

PERCEPTUAL MAPS OF SMART PHONES WITH MULTI-DIMENSIONAL SCALING ANALYSIS

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ABSTRACT

Nowadays, consumers become more selective and informed about goods and services with the development of the communication tools. Companies increase their product range in order to reach more consumers. Increment of the variety of products raises the competition in the market. Therefore, companies need a powerful marketing plan and strategy in this intense competition. At this point, product positioning that requires knowledge about the market and consumers are becoming more important for companies. Perceptual maps are important tools in the product positioning process to determine perceptions of consumers about a product. This paper demonstrates preferred qualifications by consumers and the perception map of smart phones. In many studies, Factor Analysis used for creating perceptual maps of the brands. This paper differentiated from literature by utilizing Multi-Dimensional Scaling Method for creating perceptual map of smart phones.

Keywords: *Perceptual maps, smart phone, multi-dimensional scaling.*

1. INTRODUCTION

The usage of smart phones and internet is getting extended. As a result of this, consumers are involved in more informed and selective consumption. The companies increase their goods and services' diversity to reach much more consumers. At this point, one of the marketing planning factor gains prominence which is *product positioning*.

A successful marketing strategy depends on differentiation, market orientation and cost reduction (Dalrymple and Parsons, 1995). The fundamentals of product positioning are differentiation and market orientation. For companies, positioning is the effort of taking specific and unique position in the market (Zineldin, 1996). Perceptual maps illustrate the position of a product in the market and they are also the most important tools in the product positioning process.

Product positioning provides an evaluation of the advantages and disadvantages of the product. Companies should consider how consumers perceive their products with this evaluation. Furthermore, consumers benefit from this view to be informed about the features of the product.

Perceptual maps show the location of the products in consumers' mind graphically into two dimensions. It enables a company to inform how a consumer perceives competition of the products relative to product of the company and taking the marketing actions (Crane et al., 2006).

Smart phones which are self-renewal constantly according to the needs and demands of the consumers are often followed by the younger generation. In this study, it will be observed that among five smartphone brands (iPhone, Samsung, LG, HTC, Sony), which brand is the most preferred by the students of Gazi University. We will investigate the preferences of the students in consideration of the five smartphones' specifications and develop the perceptual map of five smartphones brands.

From this point, this study is structured as follows: in Section 2 we present a basic literature review to show importance of positioning and perceptual maps and lastly, Section 3 illustrate the development process of the perceptual map with using Multi-Dimensional Scaling Analysis.

2. LITERATURE REVIEW

2.1. Positioning

Positioning is a term which was presented in the article, whose topic is "Positioning is a Game Which People Play in Impersonators Market of Today." The article is in the book which is named "Industrial Marketing" written by Al Ries and Jack Trout in 1969. Afterwards, this article was transformed to the book which is named "Positioning: War for your Brain". Reis and Trout stated that an improvement is generated from three stages which are product age, image age and positioning age (Congram and Friedman, 1991; Fill, 1995).

The period in 1970s is called the "positioning age". This period occurred by increasing the competitive environment. In this competitive environment, the companies were involved into the process which provides products or brands of the companies that was perceived in a different way from product or brands of the companies' competitors (Uner and Alkibay, 2001).

A key to positioning a product effectively is the perceptions of consumers. In determining a product's position and the preferences of consumers, companies obtain three types of data from consumers (Crane et al., 2006) such as:

- Identification of the important attributes for a product class
- Judgments of existing brands with respect to these important attributes
- Ratings of an "ideal" brand's attributes

Brand positioning is regarded as a key tool for brand implementation in competitive markets (Aaker 1996; Hooley et al. 1998; Kotler 2000). Positioning is the act of designing an organization's offering and image to occupy a distinctive place in the target market's mind (Kotler, 2000).

In the current study, we built a perceptual map to position products developed by a company and its competitors to gain valuable insights from consumer reviews. A perceptual map is a diagram which visually displays the perception of consumers. It is helpful for a company to develop new products or rebrand products since the map clearly shows the positions of products in comparison with those of competitors (Lee et al., 2016).

2.2. Perceptual Maps

Perceptual maps are often used to discover insightful strategies. Bhatnagar and Ghose (2004) used perceptual maps to display the result of segmenting web shoppers' behaviors who are shopping online or making cost collation on web. Vanlaar et al. (2008) examined the effective factors for the degree of the attention of the individuals. Their goal is to create a perceptual map to explain the public concerns about dangerous driving behaviors. Bose and Gupta (2013) utilized a perceptual map to present the experimental results based on ratings given by customers of three public sector banks and three new generation private banks. All of these methods use a perceptual map to show the result obtained from questionnaires.

Perceptual map which is one of the product positioning tools is obtained through Multi-Dimensional Scaling (MDS) Method. Multi-Dimensional Scaling Method is a significant analysis because it shows the minimum possible size of the object on a visual map by using the real distance of the objects. The outcomes are similar to the original shape because of using real distances when positioning the objects and therefore Multi-Dimensional Scaling Method is a reliable analysis (Ozdamar, 1999).

The analysis is utilized for determining the number of the size of the product or brand in the mind of the target consumers, denominating these sizes, positioning the objects and detecting the location of the ideal product or brand. One of the important point that should be considered while using Multi-Dimensional Scaling Method is determining the number of the stimulant. Number of stimulant should be enough for the objective answers of the responders and obtaining a sufficient reliable result, therefore, responders' mind will not be confused. Generally, the number of stimulant is preferred between 6 and 13. 7 stimulants were given place in our project. These stimulants are weight, resolution, screen size, price, ease of use, design and strength.

As using Multi-Dimensional Scaling Method, one should pay attention to which technique gives more reliable results. 3 techniques can be utilized while using this analysis (Hair et al., 1998): Complete Metric Technique, Incomplete Metric Technique and Semi Metric Technique. In our research, Semi Metric Technique which is the most preferred technique by the researchers and gives the most reliable results is used. In Semi Metric Technique, non-metric input data is used and as a result of this, a metric graphical arrangement is obtained.

Netzer et al. (2012) presented a method to analyze market-structure surveillance and built a perceptual map to show the result. Since most perceptual maps use two attributes to present the results, Green (1975) proposed a multi-dimensional scaling method to resolve such a problem and visualize multiple attributes in a two-dimensional graph.

The main goal of MDS is to create a perceptual map where in the space between objects fully fit to changes in perceptions. Therefore, MDS is convenient to examine sensed resemblances and variations (Vanlaar et al., 2008).

3. METHODOLOGY

As a consequence of the global smartphone market has grown quickly in recent years, we evaluate our method by using the consumer reviews of smartphones. Initially, we introduce the datasets. Secondly, we evaluate the clustering and the preference degrees of smartphones. Finally, we present the analytical results.

3.1. Sampling

In the current study, the sample consists of the students in Business Department of Gazi University. Simple Random Sampling Method was used in the selection of the sample. Majority of the determined consumer group is formed from young population. Therefore, in order to provide the reliability of the research, people who are the part of the sampling was chosen from the university students. Furthermore, in the research, data was gathered by utilizing Face to Face Survey Method. The survey was applied to 400 students.

3.2. Multi-Dimensional Scaling

In Table 1, it can be seen that the most preferred smartphone brand by the survey respondents is Samsung. We wanted from repliers to give 1 to the most preferred brand and 5 to the least preferred brand. We observed that the first preferred smartphone brand is Samsung, the second preferred brand is LG, the third preferred brand is iPhone, the fourth preferred brand is HTC and the fifth preferred brand is Sony.

Table 1. Degree of Preference of the Smartphones

	Degree of Preference
iPhone	2.95
HTC	3.04
LG	2.87
Samsung	2.86
Sony	3.27

Table 2 shows the degrees of preference of smartphones according to their properties. Seven properties of smartphones are weight, resolution, screen size, price, ease of use, design and strength. It seems that iPhone is the most preferred smartphone when we evaluate the smartphones by considering their weights. When we look at the resolution property, it is seen that iPhone is superior to other smartphone brands. The most preferred brand is Samsung considering the screen size. Furthermore, Samsung is a prior brand among other smart phones when we look at their price and ease of use. Lastly, we can see that consumers prefer iPhone for its design and strength properties.

Table 2. Degree of the Preference of Smartphones' Properties

		Degree of Preference
Weight	HTC	3.41
	iPhone	2.26
	LG	3.09
	Samsung	2.47
	Sony	3.76
Resolution	HTC	3.66
	iPhone	1.84
	LG	3.15
	Samsung	2.47
	Sony	3.88
Screen Size	HTC	3.57
	iPhone	2.67
	LG	2.98
	Samsung	2.03
	Sony	3.73
Price	HTC	3.31
	iPhone	2.98
	LG	2.90
	Samsung	2.17
	Sony	3.63
Ease of Use	HTC	3.67
	iPhone	2.40
	LG	3.10
	Samsung	1.91
	Sony	3.92
Design	HTC	3.63
	iPhone	1.94
	LG	3.16
	Samsung	2.45
	Sony	3.81
Strength	HTC	3.48
	iPhone	2.04
	LG	3.23
	Samsung	2.62
	Sony	3.62

In a perceptual map, a target function which is called the “stress” function, is used for determining how well the objects reflect the real structure. Stress value is always zero or bigger than zero. The situation which stress value is equal to zero demonstrate that the data which the researcher has is fully compatible with the perception in the mind of the consumer. However, this case is theoretical and it is not possible for the most data. In Multi-dimensional scaling analysis, stress values which is used for validity and reliability indicator are interpreted in the following way (Churchill and Lacobucci, 2002):

Stress = 0.20 Poor Fit
 Stress = 0.10 Mid-Fit
 Stress = 0.05 Good-Fit
 Stress = 0.02 Very Good-Fit
 Stress = 0.00 Fully-Fit

In our paper, after three iterations the stress value (0.026874) is less than 0.05 and thus, the conformity of the distance between five smart phone brands has good fit in the graphical layout.

Table 3. S-Stress Value

Iteration	S-Stress	Improvement
1	.26682	
2	.23359	.03323
3	.23260	.00099
Iteration stopped because S-stress improvement is less than .001000		
Stress = 0,026874		RSQ = 0,64934

Similarity matrix is a matrix that is symmetrical and does not have diagonal elements. In this paper, Semi-metric Multi-dimensional Scaling Analysis is used because the similarity matrix was generated by taking the average of similarity data which was obtained from the respondents. In Table 4, similarity matrix of five smartphone brands is given.

The similarity matrix that we obtain was submitted to SPSS 18.0 computer software package for the semi-metric Multi-dimensional Scaling Analysis and monotone regression of Euclidean distances was generally established on the distances. Therefore, we used monotone regression in this paper.

Table 4. Similarity Matrix of Five Smartphone Brands

	HTC	iPhone	LG	Samsung	Sony
HTC	.0				
iPhone	2.443	.0			
LG	2.565	2.089	.0		
Samsung	1.866	.000	.490	.0	
Sony	3.223	2.641	2.830	2.131	.0

Multi-dimensional Scaling Analysis does not have a procedure which is related to the definition of the axes. As a result of this, we obtained the definition of the dimensions by examining the qualifications of the brands. Dimensions that were obtained through SPSS Program is given in Table 5 for five smart phone brands.

Table 5. Dimensions of Perceptual Map

Dimension			
Stimulus Number	Stimulus Name	1	2
1	HTC	1.1391	1.5146
2	iPhone	.3006	-.7705
3	LG	.4618	-1.059
4	Samsung	.1154	-.2002
5	Sony	-2.017	.5159

When we look at the dimensions of the perceptual map, it is presented that dimension 1 is price and dimension 2 is screen size. For the dimension 1, positive part of the perceptual map shows “high price” smartphones which are Samsung, iPhone, LG and HTC. Negative part of the perceptual map shows “low price” smartphone which is Sony. For Dimension 2, positive part of the perceptual map shows “big screen size” smartphones which are HTC and Sony. Negative part of the perceptual map shows “small screen size” smartphones which are Samsung, iPhone and LG.

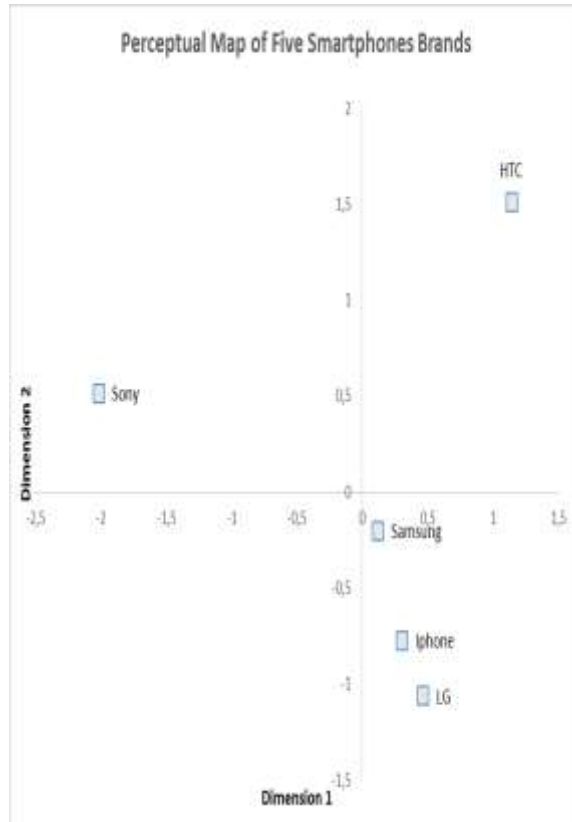


Fig 1. Perceptual Map of Five Smartphone Brands

4. CONCLUSION

In this study, the perceptions of the students of Gazi University Department of Business for 5 smartphone brands were displayed on the perception maps in a visual way. The study shows that the students position the smartphone brands according to their price and screen size. The perceptual map demonstrate that iPhone and Samsung are the most similar perceived brands. On the other hand, HTC, LG and Sony are the least similar perceived brands. Consequently, marketing managers should obtain stronger marketing strategy through perception maps by observing both the location of their businesses and the location of competing businesses. Scholars can use the other multi-dimensional scale methods or create perceptual maps according to the models of smartphones such as iPhone 6.

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