

# Attribute Based Perceptual Mapping Using Discriminant Analysis Regarding Selected Brands of Mobile Handsets: An Empirical Investigation in Haryana

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## Abstract

Indian mobile handset industry has seen explosive growth backed by liberalization and heavy investment in the telecommunication infrastructure. With growth it becomes extremely important for mobile handset brands to position their brands properly. This paper attempts to know how customers perceive different brands of mobile handset in the light of attributes considered by consumers in making purchase decision. A questionnaire survey of 300 respondents was collected in Haryana. Discriminant analysis is used to draw perceptual maps showing selected mobile handset companies. The results showed that selected mobile handset brands do not differ significantly with regard to given attributes.

**Keywords:** Brands, Mobile handsets.

## Introduction

Mobile phone industry has shown tremendous growth in last few years. It has become integral part of human daily life and personal communication across the globe. Kshetri and Cheung (2002) identified that rapid increase in mobile phone usage can be attributed due to access to quality telecommunication infrastructure, cheaper mobile phone services, innovative pricing schemes and increasing income levels. According to Gartner (2011) India is the second largest mobile handset market in the world after China and is poised to become an even larger market with unit shipment of INR 208.4 million in 2016 at a compound annual growth rate of 11.8 per cent from 2010 to 2016. With maturing and advancement of technology of the mobile handset markets, the Indian

customer become extremely demanding and their perceptions regarding mobile handsets is changing from merely communication instrument to its convergence to different application areas. Technology advancement have developed convergence of mobile handsets with built-in cameras, memory, radio, messaging services, and color displays are stimulating the growth potential (Bell, 2002). Market revenues of mobile handset companies are soaring from INR 255.91 billion in 2010 to INR 350.05 billion in 2016. Mobile handsets are emerging as the future growth engine of the Indian economy with its inclusion with different application areas.

Market share of leading mobile handset brands is shown in Table 1. According survey of voice and data (2010) Nokia remains the top handset maker in FY2010-11 with revenues of Rs 12,929 crores and a growth of 0.2 per cent from Rs 12,900 crores in FY2009-10. For FY2010-11, Nokia had a market share of 39 per cent. It has lost market share to domestic players such as Micromax and other Chinese brands in the low-end handset segment. In the high end phone segment too, Nokia faced tough competition from Samsung, Blackberry and LG brands.

**Table 1**

**Market of Leading Brands of Mobile Handsets in India, June 2011**

S No	Brand Name	Market Share (in Percent )
1	Nokia	39.00

2	Samsung	17.20
3	Micromax	6.90
4	Blackberry	5.90
5	Others(including Chinese Brands)	31.0

Source:<http://techcircle.vccircle.com/500/micromax-rises-to-no-3-indian-handset-maker-voicedata/> last viewed on September 10, 2011

Samsung followed Nokia with revenues of Rs 5,720 crores and the company captured market share of 17.2 percent. Samsung’s revenues rose 21.7 per cent in FY2010-11. Micromax captured the third position mainly due its low cost and availability of multiple features similar to high end business phones. Research in Motion’s stays at fourth position. Blackberry maker RIM garnered revenues of Rs 1,950 crores in FY2010-11, up 61.2 per cent in FY2009-10.

### **Need of Positioning for Mobile Handset Brands: An Indian Prospective**

The Indian mobile handset market, that was led by few players like Nokia, Samsung, Motorola are now crowded with multiple handset manufacturers, both from India and abroad. With increased intensity of competition among different brands of mobile handset manufacturers have compelled handset industry to enhance their application ecosystem and introduce innovative products to their customers. It becomes difficult for handset makers to position brands in the minds of the customer. Customers value hierarchy of attributes among competing brands and consequently link to goal for user requirements. Right positioning of brand resulting in significant reduction in cost and in turn result in reduction on advertisements. Attribute based brand positioning of mobile handset brands is used to identify the unique and distinctive place of consumer’s mind. In

competitive arena it is very easy to imitate the product features and position the product to cannibalize brand of leading competitors. Kotler (2002) define brand positioning as the act of designing the company’s offer and image so that it occupies a distinct and valued place in the target customer’s mind. Brand positioning involves establishing key brand associations in the minds of customers and other important constituents to differentiate the brand and establish competitive superiority (Keller et al 2002). Keller (2003) defined brand positioning as creation of optimal location in the minds of existing and potential customers so that they think of the brand in the “right way.” Brand positioning requires thoughtful analysis of competitors and consumers to determine the desired image for the brand to maximize its chances for success in different product categories. Although a number of different approaches and methodologies for positioning are possible, they all typically define the nature of the target market and relevant competitors and the means by which the brand should be seen as similar as well as distinct from those competitors. Schnedler (1996) stated that positioning products in a complex market can be one of a company’s most difficult decisions. The result of positioning is the successful creation of a customer focused value proposition. Brand positioning sets the direction of marketing activities and programs what the brand should and should not do with its market positioning. Perceptual mapping is important as rising noise levels in the media and extensive advertising by different companies lead to a clutter in the consumer’s mind. If brand awareness and recognition is good, the brand will fall in the consideration set of the consumer but may fail to build customer loyalty without a unique brand position. An important aspect of a brand’s position in a product category is how similar or different the brand is perceived to be in comparison with other brands in the product category. For positioning a new brand, especially one that is in some way different from present brands in the category of mobile handsets, several choices are available to the marketer. Marketers can choose the position of the brand and there product offerings differentiated. Brand is positioned so that it is seen as sharing important attributes or product characteristics with other brands in the category and as being superior on the differentiating or distinguishing attributes (Dickson and Ginter 1987). The unique

features of the mobile handset industry include rapid technological changes and negligible difference among the products innovation and imitation of the same by the competitors. Under such a situation, branding would ensure securing and retaining customers in the competitive market place.

### Literary Contributions

Srivastava (2005) stated that the mobile handset has shifted from being a 'technological object' to a key 'social object' as communication with others is the main purpose for mobile handset purchasing. However, facilitating reference group coordination and intensifying social interaction are the crucial factors for using a mobile handset (Urry, 2007). Grant and O'Donohoe (2007) proposed five factors for owning a mobile handset namely convenient entertainment, social stimulation, experiential learning, escapism, and purchase information and advice. Das (2012) discussed the prime factors influencing customer perception regarding mobile handset includes advertisement, variety of usage, low maintenance cost, new added features, price discount, free accessories are the prime factors considered in the selection of brand. Kasesniemi and Rautiainen (2002) observed that a variety of attributes of the handsets enabled the users to organize and schedule their everyday activities. Handsets enable the users to know the news headlines, TV and movie listings, horoscopes, directory and address, weather forecasting, sports scores, and dictionaries. Moreover, users can also make inquires about banking and flight or train schedule. It was found that SMS was embedded as the mode of cultural communication among young generation. People use their mobile handsets to copy their messages into calendars, dairies or special notebooks designed by the handset manufacturers to store SMS messages. The study concluded that inadequate storage capacity of the handset compelled them to delete some interesting messages. Product attributes influence consumer perceptions of the personal relevance of a product or service to their needs (Zhu, 2009). Green and Wind (1975) advocated that perceptual mapping can be used as a strategic management tool to communicate market structure analysis i.e. the complex relationships among marketplace competitors and the criteria

used by buyers in making purchase decisions and advocating the brand among the reference group. Attribute based perceptual mapping is a powerful graphic simplicity appeals to senior management and can stimulate discussion and strategic thinking at all levels of all types of organizations. Perceptual mapping has been used to satisfy marketing and advertising information needs related to product positioning (DeSarbo and Rao, 1984; Wind 1982), competitive market structure, consumer preferences and brand perceptions (Cooper, 1983; Pegels and Sekar, 1989) justified that attribute based perceptual maps satisfy information needs of marketers by analyzing and translating consumers numeric ratings. The output of attribute based perceptual mapping can be used to evaluate consumer's view with respective brands in the light of prominent attributes. Perceptual maps can be used to determine similarities and differences across groups of consumers. Attribute based approaches, used in this study, require a respondent to evaluate a set of brands on a large number of specific attributes, typically those attributes felt to influence how consumers perceive, evaluate and distinguish among brands and products. When choosing between different mobile phone models, consumers value familiar brands. Price of the phone has been identified as a critical factor in the choice of the mobile phone model, especially among younger people Kivi(2006).Hauser and Koppelman (1979) stressed that perceptual mapping is an important marketing research tool used in new product planning, advertising development, product positioning, and many other areas of marketing. Strategies based on perceptual maps have led to increased profits, better market control, and more stable growth. They also advocated attribute based perceptual mapping using factor analysis in comparison other popularly adopted statistical tools. Aaker (1996) defines brand position as the brand identity and value proposition that is to be actively communicated to the target audience and that demonstrates an advantage over competing brands He emphasized the importance of not only selecting a suitable positioning strategy for a target segment but also on the importance of updating the brand over a period of time, to ensure that the brand stays relevant at all times. Aaker and Shansby (1982) proposes six approaches to positioning strategy namely attributes, price quality, use or applications,

product user, product class and the competitors. Chadha and Kapoor, (2008) conducted perceptual mapping of selected insurance companies in the Insurance and justified the importance of perceptual tools importance for the marketers. Kim (1996) investigated the attributes and customer preferences of eleven deluxe hotels and F&B in various dining-out situation using factor analysis and Multi Dimensional Scaling .Das(2012) stressed on the importance of advertisement through multiple media plays a important role in the selecting particular brand of mobile hand sets. Sujan and. Bettaaan (1989) studies demonstrate that perceptions of how different a brand is from other brands in the product category affect perceptions of the brand's position within the category. Perceptual mapping has been historically regarded as one of the most important analytical tools in marketing research (Green et. al., 1975) and it is essentially suited for the analysis of brand equity's sources. Perceptual mapping is concerned with describing the consumer's perceptions of objects on one or a series of spatial maps, so that the relationship between the objects can be easily seen. Attribute-based perceptual mapping can be done using different approaches like factor analysis, correspondence analysis and discriminant analysis. These methods can identify the number of dimensions that the consumers use to distinguish the objects and determine a preferred location of an object on each of the dimensions and provide information on the nature and characteristics of these dimensions (Hauser and Frank, 1979). Perceptual mapping technique is widely used by professionals and academicians in assessing the current positions of brands against their competitors in the market and for focusing on the new positioning opportunities. Perceptual maps are two or three dimensional shows how brands and products are perceived by consumers through qualitative and quantitative techniques (Myres, 1996). Similar to the cities located on geographical maps, the brands are shown on the perceptual maps in a way that some are close to and some are far from each other (Altuna, 2010). The distances between the brands show how similarly those brands are perceived by consumers. Besides the proximities and dimensions via the gaps on them, maps also present the market opportunities for new entrants and for those brands to be repositioned (Arslan et.al, 2001).

## Objectives

The objective is to develop a sustainable competitive advantage for selected brands of product attributes in the consumer's mind following objectives were formulated

- 1 To identify the key dimension underlying the customer evaluation of brands.
- 2 The basic cognitive dimension consumer use to evaluate selected brands of mobile hand sets.
- 3 To find out the brand positioning of different brands of mobile handsets with attribute based perceptual mapping using discriminant analysis.
- 4 To draw out the implications in the light of above study.

## Research Methodology

### Data Collection and Sample

Five private mobile handset brands were selected for the study on the basis of their premium income in June to august 2012. A total of 300 respondents were selected from Rohtak , Jind, Bhadurgarh, Bhiwani from Haryana were selected. Convenience sampling was used to select the sample of the study. Before conducting a final survey pilot test was conducted on 20 respondents to identify gaps and finalize the questionnaire. The questionnaire was prepared keeping in view the objectives of the study. The data was collected through 'the personal contact' after approaching the respondents personally and explaining in detail about the survey objectives and purpose of the study. Attributes and brand preferences of each variable were measured through questions designed on a 5-point Likert type scale ranging from strongly agree to strongly disagree. The resulting sample was 63 per cent male and 37 per cent female. The demographic profile of the respondents is shown in table 2. Attribute based perceptual mapping was selected using discriminant analysis is used as discriminant analysis determines by the linear combinations of attributes that best discriminate among brands. So, significant differences among the brands can be revealed through discriminant analysis. The ratings of brands on attributes are used to develop the perceptual map. Perceptual

maps provide a visual picture of the brand positioning activity and help brand managers understand the position of the brand in comparison to competing brands (Venkatesh and Nargundkar, 2006)

**Statistical Technique Used**

In order to achieve the objective of discriminating different dimension of brand and attributes discriminant analysis had been used to

identify the attributes that were best associated with the mobile handset brands. Number of groups that are generated is five. The discriminant analysis output will give Eigen values of each function and amount of variance would explain from the original data. The discriminate function represents the axes on which the brands are first located and then attributes are located.

**Analysis of Results**

**Table 2  
 Demographic Profile of Sample Respondents**

<b>Age</b>	<b>Figure in Percent (%)</b>
25-35	27.0
35-45	35.0
45 and Above	38.0
<b>Gender</b>	
Male	63.0
Female	37.0
<b>Education</b>	
10	3.1
10+2	4.0
Graduation	8.2
Post graduation	73.5
Others	11.2
<b>Occupation</b>	
Salaried	57.7
Business	16.5
Others	25.8
<b>Annual Income</b>	
Less than 3 Lakhs	43.2
3-5 lakhs	25.0
5 lakhs and above	31.8
<b>Brands of Handset Presently Using</b>	
Samsung	36.8
Nokia	40.2
Micromax	8.0
LG	3.0
Blackberry	6.0
Others	7.0
<b>Duration of Using Present brand of Mobile Handset</b>	
Less than 1 year	25.0
1-3 Year	52.1

3 years and above	22.9
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**Table 3**  
**Relative Importance of Different attributes of Mobile Hand sets**

<b>Factors</b>	<b>Percentage of Sample Respondents</b>
Cost	26.2
Perceived Quality of Mobile Handset	22.3
Advertisement Exposure through Multiple Media	18.3
Fidelity	15.2
Post Sale Support & Availability of Spares	12.0
Visual Appealing Smart Appearance	6.0

**Source:** Field Data

**Table 4**  
**Brands of Handsets Used For Group Centroids**

<b>Code</b>	<b>Brand Name</b>
1	Nokia
2	Blackberry
3	Samsung
4	Micromax and other Chinese Brands

**Table 5**  
**Preference of Brands according to ascending value of Mean of Sample Respondents**

Brands	Mean
Nokia	1.62
Samsung	1.29
Micromax and other Chinese Product Brands	0.48
Blackberry	0.47
Total Number of Respondents	300

**Table 6**

**Group Statistics**

Brand		Mean	Std. Deviation	Valid N (listwise)	
				Unweighted	Weighted
1	Cost	2.25	.500	4	4.000
	Perceived Quality of Mobile Handset	2.50	1.291	4	4.000
	Fidelity	3.50	1.291	4	4.000
	Post Sale Support and Availability of Spares	3.00	.816	4	4.000
	Visual Appealing and Smart Appearance	3.25	2.062	4	4.000
2	Cost	2.29	1.380	7	7.000
	Perceived Quality of Mobile Handset	2.86	1.676	7	7.000
	Fidelity	2.71	1.380	7	7.000
	Post Sale Support and Availability of Spares	2.29	1.496	7	7.000

	Visual Appealing and Smart Appearance	1.86	1.464	7	7.000
3	Cost	2.83	1.835	6	6.000
	Perceived Quality of Mobile Handset	1.83	.753	6	6.000
	Fidelity	3.50	1.049	6	6.000
	Post Sale Support and Availability of Spares	2.83	1.472	6	6.000
	Visual Appealing and Smart Appearance	2.33	.816	6	6.000
4	Cost	2.00	.816	4	4.000
	Perceived Quality of Mobile Handset	2.25	1.258	4	4.000
	Fidelity	2.00	.816	4	4.000
	Post Sale Support and Availability of Spares	1.75	.500	4	4.000
	Visual Appealing and Smart Appearance	2.50	.577	4	4.000
Total	Cost	2.38	1.284	21	21.000
	Perceived Quality of Mobile Handset	2.38	1.284	21	21.000
	Fidelity	2.95	1.244	21	21.000
	Post Sale Support and Availability of Spares	2.48	1.250	21	21.000
	Visual Appealing and Smart Appearance	2.38	1.322	21	21.000

Source: Output generated by SPSS 17



**Table 7**

**Eigenvalues**

Function	Eigenvalue	% of Variance	Cumulative %	Canonical Correlation
1	1.104 <sup>a</sup>	76.6	76.6	.724
2	.245 <sup>a</sup>	17.0	93.6	.443
3	.092 <sup>a</sup>	6.4	100.0	.290

a. First 3 canonical discriminant functions were used in the analysis.

Source: Output generated by SPSS 17

**Table 8**

**Wilks' Lambda**

Test of Function(s)	Wilks' Lambda	Chi-square	df	Sig.
1 through 3	0.350	16.281	15	0.364
2 through 3	0.136	4.754	8	0.384
3	0.216	1.360	3	0.415

Source: Output generated by SPSS 17

**Table 9**

**Standardized Canonical Discriminant Function Coefficients**

	Function		
	1	2	3
Cost	.907	.465	-.383
Perceived Quality of Mobile Handset	-.939	.547	.732
Fidelity	.194	.548	.412
Post Sale Support and Availability of Spares	1.186	-.035	-.040

**Standardized Canonical Discriminant Function Coefficients**

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Cost	.907	.465	-.383
Perceived Quality of Mobile Handset	-.939	.547	.732
Fidelity	.194	.548	.412
Post Sale Support and Availability of Spares	1.186	-.035	-.040
Visual Appealing and Smart Appearance	.624	-.969	.265

Source: Output generated by SPSS 17

**Table 10**

**Structure Matrix**

	Function		
	1	2	3
Visual Appealing and Smart Appearance	.211	-.611*	.539
Perceived Quality of Mobile Handset	-.227	.178	.770*
Post Sale Support and Availability of Spares	.337	.198	.484*
Fidelity	.469	.348	.475*
Cost	.180	.271	-.307*

Note :Pooled within-groups correlations between discriminating variables and standardized canonical discriminant functions

Variables ordered by absolute size of correlation within function.

Source: Output generated by SPSS 17

Table 11

**Functions at Group Centroids**

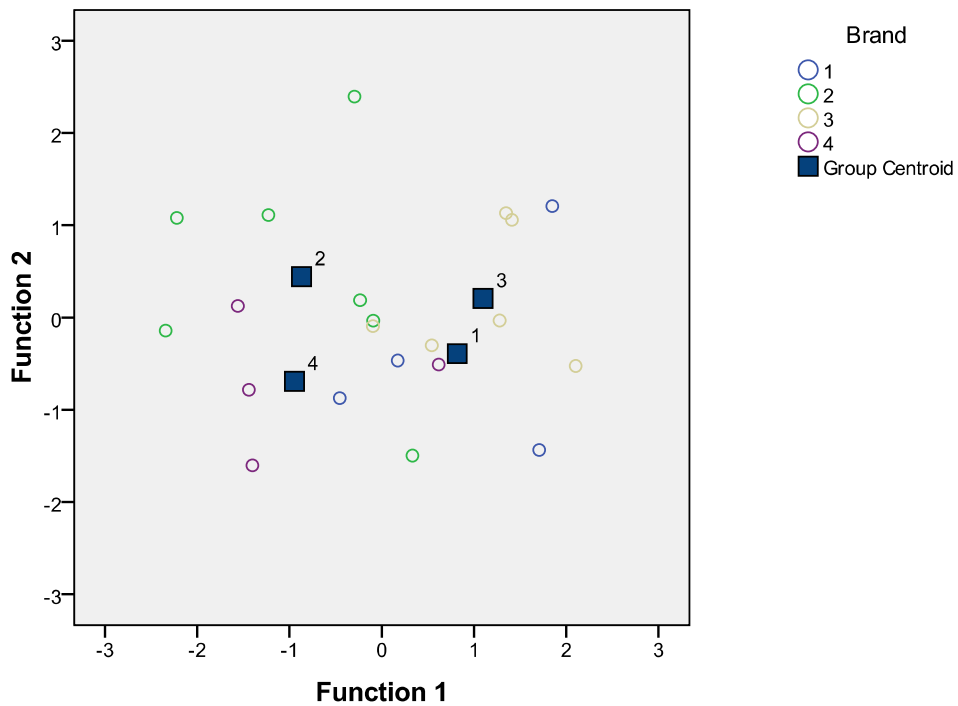
Brand	Function		
	1	2	3
1	.818	-.392	.450
2	-.868	.443	.111
3	1.098	.206	-.264
4	-.946	-.692	-.248

Unstandardized canonical discriminant functions  
 evaluated at group means

Source: Output generated by SPSS 17

Graph 1

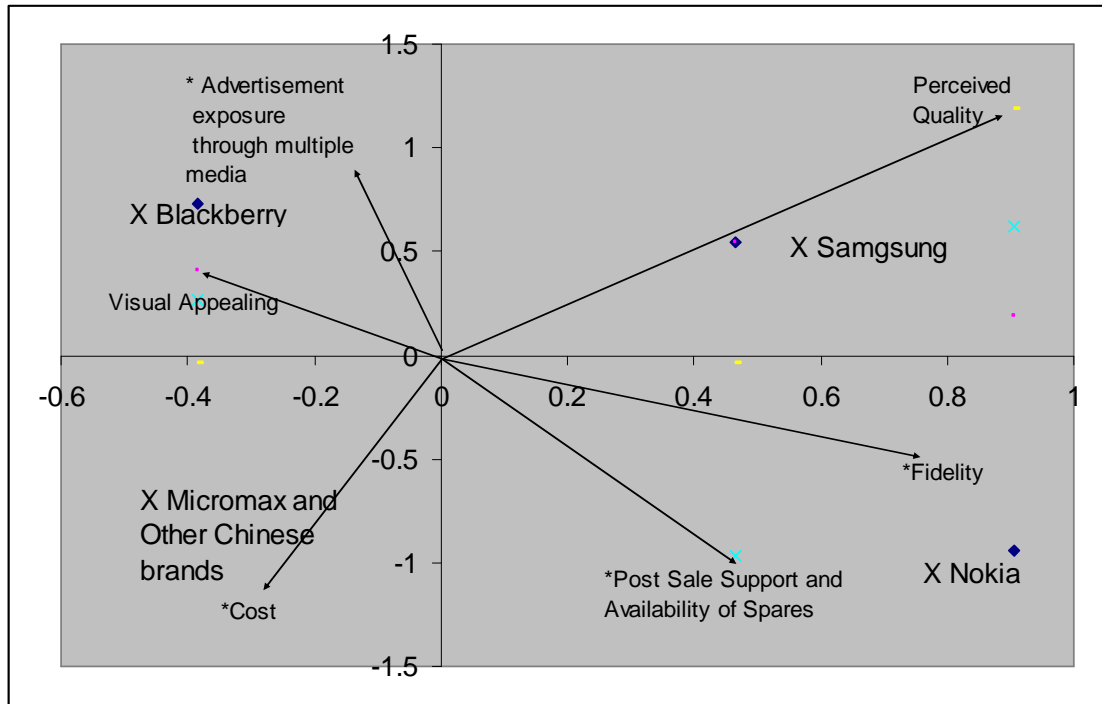
**Canonical Discriminant Functions**



Note: Coding of Brands is as per table 4

Figure 1

Perceptual Map of Mobile Handsets and Attribute using Excel from SPSS output



**Note X indicate different brands of mobile handset**  
**\* indicate attributes considered for the study on the basis of which customer evaluate different Brands**

### Analysis and Results

Figure 1 represents the vectors for each of the attributes cost, perceived quality of mobile handset and advertisement through multiple media, post sale support and availability of spares, fidelity, visual appealing and smart appearance. These vectors represent the effect of discriminating on each dimension. Longer arrows pointing more closely towards a given group centroid, represents variables most strongly associated with that particular group or Brand, in this case). Vectors pointing in the opposite direction from a given group centroid represent lower association with the concerned group variables with longer vectors in a given dimension, and those closer to a given axis are

contributing more to the interpretation of that dimension . Looking at all variables that contribute to a given axis (dimension), we can label the dimension as a combination of those variables. Table 3 shows factors influencing the customers while purchasing the mobile handsets. The result shows that cost, perceived quality of mobile handset, and advertisement through multiple media are important criterion for selecting the product. To draw perceptual map sample respondents were asked to rate selected mobile operators on six attributes namely cost, perceived quality of mobile handset, and advertisement through multiple media, post sale support and availability of spares, fidelity, visual appealing and smart appearance table 3. All attributes were measured using five point rating

scale (1 -Strongly Agree to 5-Strongly Disagree). Discriminant analysis was used with the help of SPSS 17 software and results have been tabulated from table 5 to table 10. Pooled with the group statistics in table 5 indicates high variation in the standard deviation implies the attributes chosen for analyzing different mobile handset brands are distinct. Eigen values in table 6 shows that first two functions represent 93.6% of the cumulative variance. Hence these two functions have been used for further interpretation. From table 7 low value of Wilks' lambda indicate greater difference among the group indicating appropriate adoption of discriminant analysis as a tool in perceptual mapping in present study. First three canonical discriminates were used in the analysis. From the standardized canonical discriminant function coefficients (table 8), it appears that there are three different functions based on five attributes. Function 1 consists of cost, perceived quality of mobile handset and post-sale support and availability of spares. Function 2 consists of visual appealing and smart appearance attribute and strength. Perceptual map was drawn using Excel by using SPSS output of the discriminant analysis. Figure 2 shows the perceptual map of the selected mobile handset brands and different attributes. Mobile handset brands operators plotted on the map are on the basis of value of group centroids on function 1 and 2 using table 10. All five mobile handset brands have their unique position on the map. Using the standardized coefficients of attributes on function 1 and 2 are incorporated in figure 1 using table 8, the plot of different brands has been plotted in figure 1 using canonical discriminant functions and the same has been incorporated in figure 3. Unstandardized canonical discriminant functions are evaluated by group means. Vector pointing in the opposite gives low degree of association.

### **Mobile handsets and their Association with Attributes/Dimension**

The position of different brands of mobile handsets are plotted with respect to different attribute influencing customers in selection of brand. Four brands of mobile handsets are Nokia, Samsung, Micromax and other Chinese brands

and Blackberry are possessing unique position on figure 1

- Customers identify Nokia brand on fidelity and attribute of post sale support and availability of spares as customer perceive that hand sets are durable and reliable. It is also perceived by the customers that brand have good support after post sales of handsets.
- Attribute of perceived quality attribute is highly weighted for Samsung brand. For Micromax and other Chinese brands this attribute is in opposite direction showing poor quality perceived by customers regarding brands.
- Blackberry brand is perceived better on the attribute of advertisement exposure through multiple media and visual appealing smart appearance of its mobile handsets. It is perceived to be costlier in comparison to other leading brands.
- Micromax and other Chinese brands compete on cost factor as these brands are negatively perceived in terms of quality.

### **Conclusion and Managerial Implication of Research**

Mobile handset industry would depend heavily on how effectively the firms are able to introduce with the new and innovative product designs and their convergence with future variety of applications. The branding strategies regarding mobile handsets should be more focused effectively with changing mindset and perception of the Indian consumers. To create a differentiating in mobile handset marketers of mobile handsets should create a separate submarket or niche for their brand. With this strategy the differentiating attributes should be used to create a strong perception of difference in the brand or category by itself. The brands should be focused on the perceived quality of their products as it was concluded in research study. Marketers of different brands should focus on post sale support, resulting branding promise

communication strategies as the strategies are ignored in their positioning. The marketers should be more focused towards advertising, ranking and marketing campaign to create positive mindset about the brands. The firms selling different brands of mobile handset should strengthen the distribution network and consider innovative new channels of selling their products. Brands should focus their positioning through social networking sites to create positive perception in customer's mindsets. Branding of mobile handsets is thus important as the companies have to realize the inevitability of creating an impression in the minds of the consumers, which would help them in facing the competition. Holistic branding strategies regarding mobile handsets should be more focused towards innovative feature and compatibility with wide variety of software platforms and future applications resulting in creating positive social change in the society.

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