ANALYZING THE PERCEPTIONS OF TURKISH UNIVERSITIES USING MULTIDIMENSIONAL SCALING (MDS) ANALYSIS

ULAŞ AKKÜÇÜK[*]
Boğaziçi University

SELİN KÜÇÜKKANCABAŞ[**]
Boğaziçi University

ABSTRACT

With the number of public and private universities in Turkey increasing and with the selection mechanisms offering ever more increased freedom of choice to prospective students, it is becoming important to analyze how students perceive differences among the most preferred Turkish universities. Education marketers may use perceptual maps either to see the current state of the market or to plan for new product launches (in this case, new universities). This paper analyzes the perceptions of the ten most preferred Turkish universities as judged by undergraduate students at universities around Turkey. The Multidimensional Scaling (MDS) technique is used to come up with a perceptual map of the ten most preferred Turkish universities in management education, after obtaining data in the form of similarity judgments, attribute ratings and preference ratings from the respondent students. Additional analyses are performed to attribute meaningful names to perceptual map dimensions, and also to determine the ideal point of the perceptual map. The results indicate that the three private universities plus Galatasaray University form a distinct cluster on their own, while the other six public universities are separated into two distinct groups occupying unique positions in separate quadrants of the perceptual map. It is also found that the ideal point indicates the direction of Boğaziçi University, ODTÜ and İTÜ.

Key Words: Turkish universities, perceptual mapping, Multidimensional Scaling, ALSCAL, PROFIT, PREFMAP.

TÜRK ÜNİVERSİTELERİNİN ALGILAMALARININ ÇOK BOYUTLU ÖLÇEKLENDİRME (MDS) ANALİZİ İLE İNCELENMESİ

ÖZET

Giderek artan kamu ve özel üniversite sayısı ve öğrencilerin seçim yapmasında getirilen esneklikler, öğrencilerin üniversiteler arasındaki farkları nasıl gördüklerinin incelenmesini önemli kılmaktadır. Eğitim pazarlamacıları algısal haritaları kullanarak piyasanın mevcut durumunu anlayabilir ya da yeni ürünlerin (yeni üniversitelerin) nasıl konumlandırılması gerektiğine karar verebilirler.

---

* Ulaş Akküçük is an Assistant Professor in the Department of Management at Boğaziçi University, 34342, Bebek, Istanbul, Turkey. E-mail: ulas.akkucuk@boun.edu.tr

** Selin Küçükkancabaş is a Research Assistant in the Department of Management at Boğaziçi University, 34342, Bebek, Istanbul, Turkey. E-mail: selin.kucukkancabas@boun.edu.tr

Bu makalede işletme eğitiminde en çok tercih edilen on Türk üniversitesinin, Türkiye'de çeşitli üniversitelerde okuyan öğrenciler tarafından nasıl algılandığını çok boyutlu ölçeklendirme (MDS) yöntemi ile incelenmiştir. Öğrencilerden, üniversitelerin birbirine yakınlığı ile ilgili veri toplandıktan sonra, çok boyutlu ölçeklendirme tekniği kullanılarak üniversitelerin algısal haritasına ulaşılmıştır. Farklı bazı teknikler kullanılarak ise MDS sonucu ortaya çıkan boyutlara anlamlı isimler verilmiş ve "ideal" üniversite noktası bulunmuştur. Sonuçlar göstermiştir ki üç özel üniversite ve Galatasaray Üniversitesi birbirine yakın bir küme oluştururken, diğer altı kamu üniversitesi üçerli gruplar halinde farklı yerlerde konumlanmıştır. Ayrıca bulunan ideal noktanın Boğaziçi Üniversitesi, ODTÜ ve İTÜ'nün bulunduğu noktalar yönünde olduğu görülmüştür.

Anahtar kelimeler: Türk üniversiteleri, algısal haritalama, çok boyutlu ölçeklendirme, ALSCAL, PROFIT, PREFMAP.

Facing a growing competitive environment, higher education institutions have dramatically increased their efforts in recruiting and retaining students and providing high quality service. Universities are mobilizing all of their resources for recruiting, such as changing their financial aid policies to allow students from low-income families to enroll, and updating their campuses to become more diverse and attractive, as these are what high school seniors and their parents expect (Domino et al., 2006). The educational institution needs to maintain or develop a distinct image to create a competitive advantage in an increasingly competitive market.

The statement by Keever (1998), "Create an image for your company or your competitors will do it for you," is equally relevant to the higher education sector. Institutions are becoming more aggressive in their marketing activities and need to be clear about their positioning and the image they wish to convey to their public (Russell and Marilyn, 2005).

In order for institutions to understand how customers review their products in relation to other products in the market, a number of multivariate techniques for data visualization can be used. These visualization techniques give decision makers a snapshot of how the customers see products (in this case, universities) relative to one another. Multidimensional Scaling (MDS) is one such visualization technique among other exploratory techniques used to study the interdependence of a number of variables such as Factor Analysis, Cluster Analysis and Correspondence Analysis (Hair et al., 1998). Obtaining perceptual maps by Multidimensional Scaling is a commonly used marketing practice to show how brands within a product category are similar to one another and how they differ from other brands (Parasuraman et al., 2004).

In MDS the objective is to convert consumer judgments of similarity (or dissimilarity) between objects into distances represented in multidimensional space (Hair et al., 1998). There are a number of methods for how data can be obtained or converted to a similarity (or dissimilarity) measure. In some cases data may be originally in the form of similarities or dissimilarities. A good example is store-switching data (Bucklin and Lattin, 1992). Another widely cited example is Morse Code confusion data (Rothkopf, 1957).

Another method would be to obtain similarity judgments in the form of a similarity rating (in our case we use a rating scale between one and seven, one corresponding to least similar and seven corresponding to most similar) by asking respondents to rate all possible pairs. Hence, for the three

objects Q, W, and E we would ask three similarity ratings QW, QE and WE. A third method would be to derive the dissimilarity or similarity measure (such as correlation or Euclidean distance) from another data set. Suppose we ask respondents to rate objects based on a number of attributes, compute Euclidean distances between the objects using the attribute ratings. We will have effectively derived a dissimilarity measure that could be used as input to the MDS analysis.

If direct dissimilarities are not available, we believe the second approach is the most desirable. In Hair's (1998) words "… the derived measure is the least desirable in meeting the spirit of MDS – that the evaluation of objects be made with minimal intervention by the researcher." In derived measures, the researcher's attributes may not be the correct ones, and second, there is no straightforward recipe for the dissimilarity measure chosen for conversion (correlation, squared Euclidean distance, City-Block distance, etc.). We have thus chosen to collect dissimilarities directly from the respondents. The attribute ratings collected are solely for the PROFIT analysis to follow.

The details of the different MDS algorithms will not be provided here. For a concise treatment, readers are referred to Lattin et al. (2003). In this paper we will try to shed light on how Turkish students perceive different universities by the use of a particular Multidimensional Scaling (MDS) algorithm known as ALSCAL[(1)] and a number of other complementary techniques (PREFMAP and PROFIT,[(2)] enabling us to interpret MDS solutions more accurately. In using the complementary method PROFIT we will use the importance criteria as identified in the previous literature on this field.

The paper will proceed as follows: In the next section, we will explain the research design in terms of sample determination and characteristics, the selection of the universities to be included in the perceptual map, the selection of attributes used in the PROFIT analysis and the questionnaire design. Subsequently, we will provide the results in terms of perceptual maps and certain numerical measures from the MDS algorithm ALSCAL and the complementary methods PROFIT (to attribute meaning to MDS dimensions) and PREFMAP (to find the ideal point/vector in the same MDS space). Finally, we will present a discussion of the results and future directions.

RESEARCH DESIGN

Sample

Our sample consisted of 594 students studying at different universities in Turkey. The sample was mainly a convenience sample; however, it was made sure that the views of any one university's students did not dominate the sample. To be more specific, 405 of the 594 students were students of the 10 universities in question in this study. The maximum number of students came from Boğaziçi University with 13.5%, and the second largest group was İTÜ students at 13.1%. All the other groups fell below 10%. Also, there were a total of 52 universities represented in the sample. In terms of gender, 267 respondents were female and 327 were male. In terms of the high schools from which the students were graduated, a predominant percentage were Anatolian High Schools (322 respondents), the second largest were Science High Schools (100 Science High Schools and 14 Private Science High Schools), the third largest were Private High Schools (89 respondents) and the last were State High Schools (69 respondents).

Selection of Objects (Universities) to be Plotted on the Perceptual Map

The total number of universities in Turkey is currently 83, comprising 58 public and 25 private universities (YÖK, 2007). Asking pairwise judgments from the entire set of pairs would entail the respondents to answer 3403 questions. This is obviously not feasible and many students would not be familiar with a vast majority of the 83 universities. In order to reduce the number of universities, we used the results of the 2005 University Entrance Examination in terms of the number of students universities received from the top 500. Generally, the more prestigious universities receive a larger number from the top 500. The ten universities, Boğaziçi University, Hacettepe University, Bilkent University, ODTÜ, Sabancı University, Koç University, İstanbul University, Gazi University, İstanbul Technical University and Galatasaray University, altogether received 489 students out of the 500 in the equally weighted points. We decided that this small group of universities would have been in the highly competitive set of schools from which competitive students would be making their selections.

Choice of Attributes to be Used in the PROFIT Analysis

Students are very serious and careful when choosing a university to attend. When they make decisions about attending university, and ultimately what university to attend, they consider factors much differently than how previous generations did, such as economic, academic, geographic, cultural, and even political factors (St. John et al., 2005; Teachman and Paasc, 1998; Wilson and Wilson, 1992; Zuker, 2006). If universities are to satisfy students' requirements, they must be aware of their own offerings and how these are perceived in the market place. Knowing those influential factors and the associated impact on potential students is important for institutional policy makers.

Previous studies have attempted to determine what factors have the greatest influence on students' university choice. In a specific case study, Hanson, Norman and Williams (1998) reported that the three most important positive factors for students in choosing the university in which they will enroll were its national academic reputation, the quality of educational majors available and the prestige of the university. Other factors that positively influence students' decisions were quality of facilities, variety of majors, degree of academic competition, social climate of the campus, quality of faculty, quality of social life and the distance the university is from home.

Zuker (2006), the Vice President and Dean of Student Services at the University of Dallas, based on his personal experience and interaction with the students and their parents, summarized seven important factors that high school students should consider when choosing a university. These seven factors are the size of the university, the location of the university, the academic environment, the social environment, the majors, the extracurricular activities (e.g., drama, debate, journalism, club sports, student government), and the costs.

Mazzarol and Soutar (2002) conducted a survey among 879 students at Australian universities and found that the most important factors were the quality and reputation of the university and the recognition of the institution's qualifications in their own country. Jackson (1982) noted that students would remove the alternatives on the basis of geographic, economic and academic factors with the evaluation process being affected by family backgrounds, social contexts and academic experiences. Chapman (1981) stated that university choice was influenced by student characteristics (socio-economic status, aptitude, level of educational experiences and high school capabilities) as well as external motivations

(influence of significant personnel, the fixed factors of an institution and the institution's capabilities of communicating with potential students). Location, costs, campus environment, and the availability of desired programs were included as relatively fixed university characteristics.

Previous work in the UK confirmed that course specifics (content, structure, method of assessment of the degree program) was the most popularly stated attribute, followed by location (distance from home, rural/urban place, atmosphere of the campus, facilities of the city/town of the university) and reputation of the university (league tables, recognized name or department, "old" red brick universities in comparison to "new" universities) (Moogan et al., 1999). For example, some students might be willing to choose a university with an unfavorable location (too close or too far from home, too rural or too urban, too busy or too quiet), in exchange for a more appropriate course (more interesting/ relevant modules, variety of assessment, inclusion of field trips) which had a better reputation (more established university) (Moogan et al., 2001).

Gorman (1976) made a distinction between the uncontrollable factors of higher education provision such as location and controllable factors such as academic reputation where high standards could be established and monitored. Gorman reported that location and size were the criteria most frequently used in deciding which university to attend. Reputation for academic quality was of secondary importance.

In this study we chose to use five attributes, these are:

1. The prestige of the university
2. Quality of the facilities
3. Quality of the faculty
4. Quality of social life and extracurricular activities
5. The location of the university

Questionnaire Design

The questionnaire is organized in four parts. The first part (Part A) asks the respondents to rate the similarity of a pair of universities on a scale from one to seven, where seven corresponds to most similar and one corresponds to least similar. Since 10 universities are selected, this represents 45 ($n(n-1)/2$ where n is equal to the number of objects) pairwise similarity judgments to be completed by the respondents. The second part (Part B) contains questions about particular attributes that have generally been used to identify universities, as explained in the previous section. In this part the respondents rate the 10 universities on a scale from one to seven (one being very bad and seven being very good) based on the aforementioned five attributes. In the third part (Part C) the students are expected to provide a rank order of the 10 universities in terms of preference. Finally, the students answer a number of demographic questions including gender, and type of high school graduated. The six categories of different high schools include Anadolu Lisesi (Anatolian High School), Fen Lisesi (Science High School), Özel Fen Lisesi (Private Science High School), Özel Lise (Private High School), Devlet Lisesi (State High School), Other (Foreign, Vocational School, etc.). Finally, the student is asked to identify at which university he/she is studying. This particular variable is important as we do not want the sample to be dominated by members of a particular university.

RESULTS

Common Two-Dimensional Space as Seen by the Average University Student

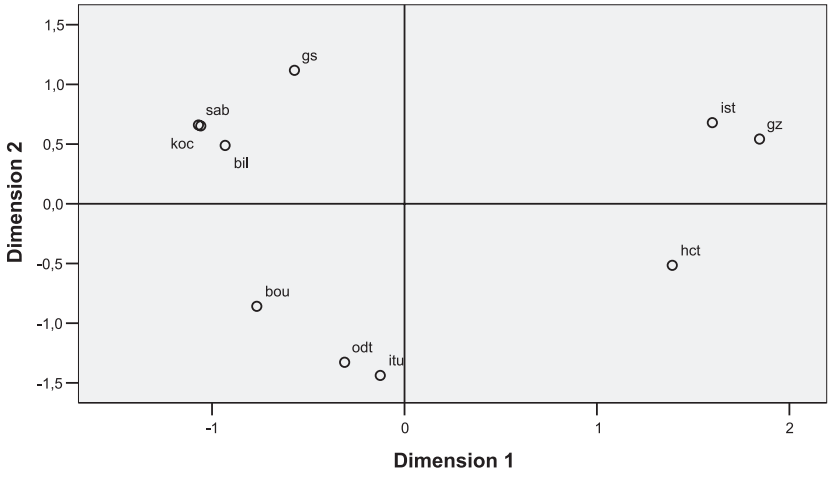
In order to see the common space as seen by the average student, the 594 responses from the students were averaged in order to get an average value of perceived similarity between the universities. Table 1 shows the average perceived similarities between the universities in the lower rectangular format.

Table 1
Average Perceived Similarity between Universities

	Hct	İst	Odt	Itu	Gz	Bou	Bil	Koc	Gs
İst	3.68								
Odt	3.85	3.03							
Itu	3.45	3.58	4.87						
Gz	3.95	4.00	3.03	2.83					
Bou	3.38	3.28	4.83	4.36	2.70				
Bil	3.63	3.10	4.31	3.82	2.94	4.52			
Koc	3.39	3.05	3.98	3.77	2.58	4.38	4.85		
Gs	3.54	3.25	3.79	3.65	2.89	4.47	4.22	4.24	
Sab	3.23	2.96	3.95	3.75	2.73	4.51	4.93	5.35	4.32

All of the 45 possible pairs are presented here. The lowest similarity is between Koç and Gazi (2.58) and the highest is between Koç and Sabancı (5.35). In order to get a two-dimensional perceptual map of the universities as seen by the students, ALSCAL (Young and Harris, 1990) program (a part of SPSS 13.0 data analysis package) was used. Since ALSCAL only accepts dissimilarities and our data is originally similarities, the seven-point scale was reverted such that seven corresponded to most dissimilar and one corresponded to most similar. After this necessary transformation, ALSCAL was used to obtain a two-dimensional solution. The resulting map is given in Figure 1. In this map the following mnemonic codes are used in place of the universities' full names: Bou (Boğaziçi), Bil (Bilkent), Hct (Hacettepe), Odt (ODTÜ), Koc (Koç), Sab (Sabancı), Ist (İstanbul University), Itu (İstanbul Technical University), Gz (Gazi University), Gs (Galatasaray University).

Figure 1
Two-dimensional Perceptual Map of Average Similarities



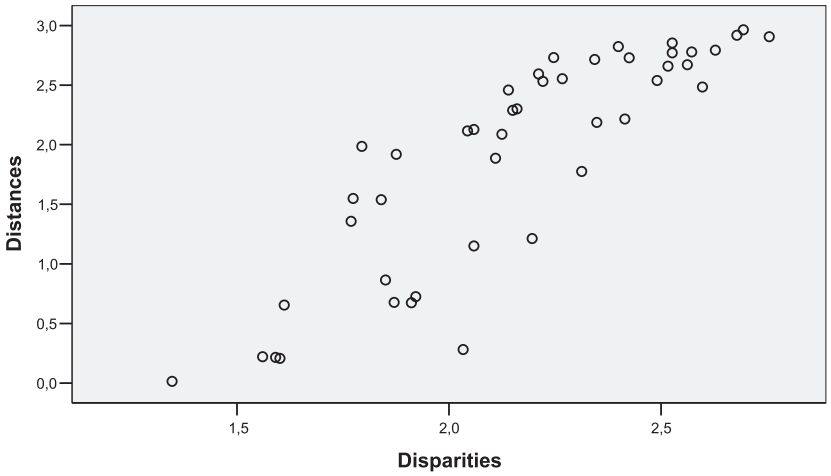
It is evident here the private universities form a distinct group at the top left corner of the map, while the six public universities are scattered across different areas of the map. Although Galatasaray is a public university, it is located near the three private universities. The public universities form two groups: One group in the lower left quadrant consisting of İTÜ, ODTÜ and Boğaziçi and the other group located toward the right of the graph consisting of Gazi, Hacettepe and İstanbul. Hacettepe, which is actually found to be very dissimilar from all other universities, occupies a distinct location in the lower right quadrant. The closest universities are Gazi and İstanbul; however Hacettepe is somewhat more distant than the group containing the Gazi-İstanbul pair.

The next section outlines a more formal approach in naming the dimensions, but even without any mathematical analysis, an examination of the two dimensions may reveal some insights. The first dimension may be a private-public dimension (from left to right on this dimension: Sabancı, Koç, Bilkent, Boğaziçi, Galatasaray, ODTÜ, İTÜ, Hacettepe, İstanbul, Gazi). Boğaziçi is placed closer to private universities on this dimension, perhaps owing to its past as an American private higher education institution (Robert College) in the near past. The second dimension (from up to down in this dimension: Galatasaray, İstanbul, Sabancı, Koç, Gazi, Bilkent, Hacettepe, Boğaziçi, ODTÜ, İTÜ) may somewhat reflect the social sciences versus engineering orientations. It may also represent university size (in terms of number of programs offered and number of students) and/or how established the university is (with the upper positions pertaining to newer universities). Some exceptions clearly stand out here, for example, İstanbul University is well established and large but is on the upper positions.

Many interpretations can be made regarding the perceptual map and these interpretations are only the initial thoughts of the authors. It is also worthwhile to point out any reflection, rotation or translation of the points would not change the Euclidean distances, and hence would give essentially the same solution. Interpretation after such a rotation may be more meaningful. The PROFIT method, to be described shortly, does not suffer from this problem as the attributes are plotted as vectors. The rotation would not alter the locations of the universities with respect to the vectors. Another note is that the dimensionality used here is two, different dimensionalities can also be used, and plots can be generated comparing pairs of dimensions. three possible plots in the case of three dimensions and six possible plots in the case of four dimensions. These solutions may also lead to different interpretations of the dimensions. The two-dimensional solution will be presented here and later the three-dimensional solution will also be presented.

The fit of the solution is generally good, although it cannot be classified as a perfect or excellent fit. There are a number of ways of determining how well the two-dimensional solution suits the average similarities calculated from the 594 subjects (Table 1). The scatter plot of distances calculated from the solution given in Figure 1 against the dissimilarities used as input to the ALSCAL procedure (generally called “disparities,” these would be the values given in Table 1, except the scale is reversed). The smoothness of the graph given in Figure 2 indicates good fit. This smoothness is also captured by the square of the correlation between the disparities and the distances. This value, termed R^2, indicates how much of the variation in the disparities is explained by the distances calculated from the configuration found by the MDS procedure. The R^2 value here is 73.94%, which is reasonably high.

Figure 2
Distances vs. Disparities



There are two other measures, often called "badness of fit" functions (Kruskal and Carroll, 1969), as lower values indicate better fit, namely Kruskal's STRESS formula 1 (Kruskal, 1964a, 1964b), and Young's SSTRESS (the measure that ALSCAL program tries to minimize). For both measures "0" represents perfect fit. SSTRESS in this study turns out to be 0.34 while STRESS 1 turns out to be 0.31. STRESS 1 value is classified as "poor" fit according to Kruskal's rule of thumb (Lattin et al., 2003). These values improve as more dimensions are used. To be more specific, the three-dimensional solution has STRESS1 of 0.18595 and the four-dimensional solution has a STRESS1 of 0.14222. The R^2 values also rise to 82.31% and 84.92%, respectively. In this section and the subsequent two sections using PROFIT and PREFMAP we prefer to use the two-dimensional solution; however, later we will also present the three-dimensional solution.

Attributing Meaning to Dimensions Using the PROFIT Approach

Although it is possible to attribute meaningful names to the coordinate axes based on pure inspection and judgment, it is also possible to use answers to Part B of the questionnaire and examine the correlations between coordinate values and ratings of the universities on the five attributes. Table 2 provides the average ratings of the 10 universities on the five attributes. Table 3 provides the correlations of the attribute ratings with the stimulus coordinates (MDS generated coordinates). From Table 3 we can see that all the attributes are negatively correlated with both of the dimensions. Hence, negative values on both dimensions mean higher attribute ratings.

The computer program PROFIT – short for property fitting – (Chang and Carroll, 1989b) is helpful in determining dimensions that are highly correlated with the attribute ratings. It employs a more sophisticated technique than the one explained above. PROFIT takes the coordinate values from the ALSCAL output and the average attribute ratings on the five attributes as input. The output is the "directional cosines" of the attributes. These are presented in Table 4. As can be seen, the values are very close to the correlations reported in Table 3, but there are some differences. The highest values for the first dimension are quality of facilities and quality of social life. As for the second dimension,

the highest values are prestige and location (as these are negative, the lower values on these coordinate axis correspond to higher ratings on the attributes). Figure 3 provides a plot of the original stimulus coordinates and the directional vectors. The directions of the five vectors (quality of social life, quality of the faculty, prestige, location, and quality of facilities) are towards the third quadrant (the quadrant in which Boğaziçi, ODTÜ and İTÜ are located).

Table 2
Average Attribute Ratings of the Universities

	prestige	facilities	faculty	social	location
Hct	4.54	4.38	4.50	3.96	3.82
İst	4.10	3.79	4.02	3.82	4.39
Odt	6.13	5.67	5.76	5.44	4.77
Itu	5.33	5.09	5.22	4.62	5.12
Gz	3.26	3.32	3.42	3.29	3.61
Bou	6.38	5.91	6.04	6.25	6.36
Bil	5.64	5.58	5.50	5.47	4.72
Koc	5.22	5.41	5.29	5.28	4.05
Gs	5.48	5.12	5.24	5.15	6.03
Sab	5.37	5.54	5.40	5.14	3.30

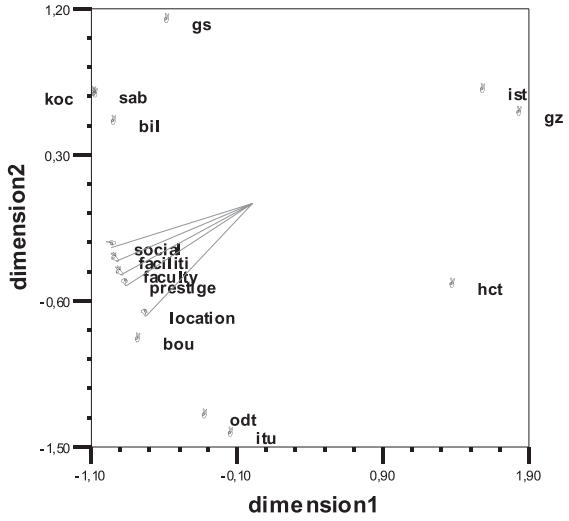
Table 3
Correlations between Average Attribute Ratings and Dimensions

	d1	d2
prestige	-0.84	-0.41
facilities	-0.93	-0.30
faculty	-0.90	-0.37
social	-0.90	-0.21
location	-0.35	-0.27

Table 4
PROFIT Output: Directional Cosines of Fitted Vectors

	d1	d2
prestige	-0.86	-0.51
facilities	-0.93	-0.35
faculty	-0.90	-0.44
social	-0.96	-0.27
location	-0.72	-0.69

Figure 3
Direction Vectors of Attributes and Universities (PROFIT)



Preference Scaling Using PREFMAP

The computer program PREFMAP (Chang and Carroll, 1989a) takes preference data and the stimulus coordinates obtained from an MDS analysis as input, and provides the "ideal point" in the same coordinate space as output. Hence, the so-called "ideal university" can be visualized in terms of the coordinate space already generated for the perceptual map of the universities. This analysis needs the ALSCAL output already discussed and the average preference values for each university computed from the answers to Part C of the survey as input. The average preference values for the universities are given in Table 5. It is seen here that Boğaziçi has the highest average preference with a large difference. ODTÜ, Bilkent, İTÜ, Koç, Sabancı, Galatasaray, Hacettepe, İstanbul, and Gazi follow.

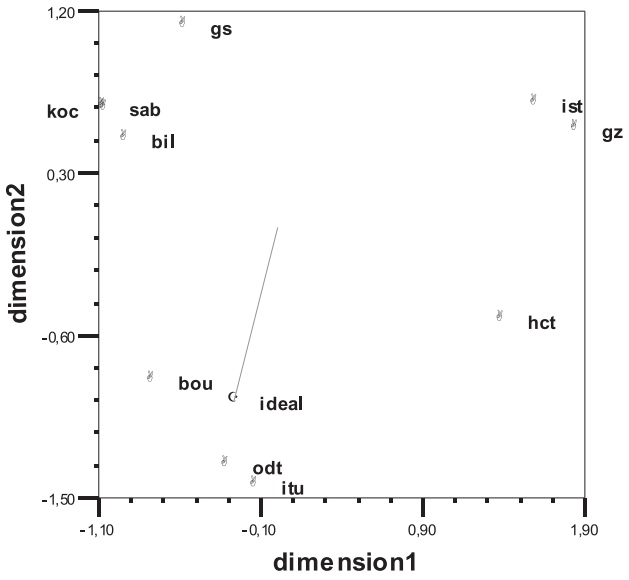
Table 5
Average Preference Values of Universities

	Preference	Rank
Hct	7.00	8
İst	7.42	9
Odt	3.82	2
Itu	4.94	4
Gz	8.91	10
Bou	2.27	1
Bil	4.76	3
Koc	5.14	5
Gs	5.30	7
Sab	5.22	6

There are a number of different models that PREFMAP uses to display the ideal points relative to the MDS produced coordinates. Of these, the "vector" model, assumes that the ideal point is at infinity and produces a vector which points at the ideal point. So the direction of the ideal point vector indicates the directions along the axes that produce an improvement in preference. The ideal point vector in

our case is found to be (-0.2690, -0.9631). The plot of the vector and the original object coordinates are provided in Figure 4. Hence, negative direction in the first axis results in a better evaluation of preference and similarly negative direction in the second axis also results in a better preference rating. Movement in the second axis results in a greater change in the preference than an equivalent movement in the first axis.

Figure 4
Universities and Ideal Point Vector (PREFMAP)



Higher Dimensional Solutions and Dimensionality Selection

As indicated earlier, while two-dimensional solutions are generally preferable and easy to obtain as an output of computer software, higher dimensional solutions can sometimes lead to better results. This is easily portrayed in the plot of the SSTRESS values against dimensionality and R^2 against dimensionality given in Figures 5 and 6, respectively.

Figure 5
SSTRESS against Dimensionality (1 to 4)

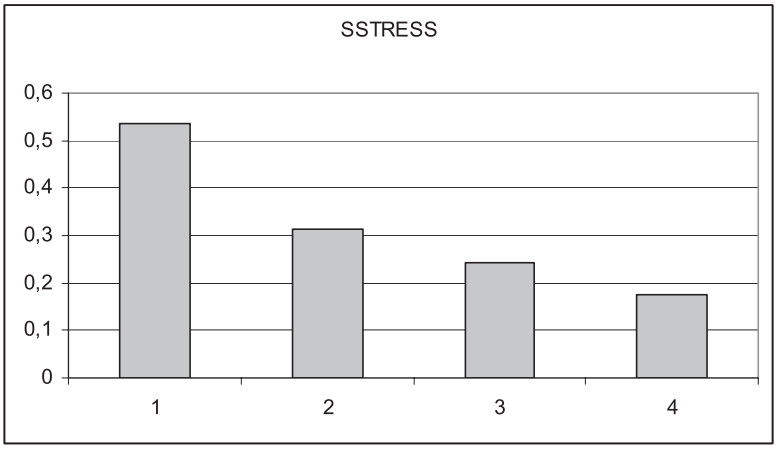


Figure 6
R^2 against Dimensionality (1 to 4)

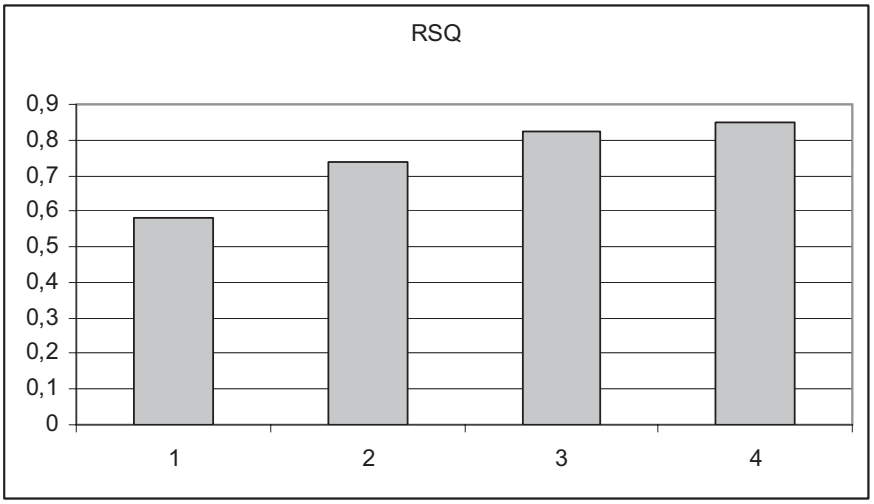
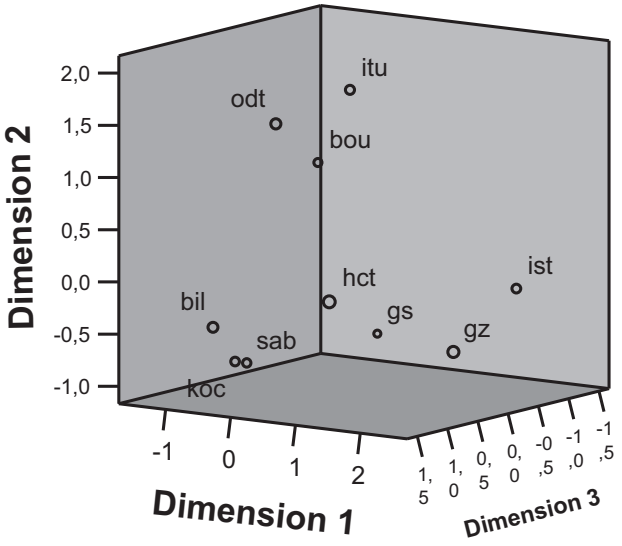


Figure 7
SPSS Generated 3-Dimensional Plot



As seen in these plots a major increase (or decrease) is followed by smaller increases (or decreases) in the measures of fit. A major change happens when we increase dimensionality from one to two, but relatively smaller changes happen as we move from two to three and three to four dimensions. This is generally the case in MDS solutions as dimensionality is increased. The choice must be made such that the increased complexity in the solution is justified by the additional gain in fit. In our case the three-dimensional solution may also be worth visualizing. SPSS does give a three-dimensional plot, which is provided in Figure 7. However, the separate two-dimensional plots are more useful. We need three plots here to account for all pairs of dimensions. Figures 8 to 10 depict the pairwise plots for the three-dimensional solution. Upon inspection of the first plot (Figure 8 – Dimension 1 and Dimension

2), it is readily evident that this is very similar to the two-dimensional solution given in Figure 1. However, there seems to be a reflection on the *y*-axis. The relative positions of the universities remain unchanged and the groupings are also similar. The original interpretations of the axes still hold here with the first dimension representing the public -private and the second representing perhaps the social science – engineering orientations. The third dimension when inspected closely seems to be one of location. This additional dimension seems to separate Ankara and İstanbul.

Figure 8
3-Dimensional Plot D1 against D2

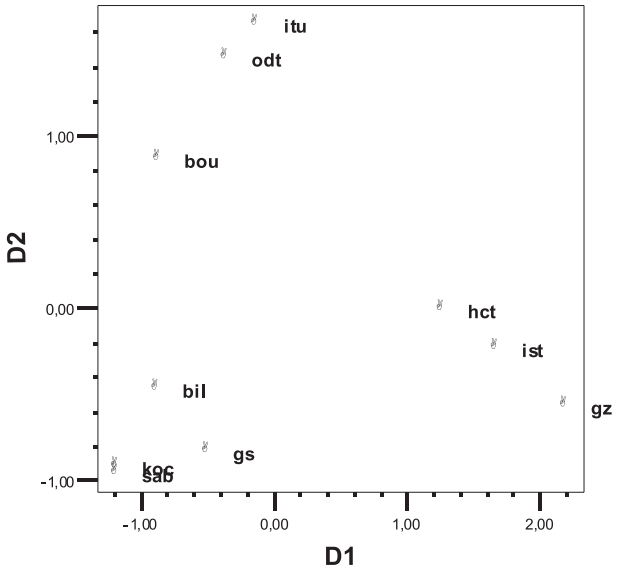


Figure 9
3-Dimensional Plot D1 against D3

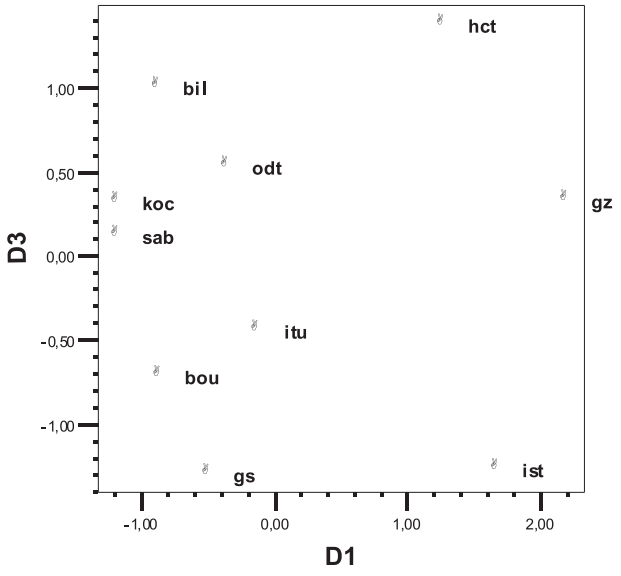
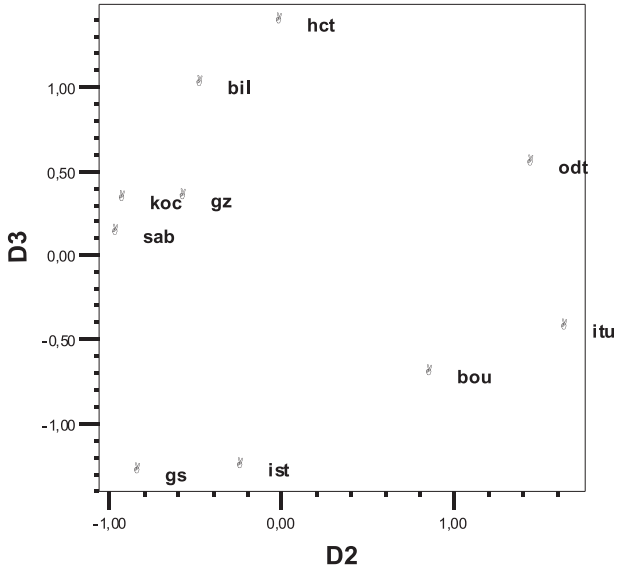


Figure 10
3-Dimensional Plot D2 against D3



CONCLUSIONS AND DIRECTIONS FOR FUTURE RESEARCH

As the ÖSS selection system now involves making a selection after one's score has been determined, and as the number of public and private universities is increasing, it seems evident that universities will need to use more sophisticated marketing tools than ever. MDS is a tool that will allow higher education institutions to see how the general public sees their universities with respect to other schools offering similar programs of study.

Our study (although it has its limitations) shows a number of important properties of Boğaziçi University. First of all, the perceptual map of the average perceptions (Figure 1) shows that Boğaziçi, together with ODTÜ and İTÜ, occupies a unique segment. Upon close examination we can also see that Boğaziçi is somewhere in between prestigious public (İTÜ, ODTÜ) and private universities (Sabancı, Koç, Bilkent). One may even state that it is a "public" university that is offering many of the advantages of a "private" university. If we divide the perceptual map into four quadrants, the lower left quadrant is occupied by Boğaziçi University, ODTÜ and İTÜ. This is also the quadrant to which all of the attribute vectors point. It is worthwhile to note Boğaziçi University has gotten the highest score from the respondents in terms of all five attributes. Also the ideal point is directed at the location of Boğaziçi University, ODTÜ and İTÜ.

One may say that since the actual university selection decision is made at the high school level, it may be more important to study the high school graduating class' opinions in order to obtain the most accurate perceptual map. A future study can include high school seniors' perceptions. Another restriction of the study is the limited number of universities. A similar study can be extended to include more universities, maybe the entire set of 83 universities. However, the length of the time required to fill the surveys may be prohibitively large. So perhaps a similarity/dissimilarity measure derived from attributes can be used. To determine the attributes, a pretest can be conducted.

Another improvement to the study can be obtained by the use of Individual Differences Scaling (INDSCAL) (Carroll and Chang, 1970). This method takes in all the proximity matrices provided by the individuals and also finds out how individuals differ from one another in terms of how they perceive the dimensions. This can be compared to some individual characteristics to gain marketing insights into the various groups of students' perceptions.

NOTES

1. ALSCAL can be found in the SPSS computer package under Analyze>Scale>Multidimensional Scaling (ALSCAL)

2. These programs are MSDOS executables and were run under Microsoft XP operating system. If prospective users are interested, PREFMAP can be found packaged with the text Lattin et al. (2003). For PROFIT refer to Smith (1989).

REFERENCES

Bucklin, R.E. and Lattin. J.M. (1992). "A Model of Product Category Competition among Grocery Retailers," *Journal of Retailing*, 68: 271-293.

Carroll, J.D. and Chang, J.J. (1970). "Analysis of Individual Differences in Multidimensional Scaling Via an N-Way Generalization of 'Eckart-Young' Decomposition," *Psychometrika*, 35: 283–319.

Chang, J.J. and Carroll, J.D. (1989a). "How to Use PREFMAP – A Program that Relates Preference Data to Multidimensional Scaling Solutions," in P.E. Green, F.J. Carmone, and S.M. Smith (eds.), *Multidimensional Scaling: Concepts and Applications*: 303–317. Newton, MA: Allyn and Bacon.

------ (1989b). "How to Use PROFIT – A Computer Program for Property Fitting by Optimizing Nonlinear or Linear Correlation," in P.E. Green, F.J. Carmone, and S.M. Smith (eds.), *Multidimensional Scaling: Concepts and Applications*: 318–331. Newton, MA: Allyn and Bacon.

Chapman, D.W. (1981). "A Model of Student University Choice," J*ournal of Higher Education*, 52(5): 490-505.

Domino, S., Libraire, T., Lutwiller, D., Supercynzski, S., and Tian, R. (2006). "Higher Education Marketing Concerns: Factors Influence Students' Choice of Universities," 6(2): 101-111.

Gorman, W.P. (1976). "An Evaluation of Student Attracting Methods and University Features by Attending Students," *University and University*, (Winter), 51: 220-5.

Hair, J.F., Anderson, R.E., Tatham, R.L., and Black, W.C. (1998). *Multivariate Data Analysis*. Prentice Hall.

Hanson, G.R., Norman, T., and William, A. (1998). "The Decision to Attend UT-Austin: What Makes a Difference?" Available at: http://www.utexas.edit/student/ research/reports/ccweb/CCweb.html [accessed in June 2007].

Jackson, G.A. (1982). "Public Efficiency and Private Choice in Higher Education," *Educational Evaluation and Policy Analysis*, 4(2): 237-47.

Keever, S. (1998), "Building Your Image on Campus," *Journal of Career Planning and Employment*, 58(2): 42-46.

Kruskal, J.B. (1964a). "Multidimensional Scaling for Optimizing a Goodness of Fit Metric to a Nonmetric Hypothesis," *Psychometrika*, 29: 1-27.

------ (1964b). "Nonmetric Multidimensional Scaling: A Numerical Method," *Psychometrika*, 29: 115-129.

Kruskal, J.B., and Carroll, J.D. (1969). "Geometrical Models and Badness-of-Fit Functions," in P.R. Krishnaiah (ed.), *Multivariate Analysis*, 2: 639–671. New York: Academic Press.

Lattin, J.M., Carroll, J.D., and Green, P.E. (2003). *Analyzing Multivariate Data*. Pacific Grove: Brooks/Cole.

Mazzarol, T. and Soutar, G.N. (2002), "'Push-Pull' Factors Influencing International Student Destination Choice," *The International Journal of Educational Management*, 16(2): 82-90.

Moogan, Y.J., Baron, S., and Bainbridge, S. (2001), "Timings and Trade-Offs in the Marketing of Higher Education Courses: A Conjoint Approach," *Marketing Intelligence and Planning*, 19(3): 179.

Parasuraman, A., Grewal, D., and Krishnan, R. (2004). *Marketing Research*. Boston: Houghton Miflin.

Punj. G.N. and Staelin, R. (1978). "The Choice Process for Graduate Business Schools," *Journal of Marketing Research*, 15(4): 588.

Rothkopf, E.Z. (1957). "A Measure of Stimulus Similarity and Errors in Some Paired-Associate Learning Tasks," *Journal of Experimental Psychology*, 53: 94-101.

Russell, M. (2005). "Marketing Education: A Review of Service Quality Perceptions among International Students," *International Journal of Contemporary Hospitality Management*, 17(1): 65.

Smith, S.M. (1989). *PC-MDS: A Multidimensional Statistics Package*. Provo, Utah: Brigham Young University.

St. John, E.P., Paulsen, M.B., and Carter, D.F. (2005). "Diversity, University Costs, and Postsecondary Opportunity: An Examination of the Financial Nexus between University Choice and Persistence for African Americans and Whites," *The Journal of Higher Education*, 76(5): 545-569.

Teachman, J.D. and Paasch, K. (1998). "The Family and Educational Aspirations," *Journal of Marriage and the Family*, (August), 60: 704-714.

Young, F.W. and Harris, D.F. (1990). “Multidimensional Scaling: Procedure ALSCAL,” in J.J. Norusis (ed.), *SPSS Base System User’s Guide*: 396-461. Chicago, IL: SPSS Inc. Reprinted in J.J. Norusis (ed.), *SPSS Professional Statistics*, (1994): 155-222. Chicago, IL: SPSS Inc.

YÖK (2007). http://www.yok.gov.tr/universiteler/uni_web.htm [accessed in May 2007].

Zuker, R.F. (2006) “Factors to Consider in Selecting a University.” Available at: http://www.thehighschoolgraduate.com/editorial/DF/factors [accessed in April 2006].

Wilson, P.M. and Wilson, J.R. (1992). “Environmental Influences on Adolescent Educational Aspirations: A Logistic Transform Model,” *Youth and Society*, 24: 52-70.