.56	0.58	0.60	0.62	0.64	0.65	0.67	...	0.98	0.99	0.99	0.99	0.99	0.99	1.00	1.00	1.00	1.00

Table 3: Factor Scores

	RC1	RC2	RC3	communalitie	Questions
Q1	0.63	-0.322	0.409	0.668	I want a car that is trendy.
Q2	0.91	0.023	0.075	0.834	I am fashion conscious.
Q3	-0.119	0.687	-0.101	0.497	I do not have the time to worry about car maintenance.
Q4	0.008	0.643	-0.544	0.708	Basic transportation is all I need.
Q5	0.34	0.751	0.24	0.737	Small cars are not prestigious.
Q6	0.002	-0.021	0.113	0.013	A car is an extension of oneself.
Q7	0.064	-0.03	-0.171	0.034	My car must function with total reliability.
Q8	-0.099	0.132	-0.04	0.029	I want a car that is easy to handle.
Q9	0.093	-0.078	-0.062	0.019	I am looking for a car which delivers a smooth ride.
Q10	0.089	-0.041	-0.076	0.015	My car must function with total reliability.
Q11	0.055	-0.051	-0.018	0.006	Today's cars are more efficient than yesterday's.
Q12	-0.054	0.028	-0.117	0.017	I want a car that is fuel economic.
Q13	-0.031	0.093	-0.051	0.012	I love to drive.
Q14	-0.893	-0.136	0.249	0.877	The car I buy must be able to handle long motorway journeys.
Q15	-0.63	-0.41	0.25	0.627	I want the most equipment I can get for my money.
Q16	-0.497	-0.329	-0.393	0.51	I want a vehicle that is environmentally friendly.
Q17	-0.372	-0.805	0.182	0.82	I want a car that is nippy and zippy.
Q18	-0.528	-0.3	-0.375	0.509	I prefer buying my next car from the same car manufacturer.
Q19	-0.532	-0.302	-0.296	0.461	I wish there were stricter exhaust regulations.
Q20	-0.889	-0.043	-0.086	0.799	One should not spend beyond ones means.
Q21	-0.642	-0.381	0.26	0.625	Good aerodynamics help fuel economy.
Q22	-0.579	-0.454	0.242	0.6	Small cars are much safer nowadays.
Q23	0.897	0.044	0.126	0.822	Buying a car on a lower interest rate does not interest me.
Q24	-0.328	0.618	0.466	0.708	I want a car that drives well on country roads.
Q25	0.558	0.526	-0.248	0.651	I consider myself an authority on cars.
Q26	0.593	0.418	-0.247	0.588	Small cars are for kids.
Q27	0.458	0.413	0.397	0.538	Small cars are for women.
Q28	0.587	0.477	-0.197	0.611	Domestic made is best made.
Q29	0.447	0.381	0.342	0.462	A car is a fashion accessory to me.
Q30	0.496	0.325	0.435	0.542	Having a masculine car is important to me.
Q31	-0.616	0.51	0.479	0.87	I want a comfortable car.
Q32	-0.104	0.669	-0.085	0.466	City driving is my main concern.
Q33	-0.03	0.666	-0.018	0.445	Fuel economy comes at the expense of performance.
Q34	-0.109	0.685	-0.02	0.482	I want a practical car.
Q35	-0.061	0.713	0.028	0.512	I have always been fascinated by cars which have a cult following.
Q36	-0.104	0.721	-0.049	0.533	I like to believe that the car I drive will one day become a cult car.
Q37	-0.23	0.504	0.571	0.633	I prefer cars with high performance.
Q38	-0.077	0.682	0.058	0.475	I do not believe that a Swatch branded car will be successful.
Q39	0.106	-0.677	0.077	0.476	Small cars take up less room in today's traffic.
Q40	0.06	-0.627	0.014	0.397	I prefer small cars.
Q41	0.652	-0.488	-0.458	0.873	In today's world it is anti-social to drive big cars.
Q42	0.159	-0.487	-0.591	0.611	Many manufacturers do not really care about their customers needs.
Q43	0.059	-0.689	0.114	0.491	I would rather deal with a manufacturer's rep than a salesperson.
Q44	0.653	-0.629	-0.004	0.822	I want to buy a car that makes a statement about me.
Q45	0.743	-0.261	-0.108	0.632	A car is an extension of oneself.
Q46	0.765	-0.304	-0.017	0.678	I always want the latest style and design in a vehicle.
Q47	0.768	-0.131	-0.162	0.633	When it comes to cars my heart rules my head.
Q48	0.732	-0.287	-0.141	0.638	My car must have a very individual interior.
Q49	0.713	-0.276	-0.107	0.596	Nowadays smart cars are mainly foreign brands.
Q50	0.729	-0.274	-0.094	0.616	People ought to buy domestic products for the good of the country.
Q51	-0.774	0.207	0.185	0.675	I want a car equipped with the latest features and technology.
Q52	-0.724	0.079	0.515	0.796	I have a relationship with my car.
Q53	-0.722	0.063	0.506	0.781	Quality and reliability of products are my main concerns.
Q54	-0.771	0.162	0.112	0.634	Image is not important to me in a car.
Q55	-0.795	0.191	0.04	0.67	Cars all look the same these days.
Q56	-0.742	0.25	0.176	0.644	t environmentally friendly products do not perform as well as those they replaced
Q57	-0.13	-0.2	0.606	0.425	I want a car that has character.
Q58	-0.089	-0.115	0.661	0.458	For me a car is a symbol of freedom and independence.
Q59	-0.084	-0.224	0.633	0.458	I am interested in car maintenance.
Q60	0.093	0.05	-0.688	0.484	When buying a car I only consider a national make.
Q61	0.26	0.12	-0.675	0.537	The government should implement policies that favor public transportation.
Q62	0.159	0.144	-0.592	0.396	The government is right to tax large cars more heavily than small cars.

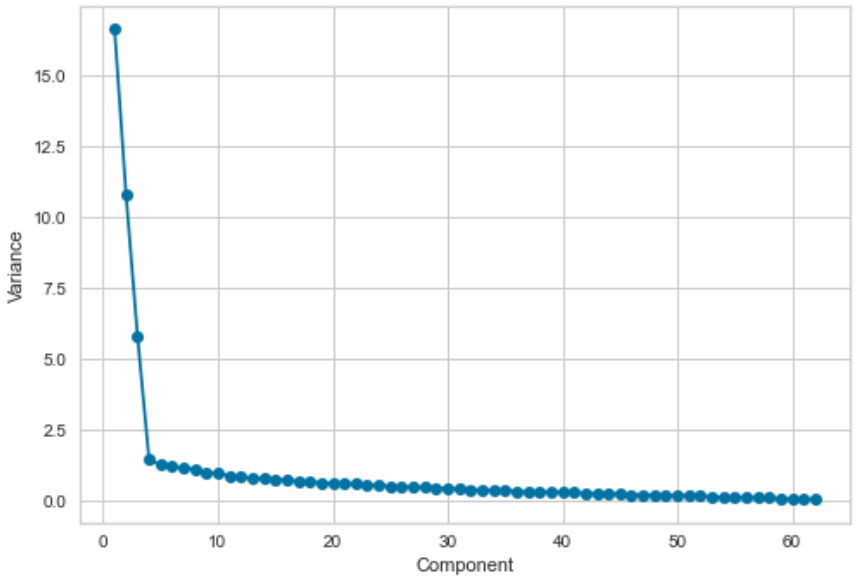
Table 4: Clusters

#Cluster	Fasion	Necessity	Freedom
0	-1.066228	-0.748296	-0.722522
1	1.383266	-0.430916	-0.245159
2	-0.200742	1.643329	-0.056442
3	-0.464984	-0.533837	2.405634

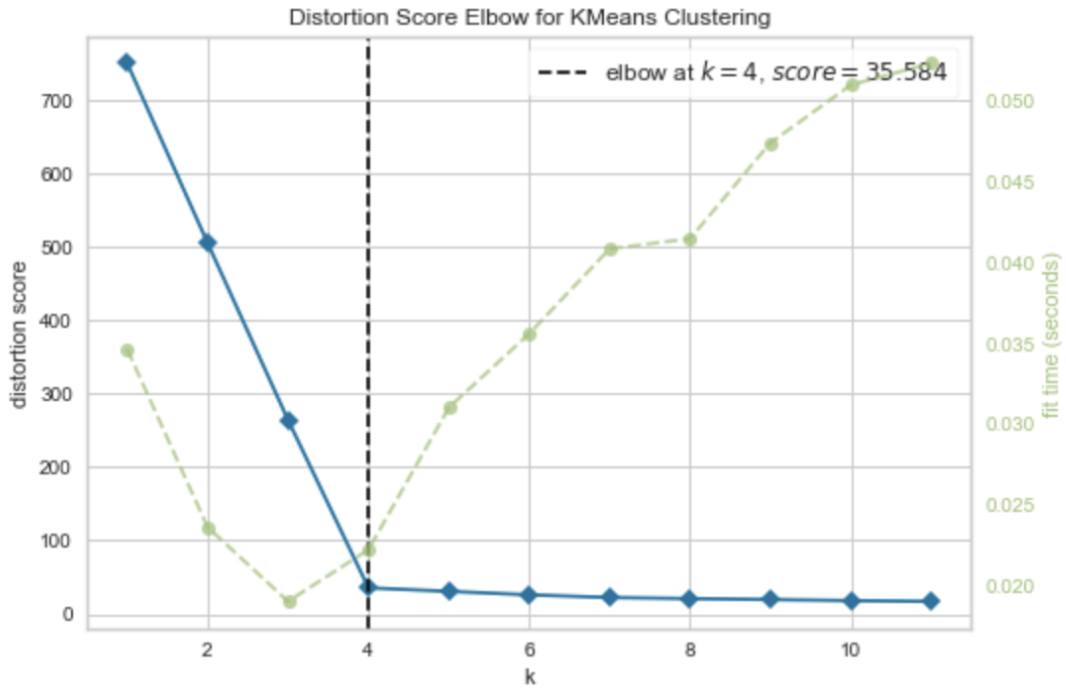
Table 5: Demographic Descriptions of Attitude Segments

Category		Traditionalists	Trend Chasers	Pragmatic	Non-conformers
Gender	**Male**	57%	59%	38%	50%
	Female	43%	41%	62%	50%
Age	**<= 25**	11%	8%	9%	13%
	-29	17%	19%	12%	22%
	-34	24%	14%	22%	13%
	-39	13%	18%	5%	13%
	-44	20%	21%	34%	31%
	>=45	15%	21%	18%	9%
Marital	**Married**	47%	54%	51%	53%
	iving Togethe	15%	10%	9%	9%
	Single	39%	36%	40%	38%
Children	**0**	63%	60%	58%	50%
	1	19%	23%	12%	25%
	>1	19%	17%	29%	25%
1st Time Purchase	**Y**	19%	13%	14%	13%
	N	81%	87%	86%	88%
Income	**<100K**	8%	6%	11%	16%
	100K - 150K	12%	19%	23%	22%
	150K - 200K	19%	17%	25%	9%
	200K - 250K	17%	21%	18%	16%
	250K - 300K	24%	23%	15%	16%
	>300K	20%	14%	8%	22%
Ka Preference	**High**	47%	44%	45%	56%
	Medium	31%	17%	49%	13%
	Low	23%	40%	6%	31%

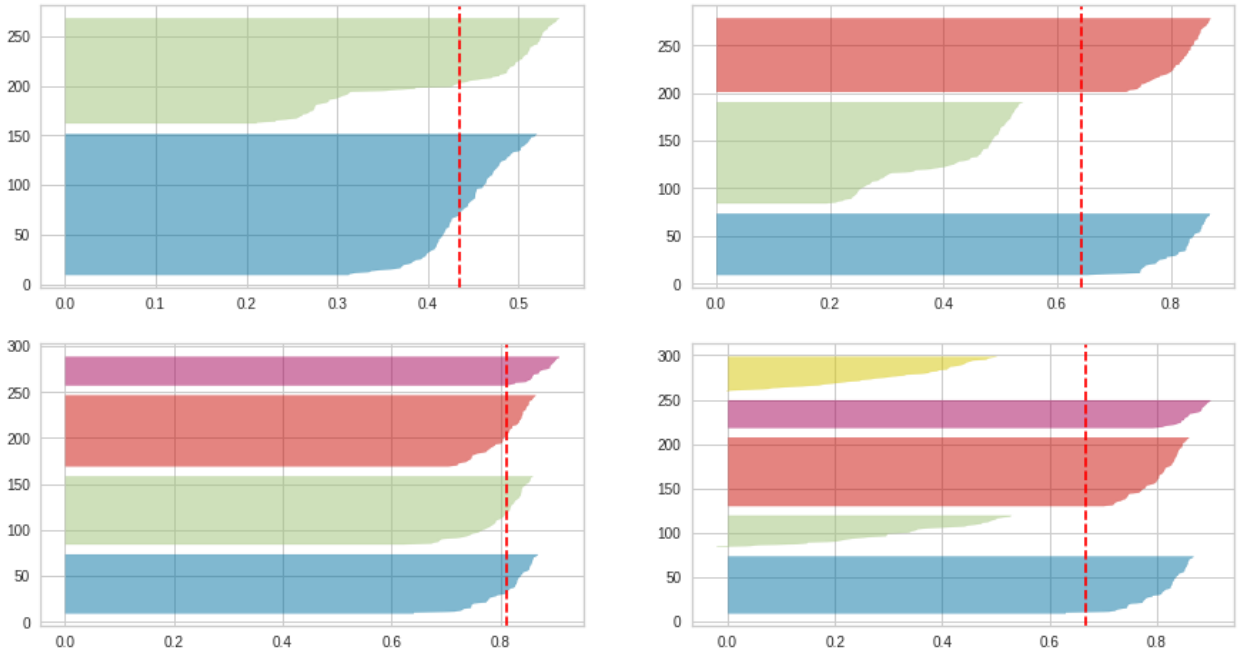
Graph 1: Factor Analysis - No Rotation



Graph 2: Elbow Plot



Graph 3: Silhouette Plot for k = 2,3,4,5



The red line represents the average silhouette score.

Graph 4: Kmeans inter-clusters distance map