A Case Study on the Preference of Mobile Phone Attributes among B-School Students

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Executive Summary

In this rapidly advancing technological era, Mobile phones have come to be dominating as a present-day marvel! The technological advancements in the Mobile phone segment have only contributed to the ever satiating demand exhibited by the buyer community. With the growing competition in this dynamic industry, introduction of additional features have added greater lure to possess this commodity. It is in this context that the case presented here exhibits interesting perspectives of buyer attributes of a typical target segment. With an aid to foster analytical thinking among the target users of the case, the case involves application of conjoint analysis employed primarily with respect to analysis of data. The analysis becomes much enriched when aligned with the qualitative factors contributing to the same. Given the subject dealt in the case, it is well suited for application from a multi-functional perspective.

Background

The rapid strides made by the manufacturers of Mobile phone owe much of their allegiance to the technological advancements in the last decade. The seamless integration of computing system into a plain-vanilla telephone device has led to metamorphosis of these new generation mobile phone devices. Minimum barriers to entry in

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this ever expanding market has only led to burgeoning competition with the fallout that prospective Mobile phone customers are inundated with irresistible offers marked by unique product attributes.

It is apt to say that a Mobile phone's distinguishable product characteristics lay the ground work for it to achieve indisputable product loyalty. A leap into Apple' Smartphone is a case in point. Focusing on essential attributes while defining a product will truly serve the purpose.

While seeking to decipher the essential attributes that should ideally be present in a Mobile phone, the ensuing trends merit careful consideration:

(1) Communication services, such as, voice, text and pictures.

(2) Wireless internet services, such as, browsing, corporate access and e-mail.

(3) Distinct media services, such as , motion pictures, games and music.

The need for a Mobile phone manufacturer to remain sensitive to product features as demanded by prospective customer, need not be overemphasized. This case has employed a popular quantitative technique known as Conjoint Analysis to capture the buyer attributes by analysing the data obtained from responses generated by administering structured questionnaire to a target group comprising of managerial students from a reputed B-School in Southern India.

Selection of attributes in Conjoint Analysis

Conjoint Analysis is a widely used market research technique in product development, product designing and pricing research. This tool is effectively applied by market researchers to measure and predict customer preferences of a product. Over the last 30 years, market researchers have developed conjoint analysis to understand customer preferences, values and choices. In particular this analysis is used to identify the relatively important attributes preferred by

customers in a product. Conjoint applications have covered many industries and virtually all aspects of managerial decision making. Some consulting firms use expertise in this technique as a competitive advantage, even when the basic technique has been known for over 30 years. Specifically, conjoint analysis is used to gain insights into how consumers value various product attributes based on their valuation of the complete product. Respondents are asked to make difficult attribute trade-offs with the aim of discovering the value behind their choices.

Conjoint analysis is a methodology in which a decision-maker has to choose from a number of options that vary simultaneously from between two or more attributes. Researchers describe products or services by sets of attribute values or levels and then measure respondents' purchase interest. This description presents respondents or judges with several hypothetical products or services, each consisting of a combination or stimuli of specified features or characteristics. Such stimuli are, therefore, described by several attributes. The conjoint results go beyond attribute importance and provide quantitative measures of the relative appeal of specific attribute levels. Therefore, to explain and predict preferences that result in an assessment of achievements is the principal goal of conjoint analysis. In applications of conjoint analysis, products or services (profiles) are described through a set of attributes with the idea of measuring the preferences of the respondents, as shown in figure 1

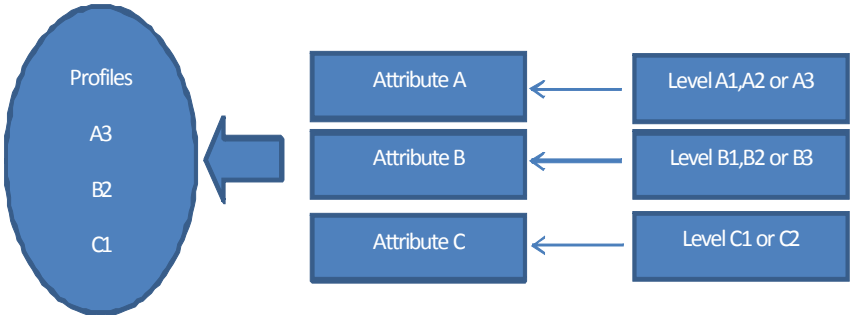

Figure 1: Relationship between profiles, attributes and levels

In the case of having *N* attributes with *k* levels each, the number of profiles or stimuli that must be evaluated is:

$$\underbrace{k*k*k\ldots.*k}_{\text{n times}} = k^N$$

For example, if we have 6 attributes with 4 levels each, the number of profiles to be evaluated is 4^6 = 4,096. If there are two more attributes with the same number of levels, in other words, 8 attributes with 4 levels each, the number of stimuli will increase significantly. Since the number of profiles to be evaluated becomes 65,536. If the number of levels varies between the attributes, for example N attributes with k levels and M attributes with l levels, then the number of stimuli to be evaluated is:

$$\underbrace{k*k*\ldots.}_{\text{n times}}*\underbrace{k*l*l*\ldots.}_{\text{n times}}*l^m = k^N*l^M$$

For example, if we have 2 attributes with 3 levels and 3 attributes with 2 levels, the total number of profiles to be evaluated will be 3^2*2^3 = 72.

Table 1 shows the number of profiles to be evaluated in relation to the number of attributes and levels. It reflects how fast the number of stimuli rises when the total number of attributes and levels are increased.

Table 1: *Number of profiles for evaluating*

	Number of Levels			
Number of attributes	2	3	4	5
4	16	81	256	625
5	32	243	1.024	3.125
6	64	729	4.096	15.625
7	128	2.187	16.384	78.125
8	256	6.561	65.536	390.625

The number of profiles established in Table 1 is determined by a full factorial design. This design uses all the possible combinations of attribute levels or factors. These factors are studied, because, they are believed to have a conjoint effect over a variable answer. The factor effect is defined as the variation experienced by the variable answer when a change is produced in the factor level. Frequently, this is known as the main effect because it refers to the fundamental interest factors of the experiment.

A full factorial design allows estimates to be obtained of the parameters corresponding to the main effects and to all the interaction effects. Evidently, this provides excessive information; therefore, the person interviewed is unable to make a proper evaluation. The person would lose interest and their evaluation would negatively influence the quality of the answers obtained. The fractional factorial designs have been created in order to solve this problem.

The fractional factorial design is the most commonly used design in Conjoint Analysis. Usually, most studies estimate the main effects by assuming the non-existence or unimportance of the interaction effects. Therefore, the interaction effects can be disregarded and a fractional factorial design used instead.

Through a fractional-factorial design, the possible combination of the attributes are obtained and presented to the respondents to rank in order of preference. In ranking methods, respondents are asked to compare a number of other options. Preferences are expressed in one of two ways: a “paired comparison” task or a top-to-bottom ranking. In paired comparisons, the respondent is presented with a number of pairs of products and is asked to choose one or the other. The second type of ranking method is to rank order a set of concepts from most to least desirable. To facilitate this task, the respondent usually is first asked to sort the product descriptions into three piles, for example: *Like very much*, *Like moderately* and finally *like little or*

not at all. After the sorting is completed, the respondent is asked to rank within the piles. This produces the full ranking.

Ranking n concepts is equivalent to making (n (n " 1))/2 paired comparisons, the number of distinct pairs which can be formed by taking two products at a time from a set of n items. These rankings form the basis of predictor variable where the attributes form the explanatory variables. It enables to decompose customers' preferences for products and into 'part-worth' utilities associated with each option of attribute of the product category.

Four steps that basically form the basis of Conjoint Analysis:

1. Selection of relevant attributes.
2. Using fractional-factorial design to obtain an orthogonal set of combinations.
3. Producing the combinations obtained from step 2 to respondents for obtaining the ranks.
4. Using these ranks in Conjoint Analysis technique to obtain Part-Worth utilities.

Using these utilities the Mobile Phone makers can make their decision about the relative importance attached to individual attributes and the combination utilities.

An application for the selection of attributes in Mobile Phones

The data has been obtained through a questionnaire addressed to B-school students. In the current investigation, conjoint analysis is used to understand how common attributes influence B-school students' in selection of a mobile phone. According to a study carried out by BBVA foundation, (a large multinational financial group) on mobiles found that the range of services and applications used in mobile phones increases in direct proportion to the age. The youngest, use the services and applications that transcend conventional

telephone communication more extensively and intensively. To cover this demand, new communication modalities are created (text messages, file exchange, etc.,), as well as other entertainment-related activities (photographing, video recording, listening to music, games, etc.,). On the other hand, adults basically use their mobile phones to make and receive calls.

The first step in the application of the methodology is the definition of the attributes and levels that characterize the product. For this purpose, the decisive attributes have been identified. An attribute is considered decisive, if it greatly contributes towards establishing the consumers´ preferences. Those attributes considered to be basic have not been taken into account. For example, the battery is an attribute that has not been considered, since it has been classified as a basic attribute, due to the fact, that most mobile phones have a standard Li-ion battery. The following are the important attributes considered to be important by B-School students: The brand of the mobile phone, choice of Android as an operating system, preference for higher resolution in terms of mega pixel and affordablity. Table 2 shows the different attributes with their corresponding levels.

Table 2: *Identification of attributes and establishment of levels*

Attributes	**Levels**
Brand	Samsung/Sony/ Motorola/ LG
Android	Yes/No
Camera	3MP/5MP/8MP
Price	Rs.5,000-Rs.7,000/Rs.7,000-Rs.10,000/Above Rs.10,000

The possible set of combinations from the levels of attributes accounts to 4 x 2 x 3 x 3 = 72. The 72 combinations are reduced to a manageable set using the orthogonal design to ease evaluation. The final 16 set of hypothetical combinations of mobile phones were presented to the respondents in a structured questionnaire (Table 3).

Table 3: *Attributes levels for a full-profile, fractional-factorial design Conjoint study (in Rs.).*

Serial No.	Brand	Android	Camera	Price	Rank
1	Samsung	Yes	3 MP	5,000 - 7,000	
2	Samsung	No	5 MP	7,000 - 10,000	
3	Samsung	No	8 MP	Above 10,000	
4	Samsung	Yes	5 MP	7,000 - 10,000	
5	Sony	Yes	3 MP	7,000 - 10,000	
6	Sony	No	5 MP	5,000 - 7,000	
7	Sony	No	8 MP	7,000 - 10,000	
8	Sony	Yes	5 MP	Above 10,000	
9	Motorola	No	3 MP	Above 10,000	
10	Motorola	Yes	5 MP	7,000 - 10,000	
11	Motorola	Yes	8 MP	5,000 - 7,000	
12	Motorola	No	5 MP	7,000 - 10,000	
13	LG	No	3 MP	7,000 - 10,000	
14	LG	Yes	5 MP	Above 10,000	
15	LG	Yes	8 MP	7,000 - 10,000	
16	LG	No	5 MP	5,000 - 7,000	

The ranks assigned by the 90 respondents are recorded and using SPSS 18 the results are obtained. The four attributes Brand, Android, Camera and Price will be treated as independent variable and rank from the respondent will be treated as dependent variable.

Attribute / level with greater utility ranges play a more significant role than those with smaller ranges (Table 4 and Table 5). The range of the utility values (highest to lowest) for each attribute / level provides a measure of how important the attribute / level was to overall preference.

Table 4 : *Utilities*

		Utility Estimate	Std. Error
Brand	Samsung	5.688	2.160
	Sony	.438	2.160
	Motorola	-1.812	2.160
	LG	-4.313	2.160
Android	No	-.529	3.944
	Yes	.529	3.944
Camera	3 MP	1.186	3.055
	5 MP	.674	3.221
	8 MP	-1.860	4.440
Price	RS 5000 - RS 7000	.425	15.753
	Rs 7000 - RS 10000	3.211	14.642
	Above RS 10000	-3.636	16.043
(Constant)	8.070	2.160	

From Table 4, the students prefer the market leader Samsung to the other brands, presence of Android as an operating system is an essential, higher image resolution is not their priority and predictably price should be in the range of Rs 5000 to Rs 7000.

Since, Part-Worth estimates are on a common scale, it is recommendable to compute the relative importance of each factor directly. For Table 5, the importance of a factor is represented by the range of its levels divided by the sum of the ranges across all factors. This calculation provides a relative importance of each attribute based on the size of the range of its part-worth estimates. The relative importance scores across all attributes will total 100 percent.

Table 5 : *Importance Values*

Brand	47.731
Camera	5.051
Price	14.540
Android	32.678

From Table 5, the results show that the attributes Brand and Android are relatively more important to B-School students as they collectively account to 80 %, followed by price 15% and the least preferred attribute is camera at 5%. The student's choice of preference of attributes is best brand with Android, affordable price and with a camera.

The correlation table (Table 6), displays two statistics, Pearson's R and Kendall's tau, which provide measures of the correlation between the observed and estimated preferences as a check on the validity of the utilities.

Table 6: *Correlations*

	Value	Sig.
Pearson's R	.763	.000
Kendall's tau	.582	.001

The validation on the utilities is obtained from Table 6. The correlation between the observed and estimated preferences is very high value of 0.763, which is significant to the scope of using Conjoint Analysis.

Now, with the help of Part-Worth utility scores, the preferences for most valued combination can be obtained. For example, the most preferred combination by the B-School respondents is a Samsung mobile phone with OS Android, with price range of Rs 5000 to Rs 7000 and Camera having 3 MP resolutions. The total utility score for this combination is 15.898 and the least preferred combination is that of LG mobile phone with no OS Android, with price range of above Rs 10000 and Camera having 8 MP resolutions.

The total utility score for this combination is -2.268. This shows that Mobile phone makers can pay more attention to the OS Android with affordable price range of Rs 5000 to Rs 7000 with negligible importance to the resolution level.

Managerial implications

From the discussion carried out above, the case facts lead to the following implications from a strictly managerial perspective.

1. Pricing considerations – In keeping with the sensitivity of this factor, target repsondents attached high degree of importance to price charged by the Mobile phone manufacturer. Given the income disposition of the target segment, this observation is not entirely unexpected. Should the manufactuer entirely concentrate on specific groups exhbibitng varied characeteristics with respect to income is debatable. What are the key inputs that may be offered by the Marketing team? These are some of the issues that merit attention.

2. Brand – Typical users of Mobile phone do tend to attach significance on the brand value commanded by the product. Factors ranging from societal status to influence of peer group contribute to the same.

3. Innovative features – These have been reflected as product differentiators. Greater the degree of innovation, greater is the interest generated among the target users. Ability of the mobile

manufaturer to incorporate recent innovations holds the key in capturing the attention of wannabe mobile users.

It is interesting to observe that among all the manufacturers (Sony, Samsung, LG and Motorolla) considered here, Samsung emerges as the most preferred choice. While this observation is limited to the respondents' perception, management of the other three manufacturers will find it interesting to investigate the reasons for not being the preferred choice. Ultimately, given the Mobile phones' highest penetration in the 'youth segment', manufacturers will like to do everything to lure their target audience.

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