NEW PRODUCT DEVELOPMENT FOR PHILIPS COFFEE MARKER

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Executive Summary

The purpose of this report is to help Philips maximize the market share by identifying the important product attributes and modifying its current coffee maker to fit consumer needs. We used 5 product attributes(Brand, Carafe Capacity, Price, Water filter & Auto Grinder) to compare the current market share of 3 brands: Philips, Krups and Cuisinart. Our findings through the Mixture Multinomial model in GLIMMIX software and conjoint study analysis concluded that there are two segments of customers. Philips should modify its existing product with a 15 cup capacity and a grinder, pricing it at $59. This product will allow Philips to accumulate 69% market share in the 1st segment and around 3.3% consumers in the 2nd segment making it a leader in the coffee maker market with an overall market share of 52%.

Introduction & Background

Philips is one of the leading technology companies in the US who have hired us to assist them with their existing product that has a low market share (13%). They are looking to modify or launch a new product. The main challenge for Philips is to analyze adding or subtracting which product attributes will help them gain maximum market share. We will be using conjoint study analysis to determine the number of segments and characteristics of each segment as well as identifying new product opportunities. Research is very important for new product development as the majority of the new products tend to fail. Through conjoint study we will also examine the 5 product attributes(Appendix 1) which were chosen after conducting detailed discussions with Philips product managers, pretests, and in-depth interviews with consumers and determine the ideal new product introduction strategy and market potential for this new product including if it will impact the existing Philips products.

Data & Methodology

Our team was given data from a commercial conjoint analysis study on coffee makers for the electronics manufacturer Philips. 3 brands in this market are Philips, Cuisinart & Krups. Through factorial design, the 5 product attributes used in the study (Appendix 1) formed 108 different product profiles. Using fractional factorial design, these were reduced to 16 different product profiles. These 16 product profiles were then categorized into 8 blocks with 3 alternatives each, through a process known as blocking. The 185 participants in the study were divided into groups of two. Each group received these 8 blocks of choice sets, which used effect coding for dummy variables. Effects coding (-1/1/0) was used to represent the attribute levels (Appendix 2). This was done so the baseline would be the average of all attribute levels. A common product profile ("Philips, 5 cups, $79, with a water filter, without an auto-grinder") was always included as alternative #3 in all choice sets. GLIMMIX software was applied to process and illustrate our analysis. As different customers have different preferences in terms of product attributes, we segmented the customers using multinomial logit & mixture regression model in GLIMMIX. BIC values of models of different segments helped us determine the optimal number of segments (2) in the coffee maker market(Appendix 3) and the entropy of 0.88 indicated the segments were well separated (Appendix 4).

In this Multinomial Logit Model, the dependent variable is the probability of choosing a product profile by each respondent and the independent variables are the effects coded product attributes. Based on the parameter estimates of the two segments we compared introducing two products in the market for Philips: Product 5: Philips brands with 15 cups capacity, at price $59, no filter and with a grinder. *AND* Product 6: Philips brand with 5 cups capacity, at price 79$, no filter and no grinder. Using Excel we determined the predicted market share post introduction of each of the 2 products.

Key Findings

The coffee maker consumer market can be segregated in 2 segments based on preferences of product attributes. This 2-segment model was chosen because it had the lowest BIC value(Appendix 3), indicating that it was the best fit. Also, we assigned each customer to one of the two segments based on the calculated posterior membership probabilities (Appendix 9). The greater the posterior probability, the more likely the customer is to belong to that segment. *Segment 1* constitutes 74% of the population (Appendix 5). The data showed that customers within this segment show a preference for Philips, as the brand name increases the utility of the product by 0.17. Only 15-cup capacity increases the utility by 0.08 units. Whereas, removing a filter increases the utility by 0.85 and adding a grinder increases the total utility of the coffee maker by 0.11(Appendix 6). All attributes are statistically significant for this segment. *Segment 2* has 26% of the respondents (Appendix 5). In this segment, brand name & water filter are not the main considerations, thus Philips can reduce the cost per unit by removing the filter. Capacity is statistically significant with capacity of 5 units increasing the utility by 0.41 units. A price point of $79 makes the highest addition of 0.57 to utility for this segment. This segment isn't interested in a grinder in their machine as it decreases their utility by 0.7 (Appendix 6). Overall, all product attributes levels are statistically significant except brand name & water filter. We also observed that segment 2 is more price sensitive than customers in Segment 1 as price has a greater pathworth in segment 2. The model also helped us understand the relative importance of various product attributes by subtracting the largest and smallest attribute level of an attribute. We found that for Segment 1, the most critical attribute is an auto-grinder, followed by water filter, brand name and price. For segment 2, Price is the most important attribute, followed by no grinder, & carafe capacity (Appendix 7). Thus, based on the coefficient of different product attribute variables, the optimal product design for Segment 1 is (Product 5):15 cups, $59, without a water filter, with an auto-grinder, and for Segment 2 is (Product 6): 5 cups, $79, without a water filter, without an auto-grinder. We tried to predict the market shares post the launch of these two products using Excel. Product 5 will increase the total market share to 52% (68.8% in Segment 1 & 3.3% in Segment 2) & cut down other competitors' by 15.65% on average. Whereas Product 6 will increase the total market share to 15% (7% in Segment 1 & 37% in Segment 2) (Appendix 8). Both the product launches are expected to take away a major portion of Cuisinart's existing market share & relatively smaller share from Krups. Modifying to Product 5 will grow Philips' market share by 458% compared to the current one whereas modifying to Product 6 will only increase the share by 12%.

Conclusion & Recommendations

We used conjoint study and multinomial logit model to evaluate the importance of 5 attributes in Philips coffee maker and arrived at the ideal product, which was product 6 (Appendix 8). The lowest BIC value was for models with two segments: 74% consumers in Segment 1 and 26% consumers in Segment 2. This analysis helped us conclude that Philips should modify its existing product with a 15 cup capacity coffee maker with an auto-grinder, priced at $59 without a water filter. Since grinder is the most important attribute for customers in Segment 1, which is the majority of our target audience, we recommend Philips' marketing activities to primarily advertise how upgrading to the coffee maker with a good quality grinder can enhance their coffee drinking experience. Similarly, price is the most important attribute to Segment 2. Secondary focus for their ad campaigns should be on value pricing. We believe this modified product with a strong go to market strategy will help Philips accumulate 69% market share in segment 1 & 3.3% consumers in segment 2, making it the leader in the coffee maker market. Since, we predict Philips to take away a major portion of Cuisinart's share, we suggest Philips monitor Cuisinart's market strategy.

Appendix: Tables, Exhibits & Figures

Appendix 1: Attribute Level

The Table below indicates options (levels) of each attribute,
for example:Brand had 3 level- Philips, Krups, and Cuisinart
Similarly Water Filter has 2 Levels: Yes or No

Table 1. Product Attributes and Levels

Attribute Level	***Brand***	***Carafe Capacity***	***Price ($)***	***Water Filter***	***Auto-Grinder***
1	Philips	5 cups	59	Yes	Yes
2	Krups	10 cups	79	No	No
3	Cuisinart	15 cups	99		

Using the factorial design method on the above levels of the 5 attributes (Brand, Carafe Capacity, Price, Water Filter, and Auto Grinder) we conclude that 108 (= 3*3*3*2*2) different product profiles can be made.

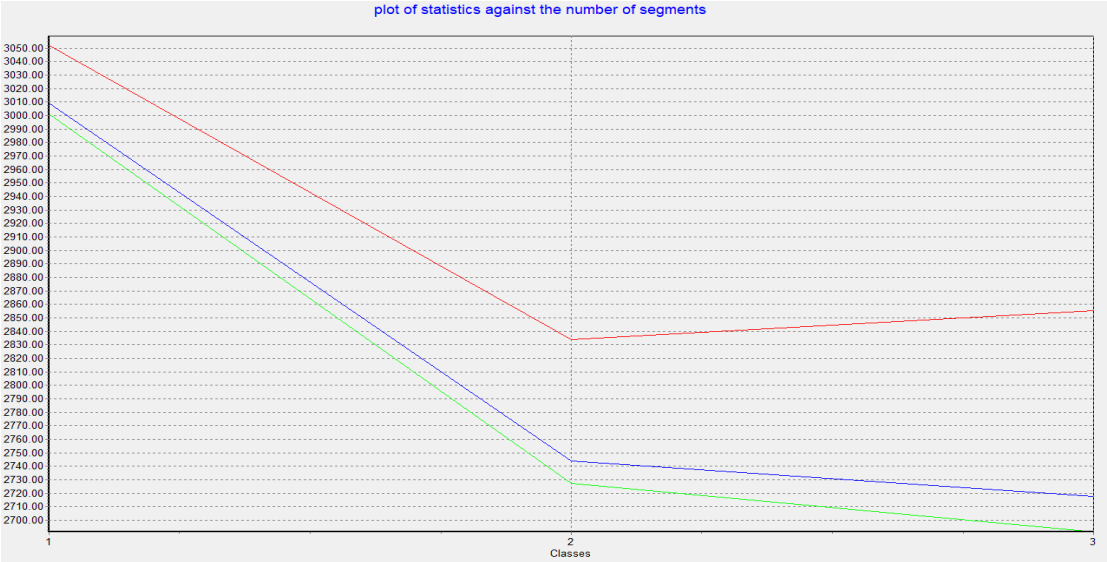
Appendix 2: Effect Coding

Below Table indicates: X_1 contains level 1, X_2 contains level 2, and X3 contains level 3 attribute.

Attribute Level	**Effect Coding**		
	X_1	**X_2**	**X3**
1	1	0	-1
2	0	1	-1
3	-1	-1	1

Appendix 3: Plots of Statistics Vs No of segments

The red line indicates BIC is lowest for 2 segment model, hence it is the most ideal model



Appendix 4: Descriptive Statistics

The below table indicates Model with 2 segments has:

- Lowest BIC (among all segments) of 2817
- Entropy of 0.88- Indicating the two segments are well separated
- R-square of 11%- Indicating that 11% of the variance for a dependent variable can explained by an independent variable or variables in a regression model

LOG LIKELIHOOD	-1346.5263
AIC	2727.0527
CAIC	2834.1493
MAIC	2744.0529
BIC	2817.1493
Entropy	0.8860
DF	17
R-Square	0.10798

Appendix 5: Coefficient & Standard error

Below table indicates 26% of population belong to segment 2 and 74% belong to segment 1

CLASS SIZE FOR SEGMENT 1 = 0.740554

Independent Variables	Coefficient Estimates	Standard Error	T value
Philips-1	0.178418	0.075652	2.358417
Krups-1	-0.194193	0.099530	-1.951103
Capacity5-1	-0.172817	0.066073	-2.615533
Capacity10-1	-0.321637	0.082266	-3.909706
Price59-1	0.190007	0.086379	2.199697
Price79-1	-0.276621	0.102369	-2.702200
Filter-1	-0.854573	0.126138	-6.774906
Grinder-1	1.119126	0.103326	10.831049

CLASS SIZE FOR SEGMENT 2 = 0.259446

Independent Variables	Coefficient Estimates	Standard Error	T value
Philips-1	0.126955	0.147256	0.862140
Krups-1	0.031675	0.151465	0.209124
Capacity5-1	0.413569	0.136392	3.032195
Capacity10-1	0.270609	0.125557	2.155268
Price59-1	0.212705	0.112839	1.885031
Price79-1	0.571494	0.237934	2.401902
Filter-1	0.106755	0.235135	0.454015
Grinder-1	-0.697830	0.143509	-4.86233

Appendix 6: 2-Segment Mixture Multinomial Logit Model Results

Model:

$U_{j,k}$ = Utility/ Attractiveness of the attribute
b = Parameter estimates
X = attribute level variable for product profile j in choice set k and attribute level p
$P(Y_{i,j,k})$ = probability of choosing product profile j in choice set k by respondent i

The parameter estimates of the model can be interpreted as following:

Segment 1:
- Philips increase the utility of the model by 0.178
- Cuisinart increases the utility by only 0.06 (= (0.178-0.194)*-1)
- Krups label decreases the utility by 0.194.
- Capacity of 5 and 10 cups lowers the utility by 0.17 and 0.32 respectively, whereas capacity of 15 cups increases the utility by 0.08.
- Adding a filtration decreases the utility by 0.855, and
- Removing the grinder reduces the utility by 0.11

Moreover for segment 1, almost all p values of the product attribute variables are less than 0.05 (except Krups-1's p value=0.0513), which means that all product attributes (brand name, carafe capacity, price, water filter, and auto-grinder) are statistically significant.

Segment 2:
- None of the brand are statistically significant indicating that none of the respondents have a strong brand preference
- 5 cups capacity adds 0.414 units to utility. 10 cups capacity adds only .27 units to utility. And 15-cup capacity on the other hand reduces the utility by 0.68 units
- The segment is indifferent to the price of $55 indicated with a high p-value and the price $99 has a negative effect on the utility. But the segment prefers $79 price, increasing the utility by 0.57 units
- Consumers in segment 2 are indifferent to filters.
- Installing a grinder has a negative impact of 0.7 on utility

SEGMENT 1

VARIABLE	Estimate	exp(b)	Std. Error	T-Value	P-Value
Philips-1	**0.178**	1.195	0.076	2.358	0.019
Krups-1	**-0.194**	0.824	0.100	-1.951	0.051
Capacity5-1	**-0.173**	0.841	0.066	-2.615	0.009
Capacity10-1	**-0.322**	0.725	0.082	-3.909	0.000
Price59-1	**0.190**	1.209	0.086	2.200	0.028
Price79-1	**-0.277**	0.758	0.102	-2.702	0.007
Filter-1	**-0.855**	0.425	0.126	-6.775	0.000
Grinder-1	**1.119**	3.062	0.103	10.832	0.000
Segment Size	0.741				

SEGMENT 2

VARIABLE	Estimate	exp(b)	Std. Error	T-Value	P-Value
Philips-1	0.127	1.135	0.153	0.832	0.405
Krups-1	0.032	1.032	0.152	0.209	0.834
Capacity5-1	**0.414**	1.512	0.136	3.033	0.002
Capacity10-1	**0.271**	1.311	0.127	2.138	0.033
Price59-1	0.213	1.237	0.114	1.858	0.063
Price79-1	**0.572**	1.771	0.239	2.392	0.017
Filter-1	0.107	1.113	0.239	0.447	0.655
Grinder-1	**-0.698**	0.498	0.143	-4.870	0.000
Segment Size	0.259				

Appendix 7: Importance of Product Attributes

Segment 1 cares about: Grinder>Filter>Capacity> Price

SEGMENT 1

VARIABLE	Estimate	P-Value	Attribute importance	Attribute importance in %
Philips-1	**0.178**	0.019		
Krups-1	**-0.194**	0.051		
Capacity5-1	**-0.173**	0.009	0.816	16%
Capacity10-1	**-0.322**	0		
Capacity15	**0.494**			
Price59-1	**0.19**	0.028	0.467	9%
Price79-1	**-0.277**	0.007		
Price 99	**0.087**			
Filter-1	**-0.855**	0	1.709	33%
No Filter	**0.855**			
Grinder-1	**1.119**	0	2.238	43%
No Grinder	**-1.119**			

Segment 2 cares about: Grinder>Price>Capacity> Filter

SEGMENT 2

VARIABLE	Estimate	P-Value	Attribute importance	Attribute importance in %
Philips-1	0.127	0.405		
Krups-1	0.032	0.834		
Capacity5-1	**0.414**	0.002	1.098	27%
Capacity10-1	**0.271**	0.033		

Capacity15	**-0.684**			
Price59-1	0.213	0.063	1.356	33%
Price79-1	**0.572**	0.017		
Price99	**-0.784**			
Filter-1	0.107	0.655	0.214	5%
No Filter	-0.107			
Grinder-1	**-0.698**	0	1.396	34%
No Grinder	**0.698**			

Appendix 8: Predicted Market Share

The original product of Philips with 10 cups capacity at 79$ with no filter and no grinder has market share of Philips is 13.2%

SEGMENT 1	Product 1 (Krups)		Product 2 (Krups)		Product 3 (Cuisinart)		Product 4 (Cuisinart)		Product 5 (Philips)	
VARIABLE	X-VALUES	b*X	X-VALUES	b*X	X-VALUES	b*X	X-VALUES	b*X	X-VALUES	b*X
Philips-1	0	0.000	0	0.000	-1	-0.178	-1	-0.178	1	0.178
Krups-1	1	-0.194	1	-0.194	-1	0.194	-1	0.194	0	0.000
Capacity5-1	1	-0.173	0	0.000	0	0.000	-1	0.173	0	0.000
Capacity10-1	0	0.000	1	-0.322	1	-0.322	-1	0.322	1	-0.322
Price59-1	1	0.190	0	0.000	-1	-0.190	0	0.000	0	0.000
Price79-1	0	0.000	1	-0.277	-1	0.277	1	-0.277	1	-0.277
Filter-1	-1	0.855	-1	0.855	-1	0.855	-1	0.855	-1	0.855
Grinder-1	-1	-1.119	-1	-1.119	1	1.119	-1	-1.119	-1	-1.119
exp(b*X)		0.643		0.348		5.780		0.970		0.504
Probability/Market Share		0.078		0.042		0.701		0.118		0.061

SEGMENT 2	Product 1 (Krups)		Product 2 (Krups)		Product 3 (Cuisinart)		Product 4 (Cuisinart)		Product 5 (Philips)	
VARIABLE	X-VALUES	b*X	X-VALUES	b*X	X-VALUES	b*X	X-VALUES	b*X	X-VALUES	b*X
Philips-1	0	0.000	0	0.000	-1	-0.127	-1	-0.127	1	0.127
Krups-1	1	0.032	1	0.032	-1	-0.032	-1	-0.032	0	0.000
Capacity5-1	1	0.414	0	0.000	0	0.000	-1	-0.414	0	0.000
Capacity10-1	0	0.000	1	0.271	1	0.271	-1	-0.271	1	0.271
Price59-1	1	0.213	0	0.000	-1	-0.213	0	0.000	0	0.000
Price79-1	0	0.000	1	0.572	-1	-0.572	1	0.572	1	0.572
Filter-1	-1	-0.107	-1	-0.107	-1	-0.107	-1	-0.107	-1	-0.107
Grinder-1	-1	0.698	-1	0.698	1	-0.698	-1	0.698	-1	0.698
exp(b*X)		3.487		4.327		0.228		1.377		4.760
Probability/Market Share		0.246		0.305		0.016		0.097		0.336
Overall Probability/Share		0.122		0.110		0.523		0.112		0.132

Analyzing and modifying the existing product with:

Product 5: Product by Philips suited to segment 1 and hence has Capacity of 15 cups at $59 with no filter but has a grinder.
Product 6: Product by Philips suited to segment 2 ad hence has Capacity of 5 cups at $79 with no filter and no grinder.

Product 5 captures 68% of segment 1 and 3.3% of segment 2 with an overall Market Share of 51.8%
Product 6 captures 7% of segment 1 and 36.8% of segment 2 with an overall market share of 14.8%

SEGMENT 1	Product 1 (Krups)		Product 2 (Krups)		Product 3 (Cuisinart)		Product 4 (Cuisinart)		Product 5 (Philips)		Product 6 (Philips)	
VARIABLE	X-VALUES	b*X	X-VALUES	b*X	X-VALUES	b*X	X-VALUES	b*X	X-VALUES	b*X	X-VALUES	b*X
Philips-1	0	0.000	0	0.000	-1	-0.178	-1	-0.178	1	0.178	1	0.178
Krups-1	1	-0.194	1	-0.194	-1	0.194	-1	0.194	0	0.000	0	0.000
Capacity5-1	1	-0.173	0	0.000	0	0.000	-1	0.173	-1	0.173	1	-0.173
Capacity10-1	0	0.000	1	-0.322	1	-0.322	-1	0.322	-1	0.322	0	0.000
Price59-1	1	0.190	0	0.000	-1	-0.190	0	0.000	1	0.190	0	0.000
Price79-1	0	0.000	1	-0.277	-1	0.277	1	-0.277	0	0.000	1	-0.277
Filter-1	-1	0.855	-1	0.855	-1	0.855	-1	0.855	-1	0.855	-1	0.855
Grinder-1	-1	-1.119	-1	-1.119	1	1.119	-1	-1.119	1	1.119	-1	-1.119
exp(b*X)		0.643		0.348		5.780		0.970		17.057		0.585
Probability/Market Share with Product 5		0.026		0.014		0.233		0.039		0.688		
Probability/Market Share with Product 6		0.077		0.042		0.694		0.116				0.070

SEGMENT 2	Product 1 (Krups)		Product 2 (Krups)		Product 3 (Cuisinart)		Product 4 (Cuisinart)		Product 5 (Philips)		Product 6 (Philips)	
VARIABLE	X-VALUES	b*X	X-VALUES	b*X	X-VALUES	b*X	X-VALUES	b*X	X-VALUES	b*X	X-VALUES	b*X
Philips-1	0	0.000	0	0.000	-1	-0.127	-1	-0.127	1	0.127	1	0.127
Krups-1	1	0.032	1	0.032	-1	-0.032	-1	-0.032	0	0.000	0	0.000
Capacity5-1	1	0.414	0	0.000	0	0.000	-1	-0.414	-1	-0.414	1	0.414
Capacity10-1	0	0.000	1	0.271	1	0.271	-1	-0.271	-1	-0.271	0	0.000
Price59-1	1	0.213	0	0.000	-1	-0.213	0	0.000	1	0.213	0	0.000
Price79-1	0	0.000	1	0.572	-1	-0.572	1	0.572	0	0.000	1	0.572
Filter-1	-1	-0.107	-1	-0.107	-1	-0.107	-1	-0.107	-1	-0.107	-1	-0.107
Grinder-1	-1	0.698	-1	0.698	1	-0.698	-1	0.698	1	-0.698	-1	0.698
exp(b*X)		3.487		4.327		0.228		1.377		0.317		5.491
Probability/Market Share with Product 5		0.358		0.444		0.023		0.141		0.033		
Probability/Market Share with Product 6		0.234		0.290		0.015		0.092				0.368

Overall Probability/Share with Product 5		0.112		0.126		0.179		0.066		0.518		
Overall Probability/Share with Product 6		0.118		0.106		0.518		0.110				0.148

Appendix 9: Posterior Membership probabilities

Below table indicates how the 185 respondents are segmented between segment 1 & 2. Higher posterior membership probability indicates more likelihood of belonging to the segment.

CLASS	1	2
1	1	0
2	1	0
3	1	0
4	0.01	1

5	0.16	0.84
6	0	1
7	0	1
8	0	1
9	0	1
10	0	1
.	.	.
.	.	.
.	.	.
180	0.99926	0.00074
181	0.00009	0.99991
182	0.99993	0.00007
183	0.00587	0.99413
184	0.0001	0.9999
185	0.05327	0.94673