



Perceptual Mapping of Cellular Phone: Analysis using Multidimensional Scaling

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Abstract

Due to availability of social media and advanced communication, now customers has become more affluence and selected about companies, brands, products and services. There are huge competitions among companies, therefore they are producing wide variety of products, in order to meet the needs of buyers. This situation also leads companies to launch very influential marketing plan and strategies. In this scenario, it is better for companies to know about their positioning and what is the image of their products in the market. Perceptual mapping via multidimensional scaling is an important tool to know about perceptions of customers and positioning of product. The aim of this research is to determine students' preference and perceptual mapping related to smart phones.

Keywords: social media, multidimensional scaling

JEL Codes: L82, L80

I. Introduction

In the present age, cellular phone has become major source of communications among people. Rapid and continuous development in communication technology like as smart phone, Global positioning system (GPS) and availability of internet has significant impact on the needs, attitudes, preferences, culture, traditions and choices of customers across the world. (Rahim, et. al, 2016). The usage of mobile among people especially teenagers and students is increasing day by day. (Falayi, et. al, 2014). It has been observed that due to availability of different educational Apps and other features, smart phones have become an essential tool for studies. (Kyung Eun Lee, 2014). Not like past, now people make their social clubs using smart phones, not only with their family members but they also remain in connect with friends across the globe through social media and websites using their mobile. (Suki, Norazah Mohd, 2013). Since nowadays, mobile phones are with advanced technology, features and functions provide more connectivity as compared to past, and so they are also called “smart phones”. (Lim, et. al, 2012). Since it is age of internet, by using smart phone, it become very easy, convenient and fast to do on-line shopping, e-banking, e-business and commerce, sending an email and paying bill through smart phone. Moreover, using mobile phones, there has been introduced many sophisticated, rapid and cost-effective marketing techniques to advertise a brand or product. Mobile marketing getting popularity and growing day by day. (Barot, et. al 2014, Zernigah, et. al, 2012). Moreover, due to rapid inventions and advancement in technology, there is huge competition in cellular phone market. In a year, companies launch many models of mobile phones. Therefore, consumer always look for new technologies, design, features and functions that companies changes in their devices on various time periods. By considering attitude towards purchasing of new mobile phone, the producers, vendors and marketers make their advertisement and sale policies accordingly. The study of previous researches suggested that major factors which impact on purchase behavior of mobile phones are numerous such as, company name, brand, price, features, social influence, durability, after sale service, resale value, size, design, easy handling and appearance etc. (Naser Azad & Maryam Safaei, 2014). Therefore, cellular manufacturing companies also consider on consumer decision and factors affecting on consumer’s choice. The main focus of this study is to get to know about the choice of smart phones. There were five popular brands: IPHONE, SAMSUNG, HUWEI, OPPO and Q-MOBILE included in the survey and university students were asked to about their favorite brand.

II. Previous Research

In recent decade, a lot of researches has been conducted on the purchasing behaviour and factors influencing choice of mobile phones, especially with reference of milliners. Following is some studies are presented. Das Debadutta, 2012, consider the young youths of coastal district of Odisha and tried to investigate the factor which influence on their purchasing behavior of mobile phone. In order to analyze the results, the researchers used statistical techniques such as, Percentages, Chi-Square Test and paired t-test. The most significant result found from analysis that majority of youth used credit system to buy smart phone. Karen Lim Lay-Yee, et. al, 2013 Malaysian young generation and determined to find out the factors related to mobile purchase decisions, moreover the researches investigate the relationship of buying decision with convenience, price, product, brand and social influence. At the end of study, the researchers suggested that sellers, vendors and marketers of mobile phones should have deep understanding of the purchase decisions of consumers, in order to compete their competitors in mobile phone selling industry.

Owusu Alfred (2013) conducted a research in Kumasi and tried investigate how price and quality of mobile phone effect on purchase of behavior of cell phone buyers. Simple random sampling technique were deployed and participants were selected. For this research, data has been collected through various techniques like as via personal interview, questionnaire distributed among participants and by considering pricelist of the selected mobile phones. Results of study have been revealed that both price and quality have significant impact on purchase behavior of customers. Uddin et al (2014) also performed same kind of research determined in Khulna city and explored the factors influence on buying decision of buyers. Respondents were selected using convenient sampling technique. A structured questionnaire has been distributed among respondents and data has been collected. In order to perform data, factor analysis method was adopted. It has been revealed from results that the important factors which influence the buying behavior of smart phones were: recommendations from peer group, price, and design, charging time of battery, operating system, outlook and advertisement. Such type of results was also found by Deepa Guleria (2015). He performed research on basis of 80 participants, and identified that the more influencing factor is usability features of mobile. Aftab et al (2015) conducted study on factors affecting buying decision of mobile phone customers. By consulting literature review, they developed a structured questionnaire consist of 21- items and data has been obtained from 432 respondents. The collected data has been analyzed using Reliability, Kaiser-Mayer-Olkin and Bartlett’s tests. It has been identified from results that the important factors are: price, physical

appearance, brand image, uniqueness of mobile and easy to use. At the end of study, many suggestions have been given to marketers.

Tariq Bhatti (2015) execute a research in area of mobile commerce and determined the important feature that influence on decision of the consumers while buying smart phones. For analysis purpose, technology acceptance model is used. It had been revealed from results that major influencing factors are perceive ease of use, personal behavior related to innovations, personal characteristics of buyers and behavior control. Moreover, this study was validate using empirical data and regression analysis were performed. Similarly, Joshi Sujata (2016) conducted research on potential factors that can effect consumers' purchasing decisions. He considered the data of 306 participants and identified that important factors were: Technology, Hardware, basic features of mobiles, brand image and price of mobile. Moreover, it has been observed that social pressure also plays significant role while choosing a product, this social pressure usually come from family, friends, classmates, salespersons, shopkeepers and so on. (Foxall, 1999; Leek et al., 2000). Therefore, it is recommended that social circle of a person should be take into account when we consider consumer choice, most importantly when choice of particular object get praise from others. This becomes more important for firms and organizations, where consumer directly meet with sale persons.

III. Objective and Hypothesis of Study

The main objective of this study is to know about most and popular brand of cellular phone among the university students. In order, to achieve the objective of this study, following hypothesis are formulated and tested using multidimensional scaling technique:

- To determine which cellular phone is brand is more preferred among all students.
- To explore the most preferred smart phone on the basis their basic features.
- To compare the choice of cellular phone brand among boys and girls.
- To find out difference of choice of cellular phone brand among three groups of students.

IV. Research Methodology

This is an exploratory study and based on survey. A structured questionnaire has been developed after extensive study of literature review related to factors influencing the purchasing behavior of smart phones. Questionnaire consist of two parts: First part comprises the information regarding basis demographics of students. While in other part of questionnaire, students were asked to rank their preferred brand of smart phones. There were five most popular brand of cellular phones were included in this study i.e. iPhone, Samsung, Huawei, Oppo and Q-mobile. Students were asked to rank these brand on the basis of price, quality, features, design, physical outlook, recommendation from friends or family member and moreover on the base of their personal experience. In this study all the participants are students, as they are more frequent users of mobile phones and they are experiencing as compare to other people of society. There were 350, questionnaires were distributed among students of Lahore Business School, The University of Lahore. Of them, 268 were completely filled out by students and returned to researches. So, the response rate was observed 89%, which is very high and considered good for analysis. Moreover, simple random sampling technique is adopted in this study. In order to meet the objective and analyze the data, we have used multidimensional scaling technique to obtain perceptual mapping. In addition to this, to gain the specific objective, we have performed Mann-Whitney U-test, to compare choices of boys and girls, while Kruskal Wallis was used to make comparison among three groups. To make an overall comparison among all ranks given by overall respondents, Kendall's test has been deployed. It is to be noted that these test are non-parametric test, as data obtained from respondents were on ranking scale.

V. Analysis and Results

Table-1 presenting details of basic demographics of students. It has been recorded that there were total 268 students included in this study, of them Boys and girls were recorded 130 (48.51%) and 138 (51.49%) respectively. Furthermore, respondents were divided into three groups according to their departments. Majority of students 103 (38.43%) were from Marketing Department, following by Finance Department 97 (36.19%) and then Human Resource Department 68 (25.37%). As far as, living status is concerned, it has been observed that majority of students, almost half of participants used to live outside, in the privately owned hostel. In addition to this, it has recorded that educational expenses of mostly respondents were paid by their parents and they were recorded 200 (74.63%). Finally, it is obvious from Table-1 that, maximum number of students 123 (45.90%) having experience of using smart phone is 2-4 years.

Table- 1 Demographic details of Respondents

Variable	Categories	Frequency	Percentage
Gender	Boys	130	48.51%
	Girls	138	51.49%
Department	Marketing	103	38.43%
	Human Resource Management	68	25.37%
	Finance	97	36.19%
Living Status	Home	79	29.48%
	University Hostel	56	20.90%
	Privately Owned Hostel	133	49.63%
Study Expense	Scholarship	23	8.58%
	Paid by own self	45	16.79%
	Paid by Parents	200	74.63%
Experience of Using Mobile Phone	Less than 2 Years	51	19.03%
	2 - 4 Years	123	45.90%
	More than 4 Years	94	35.07%

Table-2, showing the details of Ranking mean and standard deviation. It is to be noted that the brand having lowest ranking mean is supposed to be highly preferred and vice versa, as respondents were asked to rank = 1 to highest preferred Mobile, while rank = 5 to least preferred mobile. It is obvious from table-2, that all students ranked iPhone brand cellular phone highly preferred, since mean rank found for it is 2.21, followed by cell phones made by Samsung with mean ranking of 2.63, Similarly the third and fourth preferred mobiles were Huawei (mean rank =3.12) and Oppo (mean rank=3.42) respectively. Finally, least preferred cellular phone was Q-Mobile (mean rank = 4.09). The highest variation is found is response of Oppo Mobile, as the standard deviation was recorded 1.395, however the minimum standard deviation was recorded for Huawei, it was observed 1.080.

Table- 2 Mean Ranking of overall students

Brand Name	N	Mean Ranking	Std. Deviation
IPhone	268	2.21	1.208
Samsung	268	2.63	1.184
Huawei	268	3.12	1.080
Oppo	268	3.42	1.395
Q- Mobile	268	4.09	1.210

Table- 3, presents details of mean ranking or preference of basic features of cellular phones. There were five basic features were considered in this study i.e. Price, Operating System, Software Applications, Video and Audio Capability and Camera features. It has been revealed from results that as far as Price is concerned the most preferred brand is considered Samsung, while Q-Mobile was found least preferred. In addition to this, when mobile phone was evaluated on the base of Operating System and Software Application, the highest preferred brand was observed iPhone. Furthermore, when we consider, Video and Audio Capability of Mobile Phone, Samsung was found superior brand of cellular phone as compare to rest of brands. Finally, it can be seen from table-3 that, with respect to Camera feature, Oppo mobile found highest rank and supposed to be most preferred.

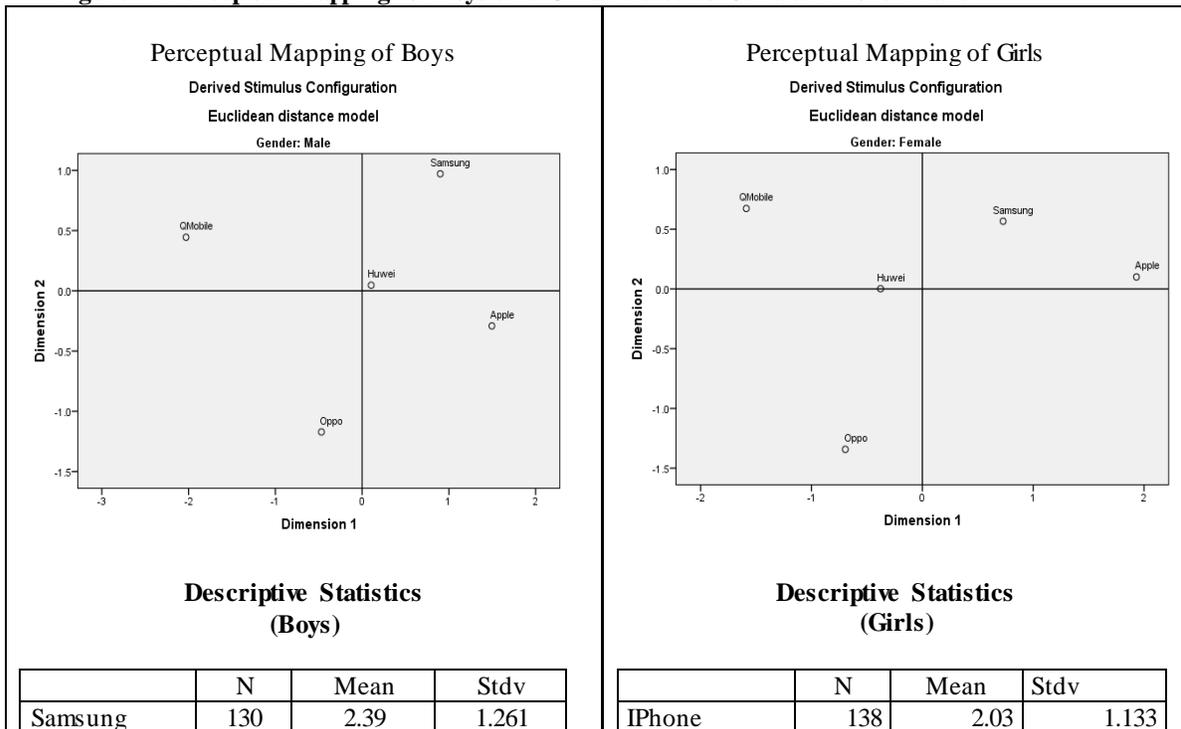
Table-3 Mean Ranking of Cellular Phone's Basic Features

Basic Features	Brand	Mean Rank
Price	IPhone	3.47
	Samsung	2.78
	Huawei	3.12
	Oppo	3.59

	Q-Mobile	3.81
Operating System	IPhone	2.78
	Samsung	2.92
	Huawei	3.10
	Oppo	3.65
	Q-Mobile	3.93
Software Applications	IPhone	3.05
	Samsung	2.89
	Huawei	3.42
	Oppo	3.69
	Q-Mobile	3.77
Video and Audio Capability	IPhone	3.10
	Samsung	3.08
	Huawei	3.31
	Oppo	3.25
	Q-Mobile	4.12
Camera feature	IPhone	3.33
	Samsung	3.56
	Huawei	3.87
	Oppo	3.20
	Q-Mobile	4.15

Figure-1 showing perceptual mapping of Boys and Girls related to Cellular Phone Brand and details of descriptive statistics. It was found that for Boys, the most preferred mobile was Samsung, with standard deviation of 1.261, followed by IPhone with average rank of 2.58, with standard deviation of 1.269. However, the least preferred mobile was found Q-Mobile, for it average rank and standard deviation were recorded 4.46 and 0.827 respectively. It is obvious from figure-1 that, Girls like IPhone most as compare to other smartphone. IPhone got mean rank 2.03 with standard deviation of 1.133, followed by Samsung with mean and standard deviation of 2.68 and 1.101 respectively. It is interesting to note that, Q-Mobile was also least preferred by Girls.

Figure- 1 Perceptual Mapping of Boys and Girls related to Cellular Phone Brand



IPhone	130	2.58	1.269	Samsung	138	2.68	1.101
Huawei	130	2.97	1.041	Huawei	138	3.25	1.101
Oppo	130	3.20	1.383	Oppo	138	3.63	1.378
Q- Mobile	130	4.46	0.827	Q- Mobile	138	3.75	1.399

In order to test whether, the mean ranking of boys and girls are same across all brand, we have performed Independent Samples Mann- Whitney U test were performed. It has been revealed from results that both boys and girls ranked Apple, Huawei, Oppo and Q-Mobile brand differently. Moreover, to compare the average rank of three departments, Kruskal – Wallis test is used. It can be seen from figure-2, that students from three departments i.e. Marketing, Human Resource Management and Finance ranked equally all departments. It means that there is no difference in average ranks of three departments across all brands.

Figure-2 Output of Mann Whitney U-Test and Kruskal-Wallis Test

Hypothesis Test Summary				Hypothesis Test Summary					
	Null Hypothesis	Test	Sig.	Decision		Null Hypothesis	Test	Sig.	Decision
1	The distribution of Apple is the same across categories of Gender.	Independent Samples Mann-Whitney U Test	.017	Reject the null hypothesis.	1	The distribution of Apple is the same across categories of Department.	Independent-Samples Kruskal-Wallis Test	.686	Retain the null hypothesis.
2	The distribution of Samsung is the same across categories of Gender.	Independent Samples Mann-Whitney U Test	.442	Retain the null hypothesis.	2	The distribution of Samsung is the same across categories of Department.	Independent-Samples Kruskal-Wallis Test	.435	Retain the null hypothesis.
3	The distribution of Huawei is the same across categories of Gender.	Independent Samples Mann-Whitney U Test	.034	Reject the null hypothesis.	3	The distribution of Huawei is the same across categories of Department.	Independent-Samples Kruskal-Wallis Test	.171	Retain the null hypothesis.
4	The distribution of Oppo is the same across categories of Gender.	Independent Samples Mann-Whitney U Test	.008	Reject the null hypothesis.	4	The distribution of Oppo is the same across categories of Department.	Independent-Samples Kruskal-Wallis Test	.641	Retain the null hypothesis.
5	The distribution of QMobile is the same across categories of Gender.	Independent Samples Mann-Whitney U Test	.000	Reject the null hypothesis.	5	The distribution of QMobile is the same across categories of Department.	Independent-Samples Kruskal-Wallis Test	.218	Retain the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

Asymptotic significances are displayed. The significance level is .05.

Finally, in order to compare, the overall ranks given by all students, we have deployed Kendall's test. It can be shown that the significance value obtained is 0.834, which shows that the average ranks of Apple, Samsung, Huawei, Oppo and Q-Mobile was statistically found equal.

Hypothesis Test Summary				
	Null Hypothesis	Test	Sig.	Decision
1	The distributions of Apple, Samsung, Huawei, Oppo and QMobile are the same.	Related-Samples Kendall's Coefficient of Concordance	.834	Retain the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

VI. Conclusions

It can be concluded from the results of this study is that there is difference in perception of respondents among different cellular phone mobiles. It has been found that there is difference in choices of Boys and Girls. Boys said that they prefer Samsung, on other hand according to girl the most favorite brand is iPhone. Comparison has been made on the basis features of smart phone and various results were reported. Moreover, it has been revealed from results of non-parametric test that the average ranking of cellular phone brand found different across the gender, while it was same when overall comparison is made and we compare the mean department wise. Since this study was conducted by considering only university students, similar kind of studies can conduct with other segments of customers like as professional, business persons etc. In addition to this, scope of study can be expanded by including more mobile companies and attributes of mobile phones. It is also recommended that such type of study should also conducted in other electronic products to know about preference of consumers.

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