Market Share Research Using Conjoint Analysis on Digital Cameras

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Abstract: This research conducts conjoint analysis market research study on a branded digital camera using programing R. The aim is to predict market share (strictly share of preference as the model doesn't take into account distribution or promotional effects). In conjoint analysis, customers are shown a variety of possible products (or services) and asked to say which they prefer. By analyzing the preferences against the specification of the products shown statistically, the underlying preferences can be worked out, so that preference for products that were not tested can be evaluated (see conjoint design) to produce a conjoint analysis model to explore different sets of preferences across the market as a whole. Using these preference values (utilities or part-worths) from the conjoint research, a market model on customers' preferences can be created based on what drives customers' decisions. This allows businesses to model and test different product and service options to evaluate likely market preferences and potential share, revenue and profit, all based on what customers really value. In this project, a share of preference model is developed to improve the offering to customers and estimate their effect on share to find out which options give the best return on investment.

1 INTRODUCTION

This research conducts conjoint analysis market research study on a branded digital camera using programing R. The aim is to predict market share (strictly share of preference as the model doesn't take into account distribution or promotional effects). In conjoint analysis, customers are shown a variety of possible products (or services) and asked to say which they prefer. By analyzing the preferences against the specification of the products shown statistically, the underlying preferences can be worked out, so that preference for products that were not tested can be evaluated (see conjoint design) to produce a conjoint analysis model to explore different sets of preferences across the market as a whole. Using these preference values (utilities or part-worths) from the conjoint research, a market model on customers' preferences can be created based on what drives customers' decisions. This allows businesses to model and test different product and service options to evaluate likely market preferences and potential share, revenue and profit, all based on what customers really value. In this project, a share of preference model is developed to improve the offering to customers and estimate their effect on share to find out which options give the best return on investment.

2 CONJOINT DESIGN

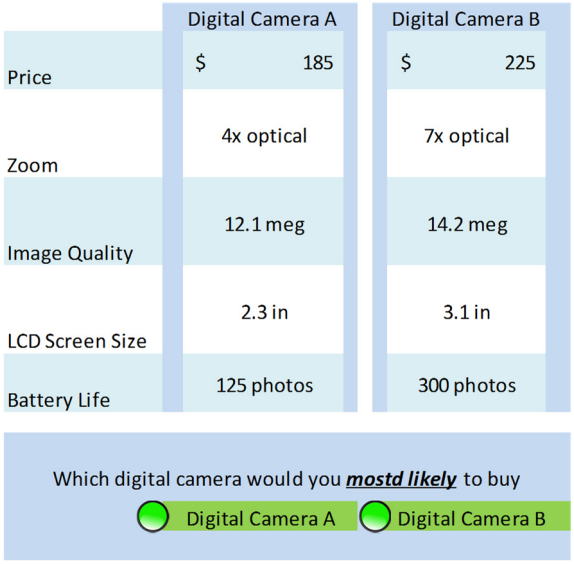
A product or service area is described in terms of a number of attributes. Based on the knowledge the product category, product features and product attributes, one design can be deployed by working with the product manager in order to know what parameters should be used. Attributes that affect customers' preference most significantly are price, zoom, image quality, LCD screen size, and battery life, which are all put into the model. This digital camera study can be applied to any consumer product because of the process would be exactly the same.

A digital camera may have attributes of zoom, screen size, brand, price and so on. Each attribute can then be broken down into a number of levels. For instance, levels for zoom may be 4x optical, or 7x optical. Using experimental design the attributes have been used to develop 16 different types of camera (the choice objects). For the sake of simplicity, the attribute with a larger magnitude is denoted as +1 while the smaller one is -1. (See Appendix 1).

However, it is hard to determine which feature has the greatest impact on customers' preferences, and what will the market share of a product with certain features be. To answer this research question, the following survey is conducted.

Since the analysis comes from the company's point of view, some combination does not make sense for a company and therefore can be eliminated. (For example, it is impossible for a company to sell goods that have the best attribute with a lower price. This means that the combination of -1,1,1,1,1 is impossible and therefore it is not under the concern).

Participant would be shown a set of products, prototypes, mock-ups, or pictures created from a combination of levels from all or some of the constituent attributes and asked to choose from, rank or rate the products. Each example is similar enough that consumers will see them as close substitutes, but a unique combination of product features is made up for a clear preference. The cameras were then organized into 120 groups for customers to choose from. (16*15/2) each pair of camera composes a question in the survey looks like the table below.



Which camera a consumer would buy at the end of day? What would the survey look like? To answer above question, a comparison of a pair of cameras is conducted to 200 responders like above.

For this model we had to simplify so that it fits on the page. The data are made up and do not reflect any real life situation.

3 DATA COLLECTION

Data for conjoint analysis are most commonly gathered through a market research survey, although conjoint analysis can also be applied to a carefully designed configurator or data from an appropriately design test market experiment. Market research rules of thumb apply with regard to statistical sample size and accuracy when designing conjoint analysis interviews. The length of the research questionnaire depends on the number of attributes to be assessed and the method of conjoint analysis in use.

A typical Adaptive Conjoint questionnaire with 20-25 attributes may take more than 30 minutes to complete. Choice based conjoint, by using a smaller profile set distributed across the sample as a whole may be completed in less than 15 minutes. Choice exercises may be displayed as a store front type layout or in some other simulated shopping environment.

200 people completed the survey, each made 120 choices. Then the total number of choices is 24,000.

An Excel spreadsheet is presented below with the choice frequencies for each camera and each person. Here is a peak of choices. An ordinal assumption is made regarding the dependent variables:

Participant	Camera1	Camera2	Camera3	Camera4	Camera5
1	15	9	14	6	12
2	13	12	14	8	14
3	13	11	12	12	10
4	14	13	6	5	13

4 ANALYSIS

Consumer psychologists have found that statistical models such as dummy variable regression or ANOVA very useful in conjoint analysis for multi-attribute alternatives.

The task addressed is to model, fit, and if successful, to predict the choices among alternatives. Several abbreviations are used in the model, and they are listed below:

DV = Choice frequency (sum across all people). Dependent variable, this is the sum of all frequencies across all people. For example, on camera 1, the sum of all frequencies across all people, the value is 2146.

IV's= Product attributes. Independent variable, this is the Product attributes as Price, Zoom, Image Quality, LCD Screen Size, Battery Life.

The Results is a simplified regression model that helps predict the odds for consumer to choose a specific product.

To evaluate the relative impact of all attributes, we use the regression equation in R:

```
RegModel <- lm(ChoiceFrequency ~ Price+Zoom+Image.Quality+LCD.Screen.Size+Battery.Life)
```

Predicted Frequency =
= 1500-347*Attribute1 + 257.7*Attribute2 + 321*Attribute3 + 121*Attribute4 + 283.1*Attribute5.

	Coefficients	Standard Errors	tStat
Intercept	1,500.00	5.05	297.17
Price	-347.00	5.05	-68.75
Zoom	257.75	5.05	51.06
Img. Quality	321.38	5.05	63.67
LCD Scr. Size	121.00	5.05	23.97
Battery Life	283.13	5.05	56.09

R-squared =0.99, F-stat=3021

5 MODEL RESULT

People like to look for price, but not like to compromise price for zoom. It means people like to pay more for higher zoom. The results can be summarized into two points.

1. All product features were considered by people when they choose cameras.
2. If there is no major surprises, they preferred:
   - Lower prices (negative coefficient)
   - Large zooms (positive coefficient)
   - Higher image quality (positive coefficient)
   - Larger LCD screens (positive coefficient)
   - Longer battery life (positive coefficient)

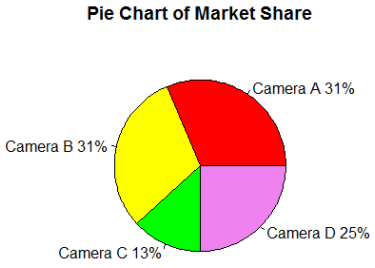
But price and image quality are most critical since they have the highest coefficients in the model.

How do we use model results in the future marketing? We can use this result to predict the market share in the future. Here is an example:

Camera A:	185	7x zoom	12.1 mg	3.1 in LCD	300 photo battery
Camera B:	225	7x zoom	14.2 mg	3.1 in LCD	300 photo battery
Camera C:	225	7x zoom	12.1 mg	3.1 in LCD	125 photo battery
Camera D:	185	4x zoom	14.2 mg	3.1 in LCD	125 photo battery

If I want to introduce camera D, what would be the market share be, comparing to other 3 competitors?

Using the model for the matrix of the example to calculate the predicted frequencies, and look at the proportions, and the proportion tells us the relative preferences and shares of digital cameras in the market.



6 DISCUSSION

Share in a market model is known as "Share of Preference". This is the expected share if customers knew all the information and all the products had the same level of distribution. If prices and costs are known, the model can be extended to include revenue and profit potential.

Models can have extra parameters to take external effects into account, so providing models that are more closely related to reality reflects the real market. A further element missing from this simple model is the ability to look at different subgroups and segments to see if a range of products could do better than a single product in the market. Market models are very valuable tools in the process of strategic analysis.

Note that the ratings must reflect what your customers perceive the position to be. Often customers' perceptions do not reflect reality and so changing the ratings on the attributes may be more about communication than changing the actual delivery. Often we find that simple service features such as delivery, availability of help, keeping promises and so on can have greater psychological effects on customers, therefore have more significant market effects than changing price or specific product features. Market modeling, also known as a market simulation, is one of the key strengths of Conjoint Analysis.

There are other types of market models for other types of trade-off research such as Pricing Research

or Brand-Price Trade Off Research. Models are a major benefit of trade-off studies over other forms of quantitative market research.

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APPENDIX

Attributes	Description	Level 1 (-1)	Level2 (+1)
Price	The price indicates the amount you would pay for the camera in your local shop.	$ 185	$ 225
Zoom	This is how much the camera can offer a 'close up' of what you are looking at. A greater zoom indicates you can get a better 'close up' image.	4x optical	7x optical
Image Q/ty	This is how detailed the picture is when stored by the camera. A higher image quality indicates you can print a larger version of the photo.	12.1 meg	14.2 meg
LCD Scr. Size	This is the size of the LCD display on the back of the camera. A larger LCD offers a better preview of you photo when you take it.	2.3 in	3.1 in
Battery Life	This is how many photos the camera can take before it needs to have the battery re-charged.	125 photos	300 photos