**DOKUZ EYLÜL UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

# THE CONJOINT ANALYSIS IN DETERMINATION OF THE CONSUMERS PREFERENCE

**by**

**Esra TURAN**

**July, 2006**

**İZMİR**

# THE CONJOINT ANALYSIS IN DETERMINATION OF THE CONSUMERS PREFERENCE

**A Thesis Submitted to the**
**Graduate School of Natural and Applied Sciences of Dokuz Eylül University**
**In Partial Fulfillment of the Requirements for the Master of Science in Statistics**
**Department, Statistics Program**

**by**

**Esra TURAN**

**July, 2006**

**İZMİR**

**M.Sc THESIS EXAMINATION RESULT FORM**

We have read the thesis entitled **"THE CONJOINT ANALYSIS IN DETERMINATION OF THE CONSUMERS PREFERENCE"** completed by **ESRA TURAN** under supervision of **ASST. PROF. ALİ RIZA FİRUZAN** and we certify that in our opinion it is fully adequate, in scope and in quality, as a thesis for the degree of Master of Science.

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**ACKNOWLEDGMENTS**

I would like to express my appreciation to my supervisor Ass. Prof. Dr. Ali Rıza FİRUZAN for his guidance, encouragement and supporting during my study.

My deepest gratitude goes out to Macit KOC who by his support or his words of advice assisted me throughout my study for the great contributions and special help.

I also send my special thanks to Duygu TÜRKER who always supports me for her valuable suggestion and encouragement. I wish to sincerely acknowledge my colleagues especially Ayselin YILDIZ for supporting and helping.

I am thankful to KUBİLAY DERSHANELERİ, IZMIR BÜYÜK DERSHANE, VIZYON DERSHANELERI, BASARI DERSHANELERI, and KIZILAY DERSHANELERI for their help to provide questionnaires.

Finally, I want to dedicate this thesis to my family who gave me strength to carry on I am grateful for their encouragement, understanding and love that I have always received.

Esra TURAN

## THE CONJOINT ANALYSIS IN DETERMINATION OF THE CONSUMERS PREFERENCE


## ABSTRACT

The purpose of this study is to conceptualize the method of Conjoint Analysis through its application. In doing so, Conjoint Analysis is applied to a study which aims to determine the factors influencing selection of university among candidate students for university.

Concerning the factors which affect the decision of students about university selection, in this study, 9 factors are listed depending upon the literature survey in the same area. These factors are the type of education system, the number of books in the library, university's reputation, campus style, the location of university, education language, the profile of academic personnel, type of the ownership of university and the total number of students of the university.

The questionnaire has been responded by 173 university candidate students as the sample of this study. The students were selected from different institutions that are giving preparation courses for University Entrance Exam. The questionnaire has been conducted in Izmir region.

The results of the study which were interpreted through Conjoint Analysis indicated that the first three important factors in the decision making about university selection, (1)university's reputation (2)type of the ownership of university (3)number of books in the library.

Consequently, this study contributes to the literature in terms of theorizing Conjoint Analysis through conducting a study on determining the most important criteria of university selection. The application of this questionnaire also provided an analysis about the preferences and criteria of Turkish university candidates in deciding their university choice.



**Keywords:** Conjoint Analysis, University Preference

# TÜKETİCİ TERCİHLERİNİ BELİRLEMEDE KONJOİNT ANALİZİ

## ÖZ

Bu çalışmanın amacı Konjoint Analizinin teorik ve kavramsal çerçevesini çizerek, konunun pratik düzlemdeki uygulamasını gerçekleştirmektir. Çalışma için gerekli olan teorik çerçeve oluşturulduktan sonra, üniversite tercih aşamasında bulunan öğrencilerin, girecekleri üniversitelerin seçiminde etkili olan faktörler, Konjoint analizi ile belirlenmiştir.

Çalışmada, üniversite seçimini etkileyen 9 farklı faktör, üniversitenin ünü, eğitim sistemi, türü, kütüphanedeki kitap sayısı, kampus türü, üniversitenin yeri, eğitim dili, akademik personelin yapısı ve toplam öğrenci sayısı olarak literatürde yer alan benzer çalışmalarda kullanılan faktörler dikkate alınarak belirlenmiştir.

Çalışma kapsamında hazırlanan anket, üniversite sınavına girecek olan ve İzmir'de faaliyet gösteren çeşitli dershanelerde eğitim gören 173 öğrenciye uygulanmıştır.

Konjoint Analizinin uygulanmasından sonra, öğrencilerin üniversite seçimlerini etkileyen faktörler arasından önem derecesine göre belirlenen ilk üç faktör sırasıyla; üniversitenin ünü, üniversitenin türü ve kütüphanedeki kitap sayısıdır.

Sonuç olarak, bu çalışma üniversiteye aday öğrencilerin üniversite tercihlerini etkileyen en önemli kriterleri belirleyerek literatüre önemli bir katkı sağlamaktadır. Bu kriterler yapılan bir uygulamayla Türkiyede ki üniversiteler için belirlenmiştir.

**Anahtar Sözcükler:** Konjoint Analizi, Üniversite tercihi

**CONTEX**

# CHAPTER ONE
# INTRODUCTION

Conjoint Analysis is the most frequently used marketing research method for consumer trade-offs. In practice, Conjoint Analysis deals with marketing management question of why consumers choose one brand or one supplier over another. Is one feature desired enough to sacrifice another? Or if one attribute had to be sacrificed, then, which one would that be? As a result, the respondents provide extremely sensitive and useful information.

Conjoint Analysis is a technique for measuring trade-offs for examining responses from the consumers in regards to their preferences and intentions to purchase products and services. In addition, it is a method for stimulating consumer reaction to changes in existing products, developing products or to newly innovated products.

Conjoint Analysis has been used for variety of purpose, including the following

1) Determining the relative importance of attributes in consumer choice process. It is measured which attributes are important in influencing consumer choice by the relative importance

2) Estimating market share of brands that differing in attribute levels[1]. This utility derived from the Conjoint Analysis can be used to determine the share of choices and hence the market share or different brands.

3) Determining the composition of the most preferred brand. The most preferred brand feature is the highest utility combination of attribute levels

Segmenting the market based on similarity of preferences for attribute levels. The respondents are segmented homogenously by using the part-worth functions[2] derived for the attribute levels.

[1] Level is the specific nonmetric value describing the factor.

The primary objective of Conjoint Analysis is to quantitatively measure the relative importance of one attribute over another. By all means, Conjoint Analysis is to asist select features to offer new or revised products or services, to help set prices, to predict the resulting level of sales or usage test on a newly developed product. In other words, conjoint analysis is a popular multivariate technique used by marketers to specifically determine how respondents develop preferences for products or services. Multivariate Analysis is a statistical procedure that simultaneously analyses multiple measurements on each individual or object under any marketing research operation. Conjoint Analysis is different from other multivariate analysis in terms of its decompositional[3](see Appendix A) nature, the fact that estimates can all be done at the individual level and flexibility considering the relationship between dependent and independent variables. Particularly, Conjoint Analysis is conducted to find out what features of new products or services should have and how it should be priced. As mentioned earlier, it can be argued that Conjoint Analysis has become popular because it is a more flexible, more powerful, and often less expensive way to address important questions in consumer buyer behaviours.

A typical Conjoint Analysis application involves a series of steps covering a variety of techniques and is not a completely standardized procedure. The flexibility of Conjoint Analysis provides an increase to its applications almost in any area in which consumer preferences are studied

Conjoint Analysis is a unique position among multivariate methods. First, the researcher constructs a set of hypothetical or real products or services by combining selected levels of each attribute. These combinations are then, presented to the respondents, who provide only their overall evaluations. Therefore, the researcher is asking respondents to conduct a very realistic task which is to choose from a set of products and services. In practice, respondents need not to tell the researcher anything else, such as how important on individual attribute to them or how well the

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[2] Part-worth faunction shows that the utility associated with the each level of each factor.
[3] Decomposional model is the class of multivariate models responses to estimate the dependence relationship.

products perform on specific attribute. Since the hypothetical products or services used in specific circumstances conducting the research, the influence of each attribute and each value of each attribute on the utility the decision of a respondents can be determined from the respondents' overall ratings.

In order to be successful implementing this technique, the products and services should be described by the researcher, clarifying the attributes and all relevant values for each attribute. The term "factor" is used when describing a specific attribute or other characteristics of the products or services. The possible values for each factor are called levels. In conjoint terms, products and services is described in terms of its level on the set of factors characterizing it. Then, the levels and factors are selected by the researcher to describe the products or services according to specific plan this combination is called treatment or stimulus[4].

In the application, it is determined the most important factors for candidate students for university in the process of selecting university. The decision making process of students when selecting appropriate university for themselves is similar to consumer buying process. It means that when selecting a university the students also consider some criteria like a consumer who decides to buy a goods & services among different alternatives in the market.

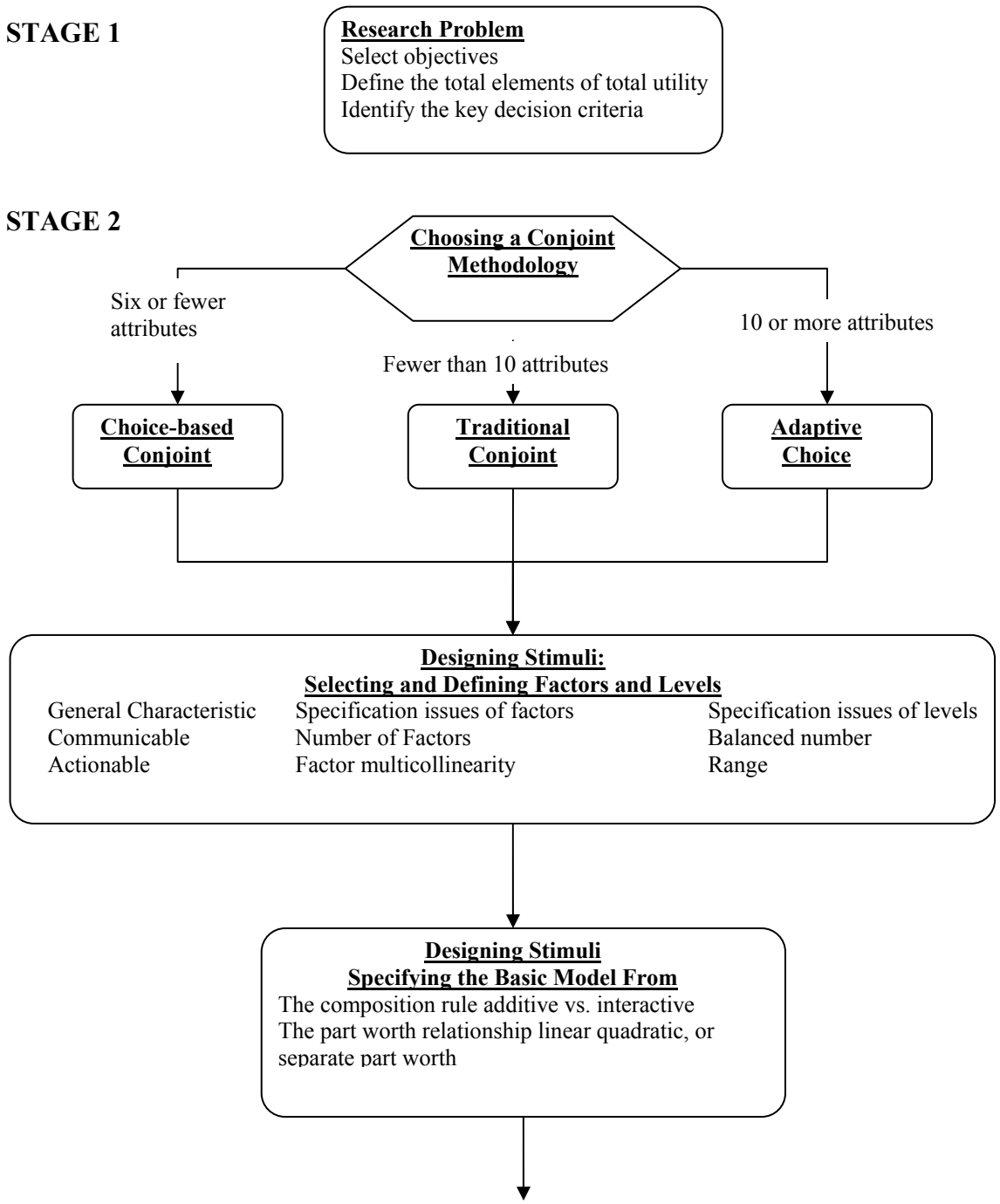
This study contains four chapters. The chapter covers mainly the introduction and gives an idea of Conjoint Analysis. In the second chapter, the general features are given and the each stages of Conjoint Analysis are explained. The application of Conjoint Analysis was made and results of analysis are interpreted in the third chapter. Conclusion and discussion of study are provided in the fourth chapter.

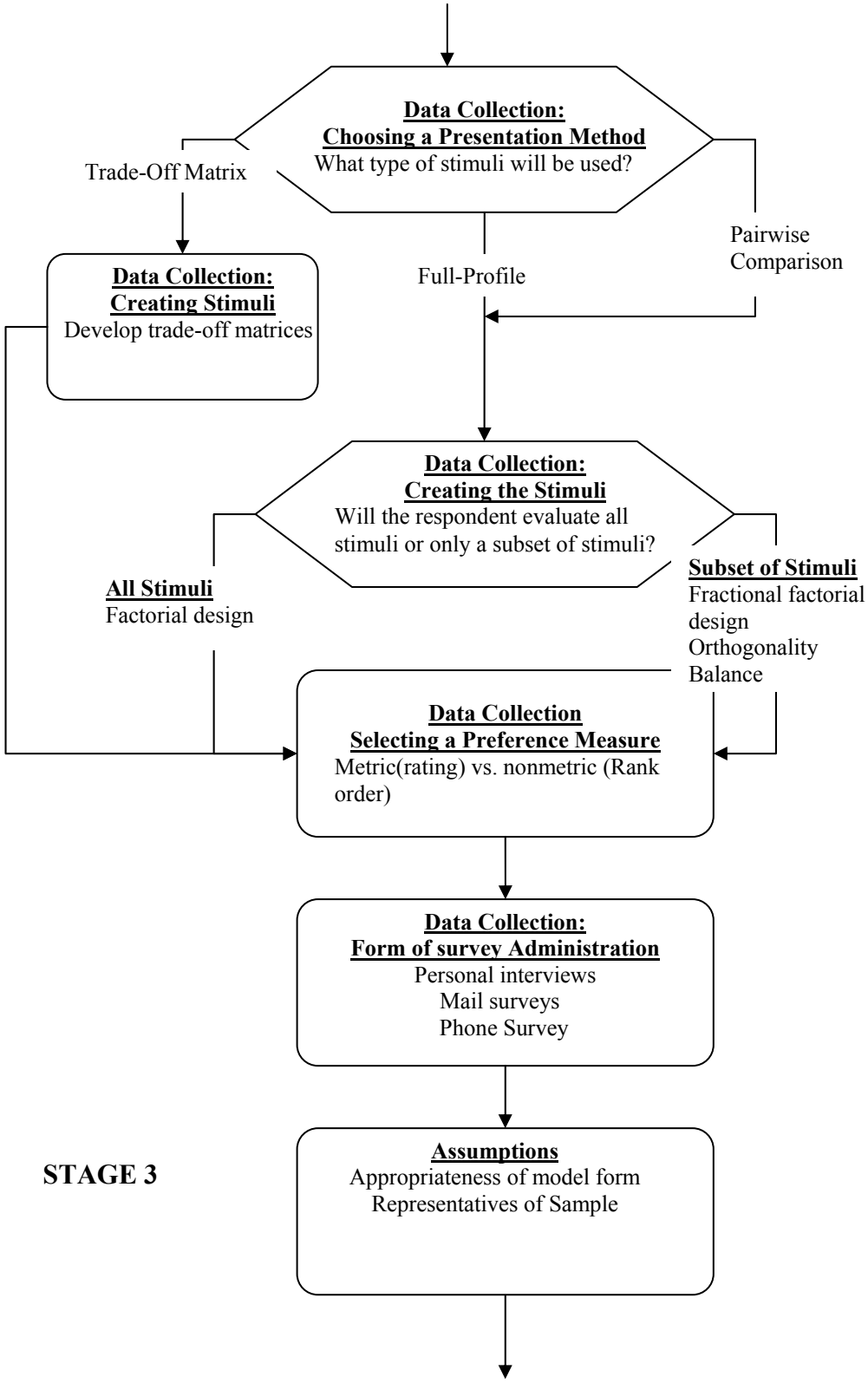
[4] Stimulus is known as a treatment. It is specific set of levels evaluated by respondents.

## CHAPTER TWO

## THE STAGES OF CONJOINT ANALYSIS

### 2.1 Algorithm Of Conjoint Analysis




Data Collection:
Choosing a Presentation Method
What type of stimuli will be used?
Trade-Off Matrix
Full-Profile
Pairwise Comparison
Data Collection:
Creating Stimuli
Develop trade-off matrices
Data Collection:
Creating the Stimuli
Will the respondent evaluate all stimuli or only a subset of stimuli?
All Stimuli
Factorial design
Subset of Stimuli
Fractional factorial design
Orthogonality
Balance
Data Collection
Selecting a Preference Measure
Metric(rating) vs. nonmetric (Rank order)
Data Collection:
Form of survey Administration
Personal interviews
Mail surveys
Phone Survey
Assumptions
Appropriateness of model form
Representatives of Sample

**STAGE 3**

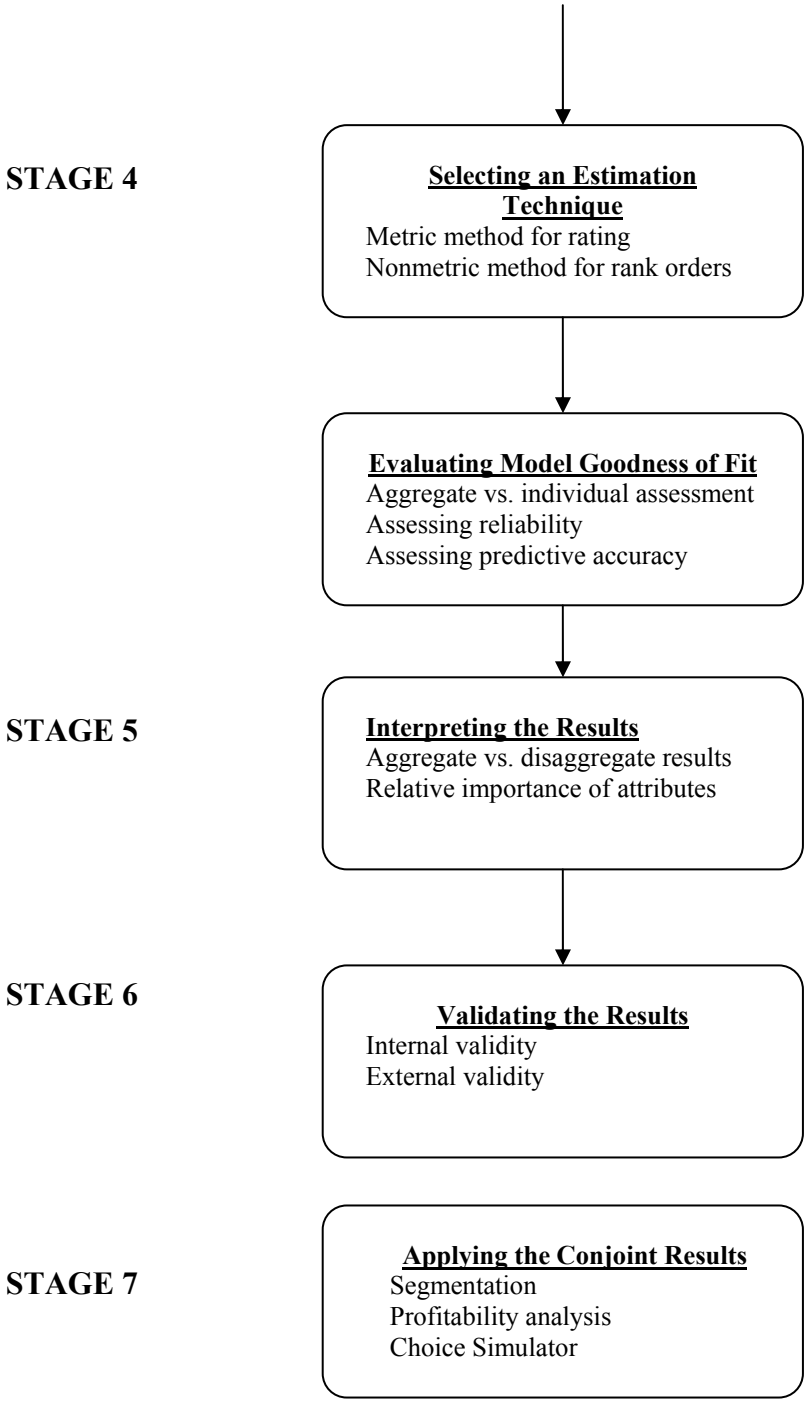



Figure 2.1 The Algorithm of Conjoint Analysis

Source: Hair et al. 2006

## 2.2 Research Problem

### *2.2.1 Select Objectives*

There are two primary objectives in Conjoint Analysis for understanding consumer decisions.

1. *Determine contribution of independent variables:*
   To determine the attributes' consumer preference. This objective provides that we can answer many questions. For example, how much does colour contribute to the willingness to buy a product? Which colour level is the best?

2. *Establish model of consumer decision:*
   To establish a valid model of consumer preference decisions which will predict consumer acceptance of any combination of attributes? This model is represented the relationship between the predictor variable and respondents' choices.

### *2.2.2 Define the total elements of total utility*

Firstly, the researcher must be defined the total utility of the object. All positive and negative attributes which impact utility of the products or services should be included in the model for respondents to make choice. If the researcher focuses on the positive factors or negative factors, this will seriously deviate the respondents' decisions.

### *2.2.3 Identify the key decision criteria*

The following questions are provided the critical guidance for key decisions in each stage to the researcher.

- Is it possible to describe all attribute that give utility or value to be product or services being studied?(Hair et al., 2006)

- What is the key decision criteria involved in the choice process for this type of product or service?(Hair et al., 2006)

The researcher can specify the determinant factors on which respondents will make their decision. The factors are the best differentiable between the objects. Many attributes may be important, but may not differentiable in making choices. For example, durability to earthquake in buildings is an important attributes, but may not be determinant in most cases because there are strictly government standards for this issue, so buildings are considered durable, at least at acceptable level. However; other attributes such as colour, magnitude or price are important and much more likely to use to decide among different building structures.

Conjoint Analysis requires some previous basis for selection of attributes. The justification may be theoretical or may be derived from other research such as survey seeking to determine what variables should be included (Sclove, 1998)

## 2.3 Design of Conjoint Analysis

The design[5] issues are the most important stage in Conjoint Analysis. The researcher faces numerous issues in designing of Conjoint Analysis.

- Which Conjoint method should be chosen? Conjoint Analysis has three different approaches for collecting and analyzing data.

- The next issues are composition and design of the stimuli. These issues are the most important to succeed of any Conjoint Analysis. What are the factors and levels to be selected in defining utility? How are they to be composed into stimuli?

[5] Specific set of conjoint stimuli created to indicating the properties of orthogonality and balance

- A key ingredient of Conjoint Analysis is its ability to represent many types of relationship in the conjoint variate[6] The types of effect require the modifications in research design. There are two types of effects in Conjoint Analysis. Main effects represent the direct impact of each attribute; interaction effects represent the unique impact of various combinations of attributes.

- The last issue relates to data collection, specifically types of preference measurement to be used.

### *2.3.1 Selecting a Conjoint Analysis Methodology*

Traditional Conjoint Analysis(TCA), Adaptive Conjoint Analysis(ACA) and Choice Based Conjoint Analysis(CBC) are three basic conjoint methodologies. The researcher should select the methodology as the many characteristics of research.

#### *2.3.1.1 Traditional Conjoint Analysis*

Traditional Conjoint Analysis is characterized by a simple additive model[7]. A respondent evaluates stimuli constructed with selected levels from each attributes (known as full profile) (Hair et al., 2006)

Green and Srinivasan(1990) recommend use of the full profile method when the number of attributes is six or fewer. Brayn Orme(2003) recommend that the full profile approach is useful for measuring up to about six attributes. Traditional Conjoint Analysis calculates set of part worth for each individual, using traditional full profile card sort(either rating or ranking) or pairwise rating. Up to 30 attributes with 15 levels can be measured, though Brayn Orme(2003) had never recommend the researchers approach these limits with real study.

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[6] Combination of factors is specified by the researcher.

[7] Model based on the additive composition rule, which assumes that individuals just "add up" the part-worths to calculate an overall or total worth score indicating utility of preference. It is known as a "main effects model" . (Hair, 2006)

Interactions between attributes such as brand and price can only be measured in limited sense with Traditional Conjoint Analysis. However, interactions between attributes with more than two or three levels each are probably better measured using CBC(Orme, 2003).

*2.3.1.2 Adaptive Conjoint Analysis*

Adaptive Conjoint Analysis went on to become very popular conjoint software tool and method in both Europe and in the US throughout the 1990s. ACA is user friendly for analyst and respondent alike. But ACA is not the best approach for every situation. The main advantage of ACA is to measure more attributes than the other methods. ACA include up to 30 attributes. Respondents do not evaluate all attribute at the same time in ACA; otherwise it can be in full profile approach. Even with six or fewer attributes, ACA's results are similar to the full profile approach.

ACA is the main effect model which means there are no interactions between attributes. This can be limiting for pricing studies, where it is sometimes important to estimate price sensitivity in the study(Sawtooh Software ACA 5.0, 2002; Orme 2003)

*2.3.1.3 Choice Based Conjoint Analysis*

Choice Based Analysis become popular in the early 1990s and then most widely used in the world. There are several reasons for its popularity. A preferred product is similar to what buyers actually do in the market place. The main characteristic of CBC is different from the other methodologies. Because respondent expresses preference by choosing from concepts rather than by rating and ranking them. CBC offer the "none" option to the respondent. The respondent may say "I wouldn't choose any of these".

Choice Based Conjoint Analysis is not appropriate for studies involving large number of attributes. Green and Srinavasan(1990) suggest six to ten as the maximum

number of attributes to handle with full profile concepts in Traditional Conjoint Analysis. For Choice Based Conjoint Analysis may even be lower because respondents must process several full profile concepts simultaneously(Sawtooth Software, CBC).

"Main effect only" is an assumption in most conjoint methods. Otherwise, CBC can measure two-way interactions. It provides an advantage to produce relatively precise results when there are few attributes and their interactions are of concern.

#### *2.3.1.4 Which Method Should Be Used?*

The researcher should determine the most appropriate conjoint method from several methods to study. If the researchers need to study many attributes, ACA should be considered. If they need include attribute interactions, CBC should be used. When they are dealing with relatively small sample sizes, ACA and Traditional Conjoint Analysis are more suitable to stabilize estimates than CBC.

Many researchers sometimes use more than one conjoint method in their studies. For example, ACA and CBC are used in the same study. ACA provides the product design and feature importance model, while CBC provides price sensitivity estimates for each brand and a powerful pricing stimulator(Orme, 2003)

Table 2.1 The criteria of the selecting methodology

| | **ACA** | **CBC** | **TCA** |
|---|---|---|---|
| Six or fewer attributes | X* | X** | X*** |
| More than six attributes | X | | X |
| Interaction | | X | |
| Small sample size | X | | X |
| Individual-level Utility | X | | X |
| Choice Task | Rating Stimuli Containing Subsets of Attributes | Choice Between Sets of Stimuli | Evaluating Full Profile Stimuli One at a Time |
| Data Collection Format | Computer Based | Any Format | Any Format |

**Source:**Sawtooth Software,ACA; Hair et al, 2006
*Upper limit on the number of attributes is 30
** Upper limit on the number of attributes is 6
*** Upper limit on the number of attributes is 9

### *2.3.2 Designing Stimuli: Selecting and Defining Factors and Levels*

The designing stimuli process is more important in the experimental foundations of Conjoint Analysis. In this process, the researchers select and then define factors and levels of their study.

#### *2.3.2.1 General Characteristic of Factors and Levels*

The selecting factor and levels are measured by *communicable* and *actionable*.

*2.3.2.1.1 Communicable Measures* Factors and levels are easily communicated for realistic evaluation. But it is difficult to describe factors and levels such as fragrance of a perfume or feel of a hand lotion in the written. Written descriptions do not capture sensory effect as well as respondents see the product first hand, smell the fragrance. Researcher must be concern about the communicability of factors and levels for taking a true reflection of respondents' preferences. Communicable is using the appropriate expression(written, graphic or other type of description)

*2.3.2.1.2 Actionable Measures* Description of factors and levels must be easily understood by respondents (Sclove, 1998). Levels should not be specified in imprecise terms such as big or small because of perceptual differences among individuals. Factors and levels must be distinct and represent a concept that can be precisely implemented: no fuzzy attributes (Maggino, 2005)

#### *2.3.2.2 Specification Issues of Factors*

After selecting the factor measures communicable and actionable in the study, the researcher must define the number of factors to be included, multicollinearity among factors.

*2.3.2.2.1. Number of Factors* The number of factor effect the statistical efficiency and reliability. The following formula is used to calculate the required minimum number of stimuli.

*Minimum Number of Stimuli = Total Number of Levels Across All Factors-Number of Factors* +1

Increasing the number of factors would cause a decrease in the number of stimuli required. For instance, 4 factors with 3 levels each is included in the Conjoint Analysis. We need a minimum of 9 ((4*3)-4+1) stimuli.

Some techniques were developed to specifically handle large numbers of attributes by specialized design. In Conjoint Analysis each respondents generate the required number of observations, and therefore the required number of stimuli is constant no matter how many respondents are analysed(Hair et al., 2006). When the number of parameters to be estimated increase, the number of stimuli increases or the reliability of parameters reduces reduction.

*2.3.2.2.2 Factor Multicollinearity* Interattribute or environmental correlation[8] denotes a lack of conceptual independence among the factors. The unrealistic stimuli(unrealistic combinations of two or more factors) can distort the conjoint design. For example, the researcher considers a washing machine with price and quality. Although both attributes are valid when considered separately, many combinations of their levels are not realistic. Therefore, why respondent consider washing machine with highest levels of quality and lowest levels of price. These attributes' combinations cannot realistically be paired.

In spite of a researcher avoiding the correlation among factors; sometimes factors are essential to the Conjoint Analysis. A researcher can define super attributes that combine the aspects of correlated attributes. The researcher creates new attribute and new realistic levels. A attribute of "performance" can be substituted of revaluation

[8] It is known as the interattribute correlation. It is the correlation among the attributes that makes combinations of attributes unreliable and redundant.

and time of guarantee. Another approach involves refined experimental designs and estimation techniques that create nearly orthogonal[9] stimuli which can be used to eliminate any unrealistic stimuli resulting from interattribute correlation (William et al., 2000).

*2.3.2.3 Specification of Issues Regarding Levels*

The respondent's evaluations affect the number of levels, the balance in levels between factors and the range of factor levels.

*2.3.2.3.1 Balanced Number of Levels.* The researcher should balance the number of levels across variables unequal numbers of levels may bias the respondents' perceptions of relative importance of the factors(Sclove, 1998). If the relative importance of factors is known a priori, the researcher may wish to expand the levels of the more important factors to avoid dilution of importance and to provide additional information on the more important factors(Wittink et al., 1992).

*2.3.2.3.2 Range of Factor Levels.* The range of the levels should not be too extreme or unacceptable. If the unacceptable levels exist, these should be eliminated. Levels that are infeasible or would not be used in realistic situation can artificially affect the results.

***2.3.3 Specifying the Basic Model Form***

The researchers must select the type of relationships between part worth estimates and specify the model form.

*2.3.3.1 The Composition Rule*

The composition rule is used to describe respondents' preferences. The composition rule describes how the respondents combine part worth values to obtain total utility.

[9] Nearly orthogonal is the characteristic of stimuli is slightly deviations from orthogonality

*2.3.3.1.1 Additive Model*. The basic composition rule is additive model. There is only the main effect attribute. It assumes the respondents simply adds up the value for combination of attributes(Hair et al., 2006). So, each respondent's total utility is the sum of the part worth of each attribute(http://etd.Isu.edu/docs/available/etd-1114102-133418/unrectricted/CHAPTER3.pdf). The commonly used model is additive model because it accounts for the most of the variation in respondents preferences.

*2.3.3.1.2 Interactive Model.* There is an interaction effect in the model. Because of the interaction effects, each respondent's total utility is greater or less than the sum of the part worth of each attribute. Each interaction term requires an additional part worth estimates for each respondent to evaluate. So, an increased number of part worth estimates reduce the statistical efficiency. Also, this increase will most likely decrease the reliability and validity of responses. Several studies cite that interaction effects are negligible on model results(http://etd.Isu.edu/docs/available/etd-1114102-133418/unrectricted/CHAPTER3.pdf)

*2.3.3.1 Selection of the Model of Preference*

The researcher focuses on how the levels of factor are related in defining the type of part worth relationship. Conjoint Analysis has three preference models.

*2.3.3.1.1 Vector Model*. The vector model is representing by a linear function that assumes preference will increase as the quantity of attribute "p" increases( Smith , Retrieved January 6, 2006) for the "$j^{th}$" stimuli is given by;

$$s_j = \sum_{p=1}^{t} w_p y_{jp} \qquad (2.1)$$

where

$w_p$= the individuals' weight for the "t" attributes

$y_{jp}$=level of the "$p^{th}$" attribute for the "$j^{th}$" stimuli

The vector model requires a single part worth to be estimated.

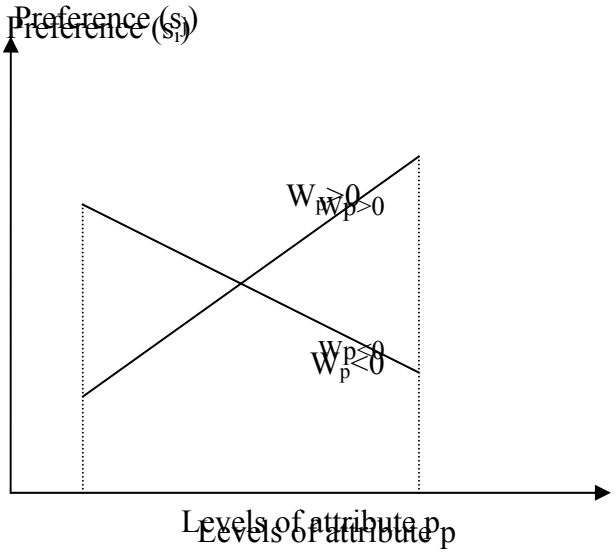


Figure 2.2 The vector model of preference

*2.3.3.1.2 Ideal Point Model.* The point function is applied as a curvilinear function that defines an optimum or ideal amount of an attribute. This ideal point model is suitable for many qualitative attributes, such as these associate with taste and smell. Ideal point model establishes that the preference is negatively related to the weighted distance ($d_j^2$) of location of the the "$j^{th}$" stimulus from the individual ideal point, $x_p$. The point is expressed as

$$d_j^{\,2} = \sum_{p=1}^{t} w_p (y_{jp} - x_p)^2 \qquad (2.2)$$

where

$y_{jp}$= level of the "$p^{th}$" attribute for the "$j^{th}$" stimuli

$x_p$= the individual's ideal point "p".

$w_p$= the individual's weights for the t attributes

So, stimuli which are closer to the ideal(smaller $d_j^2$) will be more preferred ones(larger $s_j$)(Green&Srinavasan, 1978)

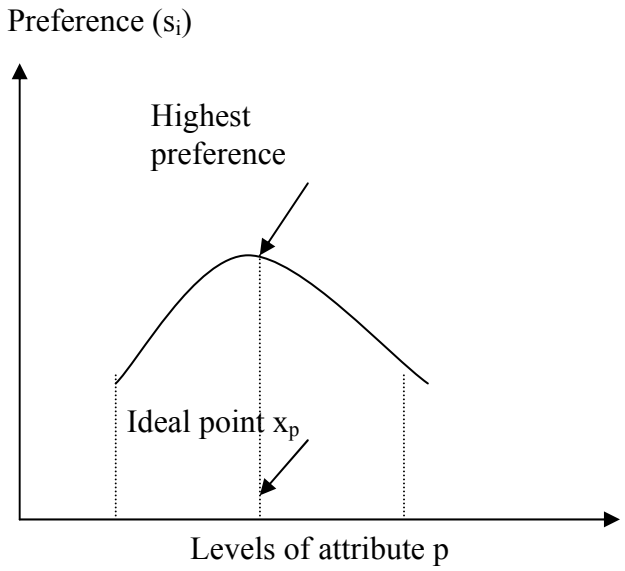


Figure 2.3 The ideal point model of preference

*2.3.3.1.3 Part-Worth Model* This model represents attributes utilities by a piecewise linear curve. And it allows separating estimates for each level. When using a separate part worth, the number of estimates;

$$s_j = \sum_{p=1}^{t} f_p(y_{jp}) \qquad (2.3)$$

where

$s_j$= preference for the stimulus object at level j

$f_p$= the function denoting the part worth of different levels of $y_{jp}$ for the "$p^{th}$" attributes

$y_{jp}$= level of the "$p^{th}$" attribute for the "$j^{th}$" stimuli

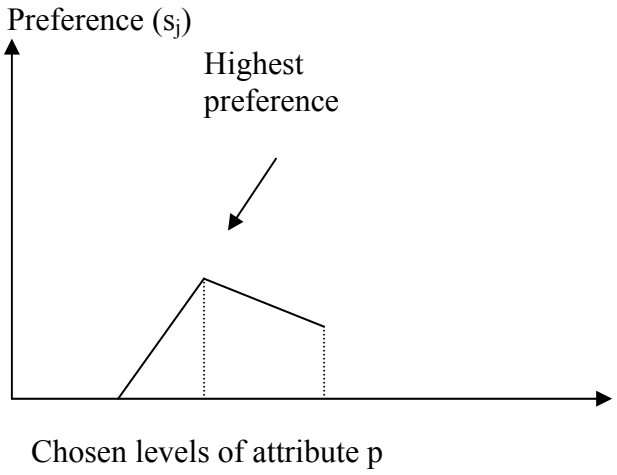


Figure 2.4 The part-worth model of preference

Each preference model requires that a different number of parameters be estimated(Smith, Retrieved January 6 2006). The part worth model requires that a different dummy variable column within the design matrix defines each level of an attributes. As one would expect, a total of j-1 dummy variables are required to estimate j levels. The vector model estimates the fewest parameters by assuming the linear functional form whereas the part worth model estimates the largest number of parameters. The ideal point model is between these two extremes(Green&Srinavasan, 1990). The restrictive of the shape of the preference model is greater as we go from part worth to the ideal point to vector models.

### *2.3.3 Data Collection*

After the specified the factor levels and the basic form, the researcher must specify the type of presentation method for the stimuli, type of response variable and the method of data collection.

#### *2.3.3.1 Choosing a Presentation Method*

There are three main presentation methods for the stimuli. These methods are trade off, full profile and pairwise comparison method.

*2.3.3.1.1 Trade Off Presentation*. Trade off presentation method also referred to as the "two-factor-at-a-time-method" The respondents are asked to rank each combination of levels from most preferred to least preferred(Aaker&Day,1990; Green&Srinavasan, 1978)

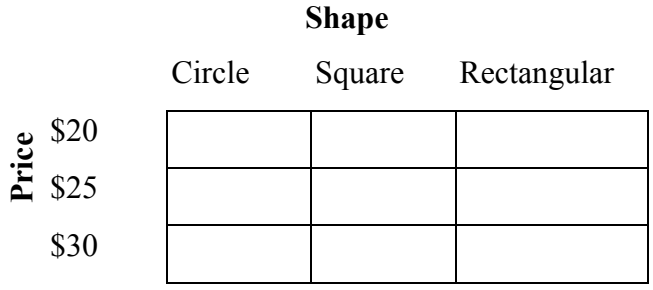


Figure 2.5 Example of Trade Off Presentation

Advantages of Trade Off Presentation

- It is simple to apply and administer because of only two attributes in each table.
- It reduces information overload by presenting two attributes at a time

Disadvantages of Trade Off Presentation

- There is same sacrifice in realism by using only two factors at a time
- When the attributes of certain products or services are correlated, what the rank order in a particular table corresponds to is not clear.
- There is the same tendency for respondents either to forget where they are in the table or follow a routinized response pattern because of fatigue.
- Only nonparametric responses are used.
- It appears to be the most suited to verbal description of stimuli rather than pictorial or other kinds of representations.
- If there are six factors; each at four levels, the respondents could be asked to fill out the 15 tables, each consisting of 16 cells. Related methods can be used to reduce the number of two way tables.

*2.3.3.1.2 Full Profile Presentation Method*. Responses are given cards that describe complete product or service configuration in the full profile approach(Aaker&Day, 1990)

| |
|---|
| Brand Name= X |
| Price= $20 |
| Shape= Square |
| Colour= Grey |

Figure 2.6 Example of Full Profile Presentation Method

Advantages of Full Profile Presentation Method

- It employs either rank order or ratings
- It gives more realistic description of stimuli by defining the levels of each of the factors.
- It is possibly to take environmental correlation between factors in real stimuli
- Its ability to measure overall preference judgements directly using behaviourally oriented constructs such as intention to buy, likelihood or trial, chances of switching and so on.

Disadvantages of Full Profile Presentation Method

- When the number of factors increases, so does possibility of information overload
- It is generally confined to five or six factors in any specific sort because of the information overload problem

Green and Srinavasan recommend that when the number of factors is 6 or fewer, Full Profile Method is used, when the number of factors ranges from 7 to 10, trade off approach becomes a possible option to the Full Profile Method.

If the number of factors exceeds 10, then the other methods such as Adaptive Conjoint are used. If the environmental correlation between factors is large and the

number of factor on the stimuli card is small(but greater than two), the Full Profile Approach is likely to be better in terms of predictive validity. However, if the environmental correlation between the factors is small and the number of factors on the stimulus card is large, the trade off approach is likely to be better.

*2.3.3.1.3 The Pairwise Combination Presentation.* The pairwise combination is a comparison of two profiles This method can evaluate preference either by obtaining a rating of preference of one stimulus over the other or a binary measure of which is preferred*(*Maggino, 2005)

It is somehow different from full profile method. The cards of pairwise comparison don't contain all attributes, as does the full profile; but instead only a few attributes at a time. It is similar to trade off method in that pairs are comparing. The pairs are attributes in trade off methods; whereas the pairs are profiles with the multiple attributes in the pairwise comparison method.

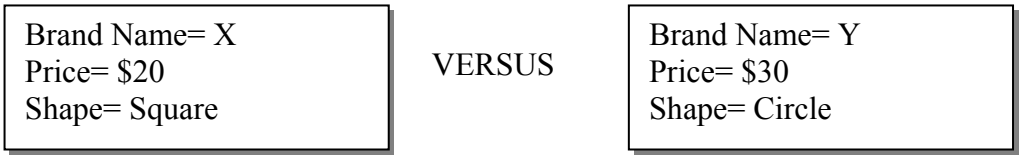


Figure 2.7 Example of Pairwise Comparison Presentation

*2.3.3.2 Creating the Stimuli*

The factors and levels are selected and the presentation methods are chosen, the next step, the researcher create the stimuli for evaluation by the respondents.

*2.3.3.2.1 Trade Off Method.* All possible combinations of attributes are used in the trade off method. The number of matrices is based on the number of factors.

The number of trade off matrices= $\frac{\boldsymbol{N(N-1)}}{\boldsymbol{2}}$

where

N= the number of factors

For example, there are three factors of each three levels in study. The required number of matrices is $\left(\frac{3\times 2}{2}\right)$ three matrices. The respondent should evaluate three tables each with 9 cells. Each table is evaluated separately, and the total evaluation is 27 cells by respondent. The following tables are any respondent's preferences. The researcher is most preferring $a_1b_1$ combination according to first table, $c_1b_1$ combination according to the second table and $a_1c_3$ combination according to the third table.

Table 2. 2 Example of respondent's preference in Trade Offs Methods

| | | **A** | | |
|---|---|---|---|---|
| | | $a_1$ | $a_2$ | $a_3$ |
| **B** | $b_1$ | 1 | 5 | 2 |
| | $b_2$ | 4 | 7 | 8 |
| | $b_3$ | 6 | 9 | 3 |

| | | **C** | | |
|---|---|---|---|---|
| | | $c_1$ | $c_2$ | $c_3$ |
| **B** | $b_1$ | 1 | 3 | 9 |
| | $b_2$ | 2 | 7 | 8 |
| | $b_3$ | 5 | 6 | 4 |

| | | **A** | | |
|---|---|---|---|---|
| | | $a_1$ | $a_2$ | $a_3$ |
| **C** | $c_1$ | 9 | 7 | 3 |
| | $c_2$ | 4 | 8 | 6 |
| | $c_3$ | 1 | 2 | 5 |

*2.3.3.2.2 Full Profile or Pairwise Presentation Methods.* The respondent evaluates all stimuli when there are small number of factors and levels in Conjoint Analysis. This format is known as a fractional factorial design[10](Hair et al., 2006)
If the researcher studies 4 attributes with four level for each variables. 256 stimuli (4levels x 4levels x 4levels x 4levels) would be created in a full factorial design for the full profile method.

Although it is not necessary to evaluate all of the stimuli, the number of stimuli is large reliable part worth estimates. The minimum of stimuli is equal to the number of estimated parameters. It is calculated as follows;

[10] Factorial design is the method of designing stimuli by generating all possible combinations of levels.

*Number of Estimated Parameters= Total Number of Levels –Number of Attributes* +1 (Hair et al., 2006)

After specifying the number of stimuli, the researcher selects the needed method for developing a subset of total stimuli that will provide the information needed for making accurate and reliable part worth estimates.

*2.3.3.2.2.1 Designing the Subset of Stimuli*. Two approaches can be applied for a subset of all stimuli in manner to preserve the orthogonality[11] and balanced design[12]aspect.

*2.3.3.2.2.1.1 Fractional Factorial Design.* The number of stimulus can be greatly reduced by means of fractional factorial designs. It is the most common method for defining a subset of stimuli for evaluation. Orthogonal array allows the efficient estimation of all main effects. Orthogonal array permit the measurement of all main effects of interest on an interactions are negligible(Malhotra&Birks, 2006; http://www.colostate.edu/Services/ACN/swmanuals/spss/ConjointSyntax.pdf; Hair et al., 2006)

The researcher studies with three attributes, defining three levels at each attribute total of (3 x 3 x 3)27 profiles can be constructed. A set of 9 profiles were constructed by the fractional factorial design. Therefore, the full profile method requires 9 stimuli to estimate the main effects. If interactions are important for the study, they should be included in the model estimation.

When the design is both orthogonal and balanced, it is called *optimal design.* All of the stimuli in optimal design may be unreliable for evaluation. The unreliable stimuli are reason unrealistic choices to respondent and it should be eliminated. The researchers eliminate the unacceptable stimuli by following the actions. The

[11] No interaction among levels of an attribute in the orthogonality.
[12] Each level in a factor appears the same number of times in the balanced design.

researchers can generate another fractional factorial design and assess the acceptability of new design's stimuli

When all design contains unacceptable stimuli and alternative design cannot be found, unacceptable stimulus can be deleted. Even though the design will not be totally orthogonal (It is called to be nearly orthogonal), it will create a multicollinearity problem. All nearly orthogonal designs should be assessed for design efficiency which is a measure of correspondence of the design in terms of orthogonality and balance to an optimal design(Kuhfeld et al, 1994). After assessing the alternative nonorthogonal design, the most efficient design with all reliable stimuli selected.

Unacceptable stimuli due to interattribute correlations can occur in optimal or orthogonal design. Interattribute correlations should be minimized but they need not to be zero. Therefore, the researcher should always assess the believability at the stimuli as a measure of practical relevance.

*2.3.3.2.2.1.2 Bridging Design.* If a large number of factors are entailed, and Adaptive Conjoint Methodology is not acceptable, bridging design can be employed. (Green&Srinavasan, 1990).The factors are divided in subsets of appropriate size. The stimuli are constructed for each subset so that the respondents never see the original number of factors in single profile. When the part worth are estimated, the separate sets of profiles are combined, and single set of estimates is provided(Hair et al., 2006; Green&Srinavasan, 1990)

*2.3.3.3 Selecting a Preference Measurement*

Trade off method is employed by ranking data. Otherwise, the full profile method and pairwise comparison method are employed either by obtaining a rating of preference of one stimulus or binary measures of which is preferred.

Rank order preference measure presents an order of preference. Respondents find the rank order approach easier when only a few products or services are evaluated. Because respondents are only required to say which alternative is preferred over another(Green&Srinavasan, 1978). It provides more flexibility in estimating different types of composition rules (Hair et al., 2006). The disadvantage of using ranking scales with large number of stimuli is difficult to administer.

Respondents normally grade perceived benefits on metric scale when rating are used(Gustafsson et al., 2000). Metric measures are easily analyzed and administered. The main advantage of rating scales is the increased information they may contain. Rating scales provide ordinal measures of preferences as well as relative measures (http://etd.Isu.edu/docs/available/etd-1114102-133418/unrectricted/ CHAPTER3.pdf)

Rating method offers more benefits to the research and is more reliable than the ranking method. Because respondents are able to express indifference among alternatives(Green, Srinavasan, 1978) It is useful to expand the number of response categories given the large number of stimuli evaluated. Generally, a rule of thumb is to have 11 categories(0-10 or 0- 100 in increments of 10) for 16 or fewer stimuli and expand to 21 categories for more than 16 stimuli(Louviere, 1988)

### *2.3.4 Survey Administration*

Surveys can be administered by mail, in person or by telephone. Each of these has advantages and disadvantages. In the past personal interview is the most often used method to obtain the conjoint response. Personal interview enables the interviewer to explain questions that respondent may misunderstand. Recent developments in interviewing methods provide Conjoint Analysis feasible both by mail and telephone. Telephone interviews allow the interviewer to clarify questions that respondent may misunderstand and they have the ability to randomly digit dialling. The disadvantage of using telephone interview is very expensive method comparing to the other methods being used. Another disadvantage of telephone interview is its difficulty for

the respondents because the time consuming taking at least 15 minutes on the telephone. The advantages of mail surveys are the low cost, ease of administration and geographical flexibility. The disadvantages of using mail surveys are low response rates, and interpreting some questions incorrectly by the respondent(http://etd.Isu.edu/docs/available/etd-1114102-133418/unrectricted/CHAPTER3.pdf)

## 2.4 Assumptions of Conjoint Analysis

Conjoint Analysis has a few statistical assumptions. Homoscedasticity and independence assumptions in the statistical tests are not necessary for Conjoint Analysis. The conjoint assumptions are as follows;

- Factorial combinations of attribute levels are believable
- Products or services alternatives can be realistically described

## 2.5 Selecting an Estimation Technique

Selecting an estimation technique is connected to the type of data collected. Green and Srinavasan(1978)classified estimation method in three categories

1) When the dependent variable is ordinally scaled, in that case nonmetric methods are used for estimates of attribute part-worth. These methods are MANOVA which is a modified form of the ANOVA, PREFMAP and LINMAP. MANOVA is restricted to the part-worth function model. LINMAP is the best suited for the ideal point model.

2) When the dependent variable is internally scaled, metric methods are used for estimates of attribute part-worth. These methods are OLS regression and Minimizing Sum of Absolute Errors(MSAE). Metric methods can also estimate the part worth for each level.

3) In addition, there are estimation methods related paired-comparison data to choice probability model. These methods are LOGIT and PROBIT. They are also nonmetric-methods.

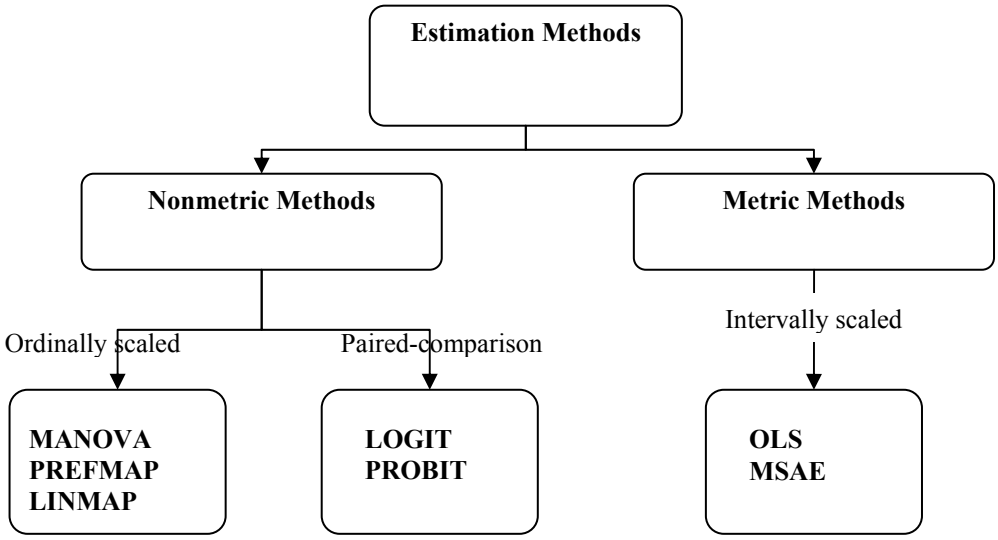


Figure 2.8 The algorithm of the estimation methods

In summary, the estimation methods do not seem to differ very much in their predictive validities. The best way to determine which method is most robust is to use both a metric and nonmetric method in estimation(Green& Srinavasan , 1978; Radler , 1993).

### *2.5.1 Calculate the Importance of an Attribute*

The basic Conjoint Analysis model can be represented by the formula 2.4

$$U(X) = \sum_{i=1}^{m} \sum_{j=1}^{k_i} \alpha_{ij} x_{ij} \qquad (2.4)$$

where

U(X)= overall utility of an alternative

$\alpha_{ij}$= the part worth utility associated with the jth level(j=1,2,…$k_j$) of the ith attribute(I=1,2,….m)

$k_i$= number of levels of attribute I

m= number of attributes

The importance of an attribute, $I_i$, is defined

$I_i=\{\max(\alpha_{ij})-\min(\alpha_{ij})\}$ for each i.

The relative importance of an attribute is defined by the formula 2.5

$$W_{li} = \frac{I_{li}}{\sum_{i=1}^{p} I_{li}} \text{ so } \sum_{i=1}^{p} W_{li} = 1 \qquad (2.5)$$

*2.5.2 Evaluating Model Goodness of Fit*

The goodness of fit measure is to assess the quality of the estimated model by comparing the actual values and estimated values of dependent variables(Green&Srinavasan, 1978). Conjoint Analysis results are assessed for accuracy at both individual and aggregate levels, and this assessment can be for both metric and non-metric responses. The objective is to determine how coherently the model predicts the set of preference evaluations given by each person. For the rank order data, correlations based on the actual and the predicted ranks(Kendall's *tau* or Spearman's *rho*) are used(Hair et al., 2006). If a metric rating is obtained, then Pearson correlation is appropriate along with a comparison of actual and predicted ranks. Since the number of stimuli does not substantially exceed the number of parameters, and there is always the potential for "overfitting" the data, the researcher should measure model accuracy not only on the original stimuli but also with a set of *validation* or *holdout stimuli* (by a procedure similar to a holdout sample in discriminant analysis): the researcher prepares more stimuli that needed for estimation of the part-worths, and the respondent rates all of them at the same time; estimated parameters are then used to predict preference for the new set of stimuli(Maggino, 2005).

If an aggregate estimation technique is used, the researchers have the option of selecting a holdout sample or respondents in each group to assess predictive accuracy. This method is not feasible for disaggregate result because there is no generalized model to apply to the holdout sample, as each respondent in the estimation sample has individualized part-worth estimates(Hair et al., 2006).

## 2.6 Interpreting the Results

In most cases, disaggregate analysis should be used to interpret the results. Each respondent is modelled separately, and the results of the model are examined for each respondent in disaggregate analysis. Interpretation, can also take place with aggregate results. Whether the model estimation is made at the individual level or the aggregate estimates are made for a set of respondents, the analysis fit one model to the aggregate of the responses(Hair et al., 2006).

### *2.6.1 Examining the Estimated Part-Worths*

Conjoint Analysis begins with a comparison of each attribute and then an examination of the part worth estimates for each attribute. The results of Conjoint Analysis belong to each attribute and to each part worth estimate of each attribute. The absolute higher part worth is more impact on overall utility. Part worth values can be plotted graphically to identify patterns.

### *2.6.2 Assessing the Relative Importance of Attributes*

Conjoint Analysis can asses the relativeness of each attribute. For each respondent, Conjoint Analysis determines an importance value for each attribute. The importance value for each attribute can be converted to percentages summing to 100 percent by dividing each attribute's range by the sum of all range values.

## 2.7 Validation of the Conjoint Results

The researcher should validate both internally and externally for the researcher Conjoint Analysis results. Internally validation involves confirmation that the choice of composition rule is appropriate. This validation process is the most efficiently accomplished by comparing alternative models in a pre-test study to confirm which model is appropriate(Hair et al., 2006). In summary, internally validity tests the goodness of the model.

External validation corresponds to the general ability of Conjoint Analysis to predict actual choices in specific terms the issue of sample representativeness.

# CHAPTER THREE
# AN APPLICATION OF CONJOINT ANALYSIS

Conjoint Analysis' properties and its steps were explained in previous chapter. In this chapter these steps were explained in an application of Conjoint Analysis to a randomly select of candidate students for university

## 3.1 Objectives of Conjoint Analysis

How students make decisions and select one university over another is the most important for prudent university management. The main purpose of this study is to understand how candidate students for university make a decision in choosing one university. In order to achieve this setting goal, it was planned to determine the criteria of an ideal university at which the students want to be educated. The factors to select a university were determined but the reasons behind selecting these universities were not asked. The thesis more concentrates on the criteria which had an impact on selection.

The decision to select a university is one of the most important and difficult decisions that a candidate student for university will have to make in his or her adolescent life. There are many critical factors for a candidate student for university who considers when it comes to selecting the "right" university. When the factors involved in determining a student's preferences are compared with each other, surely some factors are more important than others, some others have a secondary role in the determination process. This study is aimed to determine the major factors influencing the university preferences of candidate students' and the relative importance of them attaching to these factors.

In the course of the study, 173 candidate students for university were examined for determining the university preference. The sample was randomly selected from the students who took the university-exam preparation course in İzmir. The study was applied between the dates of June 1$^{st}$ and the 15$^{th}$ in 2006. Due to the

approaching university exam date, the students seem to concentrate on the selection of the university of their choice. A self-reported questionnaire form was conducted as a data collection method.

The literature indicates that there are various importance choice criteria. Many researchers find out the different criteria influencing the selecting of college or university.

Table 3.1 Review of Literature

| | | |
|---|---|---|
| Abell(2003) | Academic reputation, prestige, future career aspirations, size, location | For selecting college |
| Webb(1993) | Academic reputation, accreditation, proximity, tuition, books, fees, location, library size, parking, placement reputation | For selecting college |
| Poock(1999) | Flexible programs, availability of evening classes, ability to continue working in current job, location, and reputation of program | For selecting doctoral programs |
| Poock(2001) | Location (proximity to home), friendliness of department faculty And staff, availability of evening classes, ability to continue working in current job, flexible program requirements, positive interaction with faculty, and reputation of institution | For selecting institute |
| Hazzard(1996) | Availability of financial aid, program of study, cost, academic Reputation, location, and variety of courses | For selecting Historically Black Colleges and Universities |

After reviewing the literature, using factors that are appropriate the university properties in Turkey were selected. It is considered only nine major factors from many factors influencing candidate students' university preference in the study.

These factors are the education system(SYSTEM), education language(LANGUAGE), campus style(CAMPUS), the location of the university(LOCATION), type of the ownership of university(TYPE), academic personnel(ACADEMIC PERSONNEL), the total number of students of university(SIZE), the number of books in library(LIBRARY) and the university's reputation(REPUTATION).

## 3.2 Design of the Conjoint Analysis

At this stage, the decisions were made to select a conjoint method was used, design the stimuli was evaluated, basic model was specified as well as the method of data collection was selected.

### *3.2.1 Selecting a Conjoint Methodology*

Firstly the most suitable conjoint method was selected from three methods, which are Traditional Conjoint, Adaptive Conjoint, Choice Based Conjoint. There were only nine factors and no interactions between the attributes in the study, so the conjoint section of the questionnaire was developed by the traditional conjoint method.

### *3.2.2 Designing Stimuli*

#### *3.2.2.1 Selecting and Defining Factors and Levels*

In the study, there were nine factors and their levels that influencing the university preference. All factors had already selected and defined. The levels of attributes were selected according to properties of universities in Turkey. The determining attributes and their levels were as the follows;

Education system(SYSTEM) is the type of teaching the courses at the university. In general terms, there are two learning systems: classic system and problem based

learning. In classic system, the lecturer teaches a course during the lesson. If students do not understand the subject, the lecturer again expresses the subject. But in the problem based learning system, there are the learning based on the problem. The lecturer doesn't teach a course the students. Before the course they research the subject and discuss in the class. The lecturer only directs them and gives a hint about the subject. Problem based learning and classic systems were determined as the levels of the education system in this study.

Education language(LANGUAGE) is used for instruction for all courses by lecturer. The lecturer teaches the course in Turkish. Generally English is thought as a foreign language. Turkish and one foreign language were determined as the levels of education language in this study.

The campus style(CAMPUS) is the main structural, location, including facilities on the campus. In the small and fragmented campus there are different buildings in different campuses in the centre of city. Otherwise, in the big and single campus, there are different buildings in one big campus that is located out of city centre. Big and single campus and small and fragmented campus styles were determined as the levels of types of campus in this study.

Location of the university(LOCATION) is the situation according to residence or domicile of the student. The university is in the outside of student's residence city or within the student's residency. Within the city campus and outside of city campus were determined as the levels of location of the university in this study.

Type of the ownership of university(TYPE) is also an important factor for choosing the university. There are two types of ownerships. One is state another one is private ownership. The public universities are owned by the government. The students pay a small amount of tuition to government in each semester. On the other hand, the ownership is by a person or a foundation at private universities. The private universities' tuition is much more than state universities' tuition. State and private

universities were determined as the levels of the type of the ownership of university in this study.

Academic personnel(ACADEMIC PERSONNEL) are the properties of university's academic staff. Lecturers and assistant professors may be considered as young academic staff, in comparison professors or associate professors may be considered as experienced academic staff. Two levels were selected, young and dynamic and old and experienced were determined as the levels of academic personnel.

The size category of the students(SIZE) is determined by the number of the students at each faculty. If the number of the students is less than 5,000 students, then it can be said that the university is small size. If the number of student is between 5000- 15,000 then it may be categorized as a medium size university. If the number of students is more than 15,000 then it can be said that the university is big. Three levels of this attribute were selected. The sizes were less than 5,000, between 5,000 and 15,000 and more than 15,000. These numbers decide the levels of the total number of students at the university.

The size category of the library(LIBRARY) is determined by the number of the books. If the number of books is less than 100,000, then, library is considered a small one. If the number of books is between 100,000 and 300,000, it can be said that library is medium size. If the number of books is more than 300,000 it may be said that the library is big. Three levels of this attribute were selected. The sizes were less than 100,000, between 100,000 and 300,000 and more than 300,000.These numbers decide the levels of the total number of books at the library.

University's reputation is the level of well-known of university's name. Better known the university name, higher the university's reputation. The most, averaged, and the least were determined as the levels of the university's reputation in this study.

Table 3.2 Attributes and Levels for the Selecting of University

| **Attribute Description** | **Levels** | | |
|---|---|---|---|
| **System** | Classic | Problem Based Learning | |
| **Education language** | Turkish | Foreign Language | |
| **Campus** | Small and fragmented | Big and single | |
| **Location** | Within the city campus | Outside of city campus | |
| **Type** | Private | State | |
| **Academic personnel** | Young and Dynamic | Experienced | |
| **Size** | Less than 5,000 students | Between 5,000 and 15,000 students | More than 15,000 students |
| **Library** | Less than 100,000 books | Between 100,000and 300,000 books | More than 300,000 books |
| **Reputation** | Most | Average | Least |

*3.2.2.2 Specifying the Basic Model Form*

With the levels specified, this step involves compositon rule and the type of relationship among levels. It was assumed that interaction terms were not needed. Because of no interactions between nine factors that were determined, the additive model was used.

Selecting model type was expressed in Session 2.3.1. Because of linear relationship between all of the levels of factors and their preference scores, vector model was used the selecting model of preference in the study. In summary, the determining relationship is shown in the Table 3.2.

Table 3. 3 Model Descriptions

| | N of Levels | Relation to Scores |
|---|---|---|
| SYSTEM | 2 | Linear |
| LANGUAGE | 2 | Linear |
| CAMPUS | 2 | Linear |
| LOCATION | 2 | Linear |
| TYPE | 2 | Linear (more) |
| PERSONNEL | 2 | Linear |
| SIZE | 3 | Linear |
| LIBRARY | 3 | Linear (more) |
| REPUTATION | 3 | Linear (less) |

Linear model indicates an expected linear relationship between the levels of attribute and scores. “Linear more” indicates that higher levels of attributes are expected to be preferred. Otherwise, “linear less” indicates that lower levels of attributes are expected to be preferred.

### 3.2.4. Specifying the Method of Data Collection

The final step in the designing of stimuli is the collection of preference from respondents. Full Profile method was used for obtaining respondent evaluations. 1728 possible combination (2x2x2x2x2x2x3x3x3) would be obtained in the full factorial design for the full profile method. It was difficult and time consuming to evaluate all of the stimuli by the students. Therefore, the fractional factorial design was used for reducing the number of stimuli. The 16 stimulus that form orthogonal array were generated in SPSS 13.0(see Appendix B), allowing for the estimation of orthogonal main effects for each factor. The number of levels of each factor in created stimulus was equal because of the constructed orthogonal array. Four additional stimulus were generated for validation. Each student is assigned to answer a handout form which consists of eleven categories ranking “not at all likely to

prefer" to "certain to prefer". As a result, a rating measure of preference was collected. The handout forms were administered in person. The stimulus for validation was rated at the same time. 20 stimuli that were the hypothetical universities in this study were successfully completed by the total of 173 candidate students for university.

## 3.3 Estimating the Conjoint Model

With the data collection specified, the next step involves selecting the appropriate estimation methods for deriving the part-worth and assessing goodness of fit. The OLS method was used as estimating the conjoint model since the preference score was obtained internally scaled.

The part worth and relative importance of each attribute for each respondent and overall results were estimated using Traditional Conjoint analysis and were analyzed further using the SPSS . The Conjoint Syntax that you can see in Appendix C was written for obtaining the mentioned results. When the syntax was running, these results are obtained.

### *3.3.1 Assessing the Goodness of Fit*

Pearson correlations were calculated for estimation sample because preference was measured using rating. The rating values were converted the rank orders and Kendall's Tau measure calculated. The holdout sample for validation purposes used only the Kendalls's Tau.

In the study, the correlation coefficient was 0,984, indicating a good predictive ability. This correlation coefficient is significant at $\alpha$=0,05

Table 3.4 Correlations (a)

| | Value | Sig. |
|---|---|---|
| Pearson's R | 0.984 | 0.0000 |
| Kendall's tau | 0.967 | 0.0000 |

a Correlations between observed and estimated preferences

The correlation coefficients are significant at α=0,05 for each department. So, the estimated models for each department have good predictive ability.

Table 3.5 Correlations for each department

| | | Value | Sig. |
|---|---|---|---|
| Natural Sciences | Pearson's R | 0.994 | 0.0000 |
| | Kendall's tau | 1.000 | 0.0000 |
| Turkish and Mathematics Sciences | Pearson's R | 0.957 | 0.0000 |
| | Kendall's tau | 0.778 | 0.0000 |
| Social Sciences | Pearson's R | 0,919 | 0.0000 |
| | Kendall's tau | 0,804 | 0.0000 |

## 3.4 Interpreting the Results

The results of Conjoint Analysis are interpreted due to the estimating good predictive model. The results were interpreted for the first candidate student, amongst all of the candidate students. And also, the model was obtained for each department after the students were separated according to departments. Checking the goodness of model, the results for each department were interpreted.

### *3.4.1 Interpreting the result for the first candidate student for university*

As it is shown in Table 3.7, When the first student select a university, the factors that play a significant role are consecutively the university education system,

university's reputation, the number of books in library, the type of the ownership of university, the profiles of academic personnel and the campus style, the number of students, education language and the location of campus according to student's residency. As the best level of each factor is shown bold font in the Table 3.6, The first student prefer to educate in the university that has problem based learning education system, education in foreign language, small and fragmented campus, within the city campus, private university, young and dynamic academic personnel, the number of students is less than 5,000, less than 100,000 books in the library and the least reputation.

Table 3.6 Utilities for the first student

| | | Utility Estimate | Std. Error |
|---|---|---|---|
| SYSTEM | Classic | 7.8750 | 0.9780 |
| | **Problem Based Learning** | 15.7500 | 1.9560 |
| EDUCATION LANGUAGE | Turkish | 0.1250 | 0.9780 |
| | **Foreign Language** | 0.2500 | 1.9560 |
| CAMPUS | **Small and fragmented** | -0.3750 | 0.9780 |
| | Big and single | -0.7500 | 1.9560 |
| LOCATION | **Within the city** | -0.1250 | 0.9780 |
| | Outside of city | -0.2500 | 1.9560 |
| TYPE | **Private** | -0.6250 | 0.9780 |
| | State | -1.2500 | 1.9560 |
| ACADEMIC PERSONNEL | Experienced | 0.3750 | 0.9780 |
| | **Young and dynamic** | 0.7500 | 1.9560 |
| SIZE | **Less than 5,000** | -0.0682 | 0.5897 |
| | 5,000-15,000 | -0.1364 | 1.1795 |
| | More than 15,000 | -0.2045 | 1.7692 |
| LIBRARY | **Less than 100,000** | -0.3409 | 0.5897 |
| | 100,000-300,000 | -0.6818 | 1.1795 |
| | More than 300,000 | -1.0227 | 1.7692 |
| REPUTATION | Most | 0.8409 | 0.5897 |
| | Average | 1.6818 | 1.1795 |
| | **Least.** | 2.5227 | 1.7692 |
| (CONSTANT) | | -7.5682 | 4.0431 |

The importance values were obtained by using SPSS. On the other hand, these values were calculated manual by using formula 2.5. These values are shown the important factors consecutively.

Table 3.7 Importance Values for the first student(Averaged Importance Score)

| **Factors** | **Importance Values** |
|---|---|
| SYSTEM | 65.63 |
| LANGUAGE | 1.04 |
| CAMPUS | 3.13 |
| LOCATION | 1.04 |
| TYPE | 5.21 |
| PERSONNEL | 3.13 |
| SIZE | 1.14 |
| LIBRARY | 5.68 |
| REPUTATION | 14.02 |

The best university criteria are shown in Table 3.8 for the first respondent based on the important factors. The first student reaches the maximum utility when selecting the university shown is shown in Table 3.8.

Table 3.8 The Best University Criteria for the first student

| **Properties of University** |
|---|
| **1.** Problem based learning education system |
| **2.** The least reputation |
| **3.** The number of books is less than 100,000 in library |
| **4.** Private university |
| **5.** Small and fragmented campus style |
| **6.** Young and dynamic academic personnel |
| **7.** The number of students is less than 5,000 |
| **8.** Education in Foreign Language |
| **9.** Campus located within the city |

Table 3.9 Coefficients for the first student

| | **B Coefficient** |
|---|---|
| | **Estimate** |
| SYSTEM | 7.8750 |
| LANGUAGE | 0.1250 |
| CAMPUS | -3.3750 |
| LOCATION | -0.1250 |
| TYPE | -0.6250 |
| PERSONNEL | 0.3750 |
| SIZE | -0.0682 |
| LIBRARY | -0.3409 |
| REPUTATION | 0.8409 |

The total utility or predicted score was calculated for the first student by two ways.

First way is using the formula 2.4.

*Total Utility=constant*+ (7.8750**system*)+(0.1250**language*)+ (-3.3750**campus*)+ (-0.1250**location*)+(-0.6250**type*)+(0.3750**personnel*)+ (-0.0682**size*)+(-0.3409**library*)+(0.8409**reputation*)

Second way is using the part-worth values of each attribute.

*Total Utility=constant*+ utility(*system*)+ utility(*language*)+ utility(*campus*)+ utility(*location*)+ utility(*type*)+ utility(*personnel*)+ utility(*size*)+ utility(*library*)+ utility(*reputation*)

For example, the total utility of third card profile that you can see in Appendix A for the first student.

*Total Utility*=-7.5682+ (7.8750**Problem based learning*)+(0.1250**Turkish*) +(-3.3750**Small and fragmented*)+(-0.1250**Within the city*)+(-0.6250**Private*) +(0.3750**Young and dynamic*)+(-0.0682**between 5,000 and 15,000*) +(-0.3409**more than 300,000*)+(0.8409**Least*)

*Total Utility=-7.5682*+(7.8750*2)+(0.1250*1)+(-3.3750*1)+(-0.1250*1)+(-0.6250*1)+(0.3750*2)+(-0.0682*2)+(-0.3409*3)+(0.8409*3)=9.2954

or total utility was calculated using the part-worth utility is shown in Table 3.6.

*Total Utility*= -7.568+utility(*Problem based learning*)+ utility(*Turkish*)+ utility(*Small and fragmented*)+utility(*Within the city*)+ utility(*Private*)+ utility(*Young and dynamic*)+ utility(*between 5,000 and 15,000*)+ utility(*more than 300,000*)+ utility(*Least*)

*Total Utility=-7.5682*+15.7500+(-0.1250)+(-0.3750)+(-0.1250)+(-0.6250)+0.7500+(-0.1364)+(-1.0227)+2.5227=9.2954

The total utility of the third card for the fist respondent is 9.2954. Total utility for any university profile according to the Conjoint Analyses model can be calculated using the predicted scores model for the first student.

### *3.4.2 Interpreting the result for candidate students for university*

In this study, the important factors that affect the students' university preference for selecting the university are consecutively university's reputation, the number of books in library, the type of the ownership of university, the campus style, education language, the location of campus according to the students' residency, the number of students, education system, the profiles of academic personnel. As it is shown in Table 3.10, The candidate students for university prefer problem based learning over classic education system, foreign language over Turkish education language, small and fragmented campus style over big and single campus style, within the city campus over outside of city campus, state university over private university, young and dynamic academic personnel over experienced academic personnel, big university, big library and the most reputable university.

Table 3.10 Utility values for all students

| | **Importance Values** | | **Utility Estimate** |
|---|---|---|---|
| SYSTEM | 8.80 | Classic | 0.2587 |
| | | **Problem Based Learning** | 0.5174 |
| EDUCATION LANGUAGE | 10.36 | Turkish | 0.4390 |
| | | **Foreign Language** | 0.8779 |
| CAMPUS | 10.86 | **Small and fragmented** | -0.5475 |
| | | Big and single | -1.0950 |
| LOCATION | 9.79 | **Within the city** | -0.1172 |
| | | Outside of city | -0.2345 |
| TYPE | 14.76 | Private | 1.0998 |
| | | **State** | 2.1996 |
| ACADEMIC PERSONNEL | 7.24 | Experienced | 0.0591 |
| | | **Young and dynamic** | 0.1182 |
| SIZE | 8.88 | Less than 5,000 | 0.0344 |
| | | 5,000-15,000 | 0.0687 |
| | | **More than 15,000** | 0.1031 |
| LIBRARY | 11.68 | Less than 100,000 | 0.1429 |
| | | 100,000-300,000 | 0.2858 |
| | | **More than 300,000** | 0.4286 |
| REPUTATION | 17.64 | **Most** | -0.7204 |
| | | Average | -1.4408 |
| | | Least. | -2.1612 |
| (CONSTANT) | | | 4.7146 |

The best university criteria are in Table 3.11 for the candidate students for university based on the important factors. If the university has the following criteria, it is obtained the maximum utility for students.

Table 3. 11 The Best University **c**riteria for candidate students for university

| **Properties of University** |
|---|
| **1.** The most reputation |
| **2.** State university |
| **3.** The number of books is more than 300,000 in library |
| **4.** Small and fragmented campus style |
| **5.** Education in Foreign Language |
| **6.** Campus located within the city |
| **7.** The number of students is more than 15,000 |
| **8.** Problem based learning education system |
| **9.** Young and dynamic academic personnel |

The top of three factors are the university's reputation, type of the ownership of university and number of books(see Figure 3.1).The brand concept is the most important factor for consumer at every sector in recent years. People perceive brand as the showing of level of quality. Therefore, reputation is a brand in the education system and it shows the level of quality according to the people. So, it was expected that the university's reputation is the most important factor when selecting university. The type of the ownership of university is the second important factor when selecting university. The students prefer to educate in the public university. One of the reasons for that result can be low income. Because of the level of income is the most important factor for consumer behaviours that live in the low income area in the decision making process.

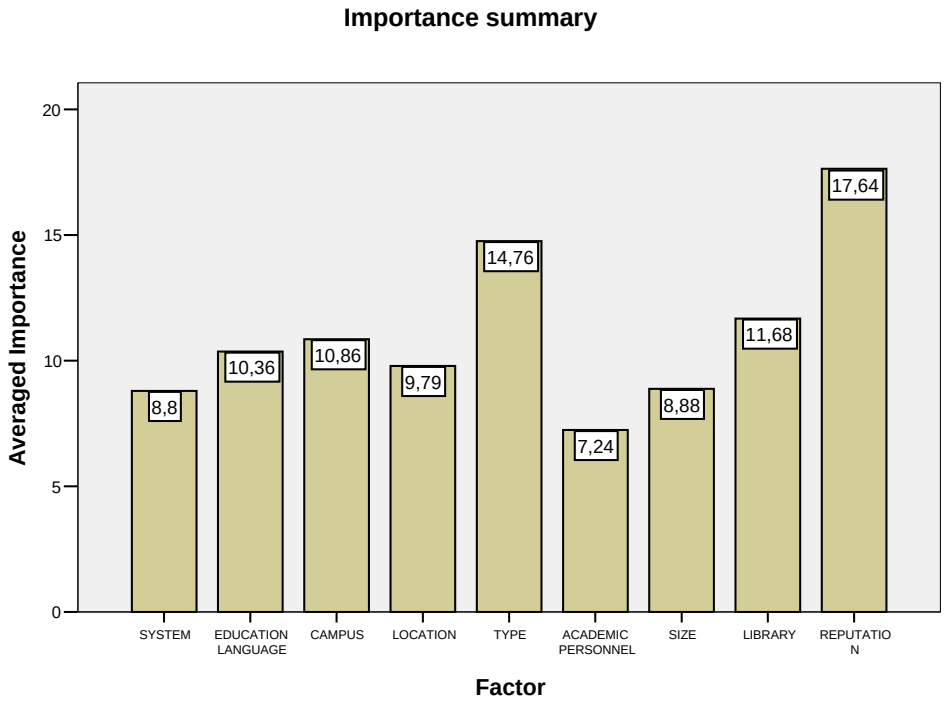


Figure 3.1 Importance values of each factor

Table 3.12 Coefficients of the factor for the candidate students for university

| | **B Coefficient** |
|---|---|
| | **Estimate** |
| SYSTEM | 0.2587 |
| LANGUAGE | 0.4390 |
| CAMPUS | -0.5475 |
| LOCATION | -0.1172 |
| TYPE | 1.0998 |
| PERSONNEL | 0.0591 |
| SIZE | 0.0344 |
| LIBRARY | 0.1429 |
| REPUTATION | -0.7204 |

The general predicted score model is

$$S_{ij} = 4.7146 + (0.2587 * system) + (0.4390 * language) + (-0.5475 * campus) + (-0.1172 * location) + (1.0998 * type) + (0.0591 * personnel) + (0.0344 * size) + (0.1429 * library) + (-0.7204 * reputation)$$

or

$$S_{ij} = 4.7146 + \text{utility}(system) + \text{utility}(language) + \text{utility}(campus) + \text{utility}(location) + \text{utility}(type) + \text{utility}(personnel) + \text{utility}(size) + \text{utility}(library) + \text{utility}(reputation)$$

The predicted scores were calculated for each card by using the general predicted score model. As you see in Figure 3.2, the eighth card provides the maximum utility for the candidate students for university in created cards On the other hand; the twelfth card provides the minimum utility for the candidate students for university in these cards. And the predicted score of any university‘s profile can be calculated.

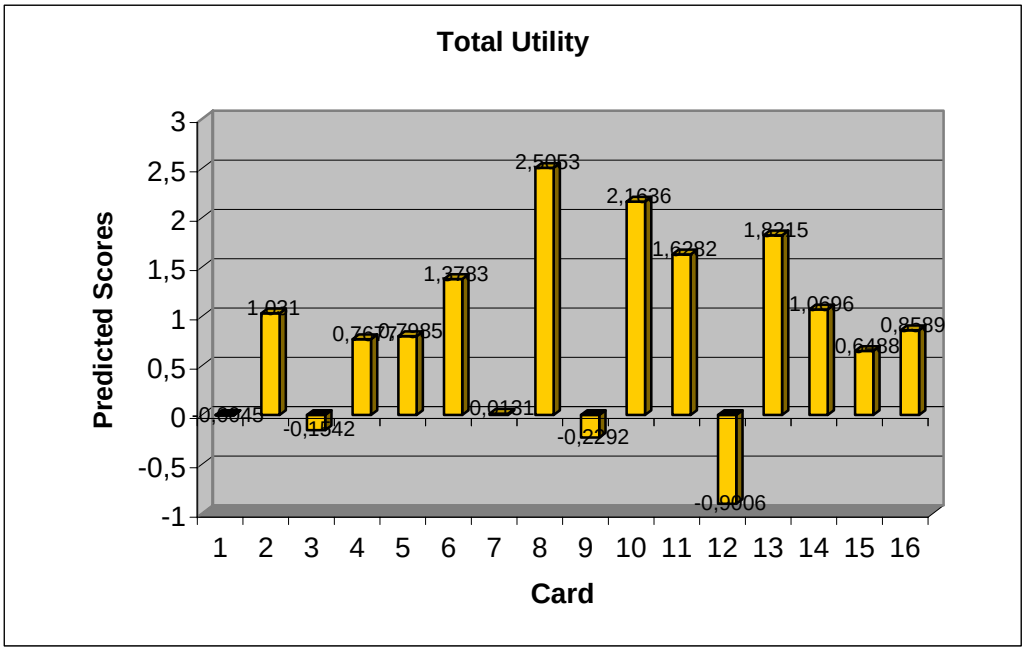


Figure 3.2 Total utility of each created stimulus

The utility of problem based learning education system is 0.517; the utility of classic education system is 0.259. The problem based learning education system is the best level of system attribute. Therefore, if problem based learning education system is selected, there is not a utility loss due to providing the maximum utility to student in the system attribute. If the classic education system is selected, there are 0.258 (0.259-0.517) utility losses.

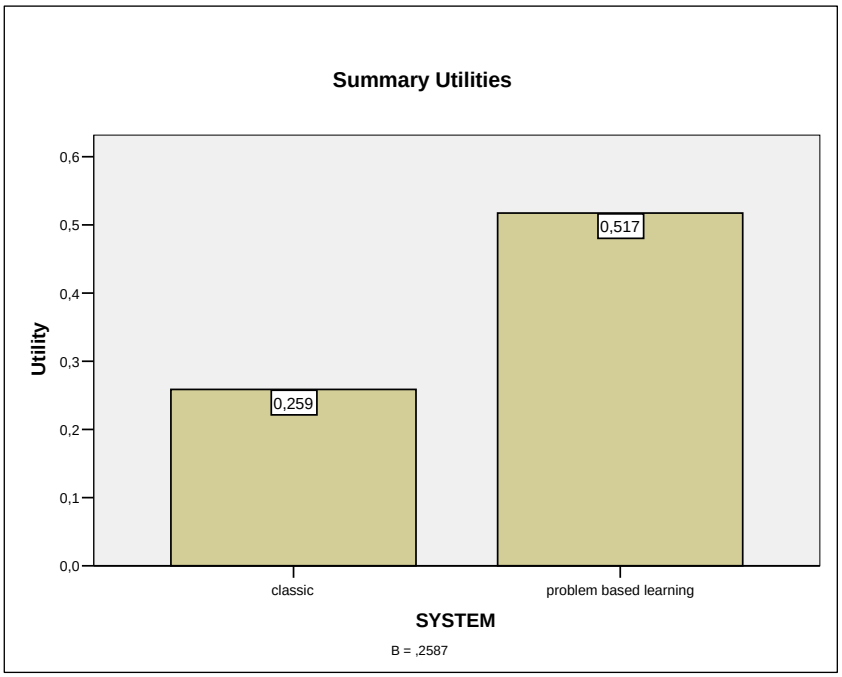


Figure 3.3 The utility values of the levels of system attribute

The utility of foreign language education language is 0.878; the utility of Turkish education language is 0.439. The foreign language education language is the best level of education language attribute. Therefore, if the foreign language education language is selected, there is not a utility loss due to providing the maximum utility to student in the education languages attribute. If the Turkish education language is selected, there are 0.439 (0.439-0.878) utility losses.

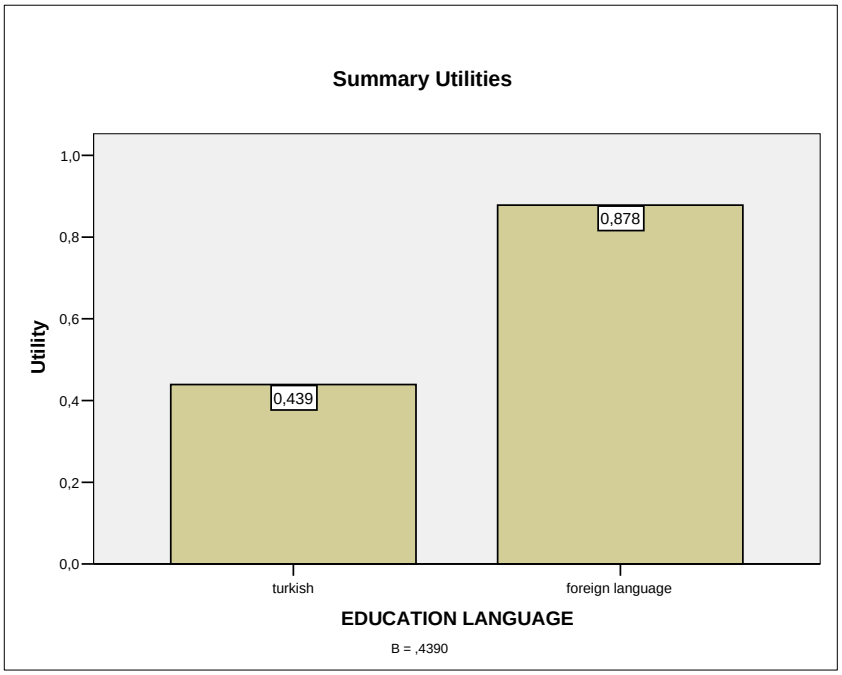


Figure 3.4 The utility values of the levels of education language attribute

The utility of small and fragmented campus style is -0.547; the utility of big and single campus style is -1.095. The small and fragmented campus style is the best level of the campus style. Therefore, if small and fragmented campus style is selected, there is not a utility loss due to providing the maximum utility to student in the campus style attribute. If big and single campus style is selected, there are 0.548 (-0.905-(-0.547)) utility losses.

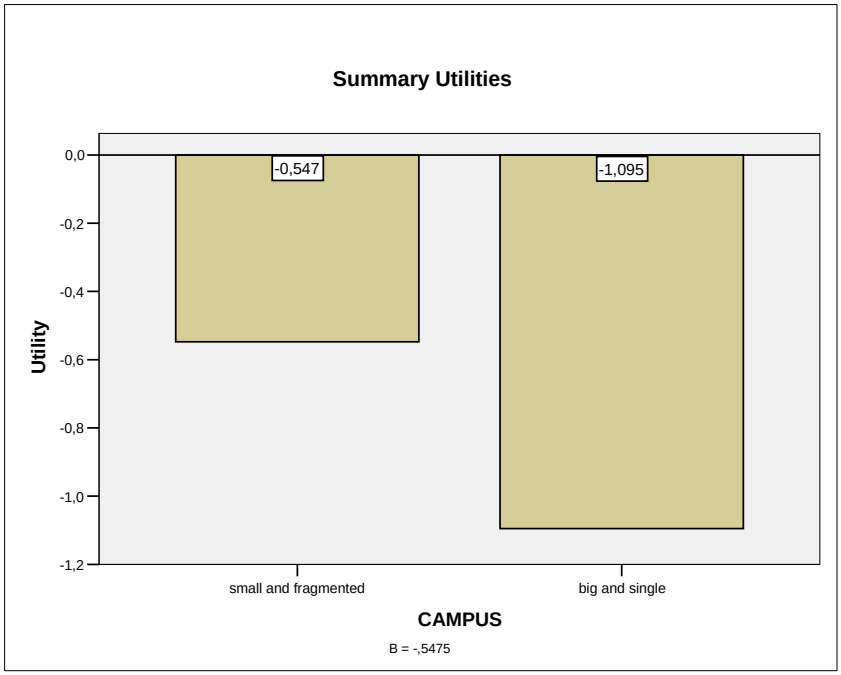


Figure 3.5 The utility values of the levels of campus attributes

The utility of outside of city campus is -0.2345; the utility of within the city campus is -0.1172. The within the city campus is the best level of the location of campus. Therefore, if within the city campus is selected, there is not a utility loss due to providing the maximum utility to student in the location of campus attribute. If outside of city campus is selected, there are 0.1173 (-0.2345-(-0.1172)) utility losses.

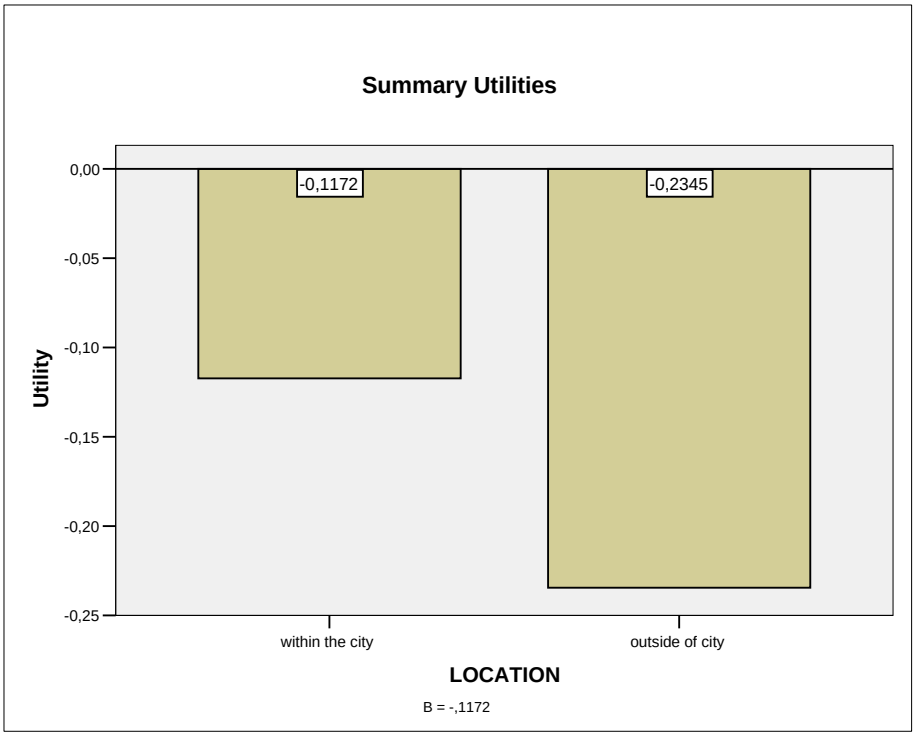


Figure 3.6 The utility values of the levels of location attribute

The utility of state university is 2.2; the utility private university is 1.1. The state university is the best level of the type of the ownership of university. Therefore, when state university is selected, there is not a utility loss due to providing the maximum utility to student in the type of the ownership of university attribute. If private university is selected, there are 1.1 (1.1-2.2) utility losses.

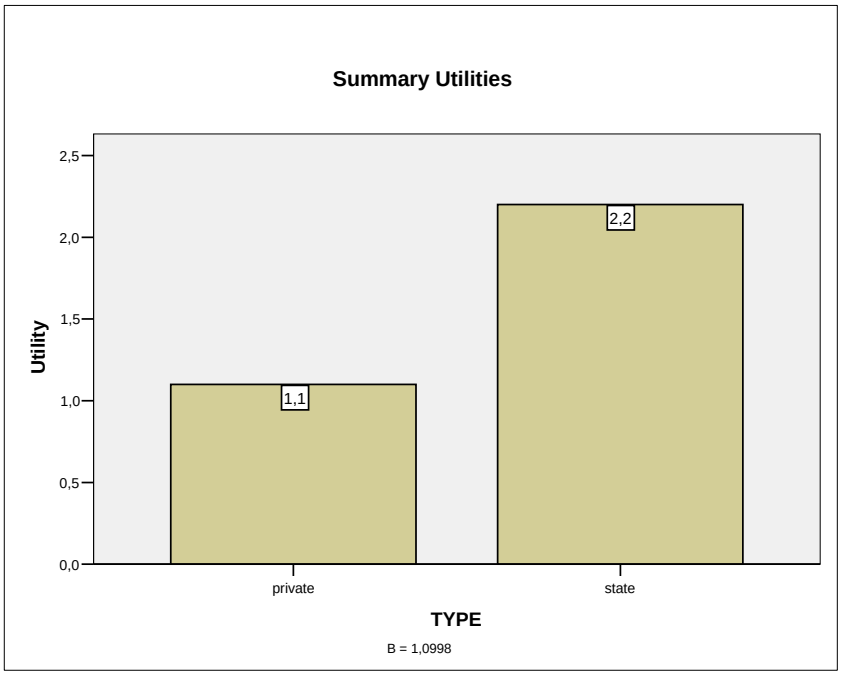


Figure 3.7 The utility values of the levels of type attribute

The utility of young and dynamic academic personnel is 0.1182; the utility of experienced academic personnel is 0.591. The young and dynamic university is the best level of the academic personnel attribute. Therefore, if young and dynamic is selected, there is not a utility loss due to providing the maximum utility to student in the profile of academic personnel attribute. If experienced academic personnel is selected, there are 0.4728 (0.1182-0.591) utility losses.

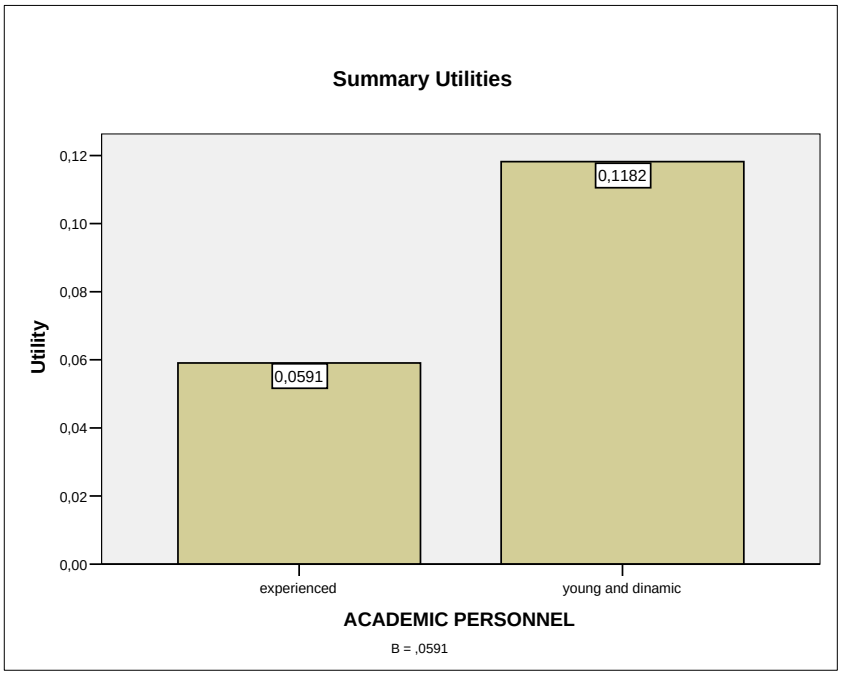


Figure 3.8 The utility values of the levels of academic personnel attribute

The utility of the number of students is less than 5,000, between 5,000 and 15,000 and more than 15,000 are consequently 0.0344, 0.0687 and 0.1031. The number of students is more than 15,000 is the best level of the size attribute. Therefore, “more than 15,000” level is selected, there is not a utility loss due to providing the maximum utility to student in the size attribute. If “less than 5,000” level is selected, there is 0.0687 (0.0344-0.1031) utility loss. If “5,000-15,000” level is selected there are 0.9623 (0.00687-0.1031) utility losses.

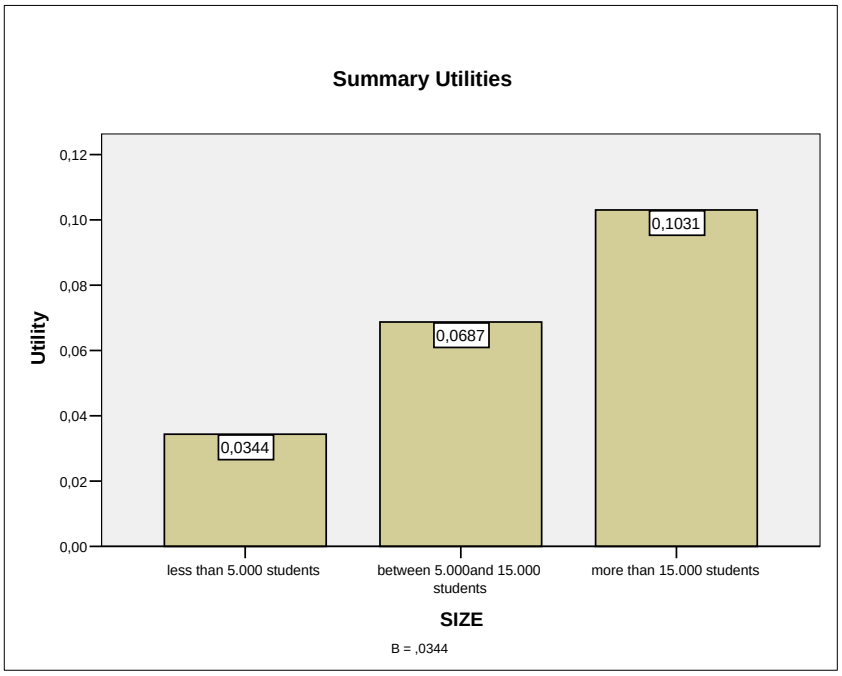


Figure 3 9 The utility values of the levels of size attribute

The utility of the number of books is less than 100,000, between 100,000 and 300,000 and more than 300,000 are consequently 0.143, 0,286 and 0.429. The number of books is more than 300,000 is the best level of the library attribute. Therefore, “more than 300,000” level is selected, there is not a utility loss due to providing the maximum utility to student in the library attribute. If “less than 100,000” level is selected, there is 0.0286 (0,.143-0.429) utility loss. If “100,000-300,000” level is selected there are 0.143 (0.286-0.429) utility losses.

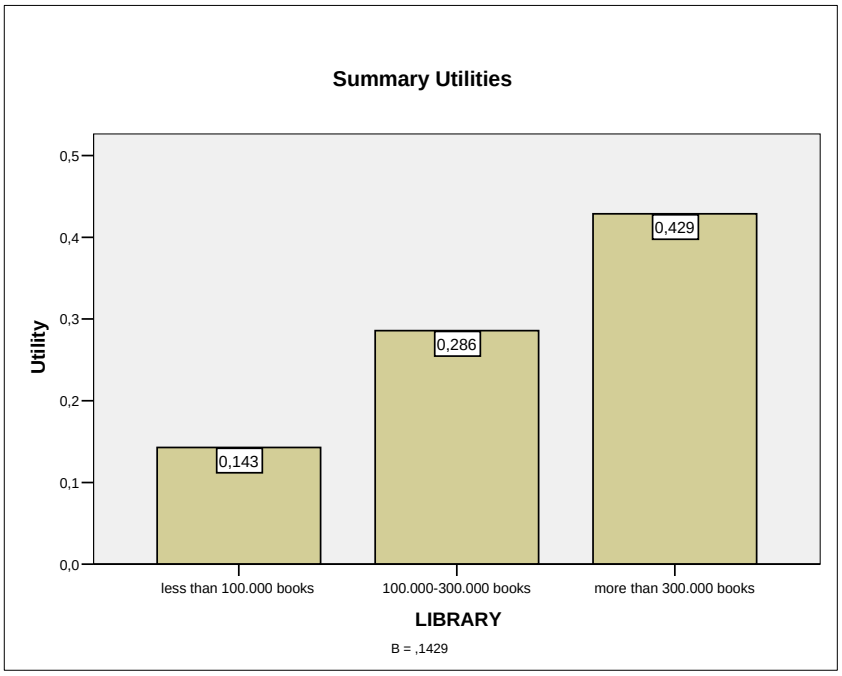


Figure 3.10 The utility values of the levels of library attributes

The utility of least, average and most reputation is consequently -0.72 ,-1.441 and -2.161. The most reputation is the best level of the university's reputation attribute. Therefore, the most reputation is selected, there is not a utility loss due to providing the maximum utility to student in the profile of university's reputation attribute. If average reputation is selected, there is 0.721 (-1.441-(-0.72)) utility loss. If the least reputation is selected, there is 1.441 (-2.161-(-0.72)) utility loss.

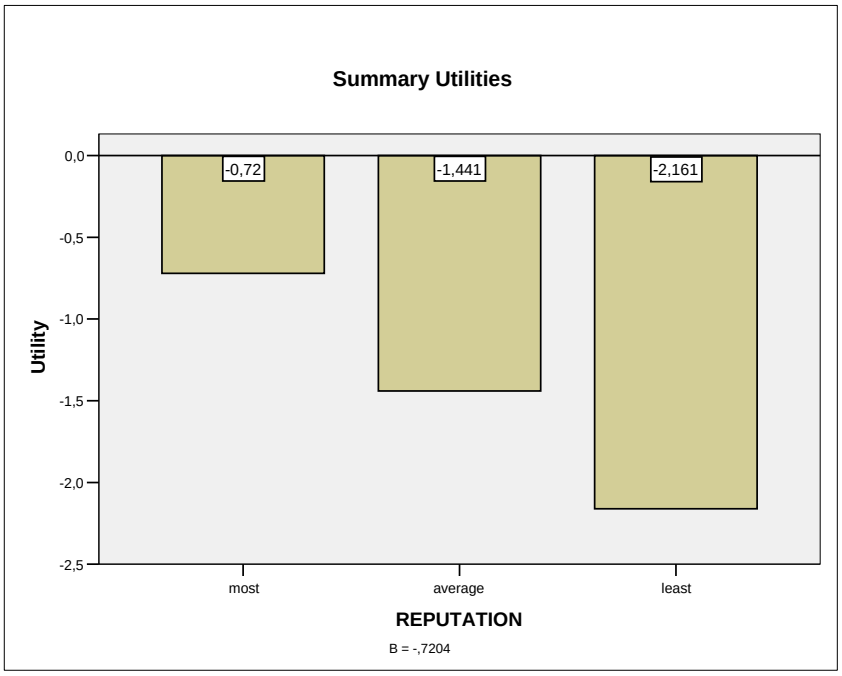


Figure 3.11 The utility values of the levels of reputation attribute

The Conjoint Analysis was applied to each department separately. All of the results of analyses for each department are valid and selected model is good predictive. The total utility model was determined for each department separately. In doing so, the best university criteria were identified for each of them.

### *3.4.3 Interpreting the result for candidate students who are in the department of Natural Sciences for university*

The results of the department of Natural Sciences were shown in Table 3.13. For candidate students for university at the department of Natural Sciences, the important factors that affect students' university preference are consecutively university's reputation, the type of the ownership of university, the number of books in library, education system, education language, the campus style, the number of students, the location of campus according to the students' residency, the profiles of academic personnel. The best level of each factor is shown bold font in the Table 3.13. The candidate students for university at the department of Natural Sciences prefer to be educated in the university has problem based learning education system, education in

foreign language, small and fragmented campus, outside of city campus, state university, experienced academic personnel, more than 15,000 students, more than 300,000 books in the library and the most reputation.

Table 3.13 Utility values for candidate students who are in the department of Natural Sciences

| | **Average Importance** | **Coefficient** | | **Utility Estimate** |
|---|---|---|---|---|
| SYSTEM | 10.04 | 0.4565 | Classic | 0.4565 |
| | | | **Problem Based Learning** | 0.9130 |
| EDUCATION LANGUAGE | 9.97 | 0.5833 | Turkish | 0.5833 |
| | | | **Foreign Language** | 1.1667 |
| CAMPUS | 9.84 | -0.4167 | **Small and fragmented** | -0.4167 |
| | | | Big and single | -0.8333 |
| LOCATION | 8.94 | 0.0725 | Within the city | 0.0725 |
| | | | **Outside of city** | 0.1449 |
| TYPE | 15.98 | 1.3261 | Private | 1.3261 |
| | | | **State** | 2.6522 |
| ACADEMIC PERSONNEL | 7.53 | -0.0652 | **Experienced** | -0.062 |
| | | | Young and dynamic | -0.1304 |
| SIZE | 9.52 | 0.1107 | Less than 5,000 | 0.1107 |
| | | | 5,000-15,000 | 0.2213 |
| | | | **More than 15,000** | 0.3320 |
| LIBRARY | 11.93 | 0.1120 | Less than 100,000 | 0.1120 |
| | | | 100,000-300,000 | 0.2240 |
| | | | **More than 300,000** | 0.3360 |
| REPUTATION | 16.25 | -0.7339 | **Most** | -0.7339 |
| | | | Average | -1.4677 |
| | | | Least | -2.2016 |
| (CONSTANT) | | | | 3.3837 |

The general predicted score model is

$$S_{ij} = 3.3837 + (0.4565 * system) + (0.5833 * educationlanguage) + (-0.4167 * campus) + (0.0725 * location) + (1.3261 * type) + (-0.0652 * academicpersonnel) + (0.1107 * size) + (0.1120 * library) + (-0.7339 * reputation)$$

The best university criteria are shown in Table 3.14 for the department of Natural Sciences' candidate student for university based on the important factors. If the university has the following criteria, the maximum utility is obtained for candidate students who are at the department of Natural Sciences when selecting this university.

Table 3.14 The Best University Criteria for the candidate students who are at the department of Natural Sciences for university

| **Properties of University** |
|---|
| **1.** The most reputation |
| **2.** State university |
| **3.** The number of books is more than 300,000 in library |
| **4.** Problem based learning education system |
| **5.** Education in Foreign Language |
| **6.** Small and fragmented campus style |
| **7.** The number of students is more than 15,000 |
| **8.** Campus located outside of city |
| **9.** Experienced academic personnel |

### *3.4.4 Interpreting the result for candidate students who are in the department of Turkish and Mathematics Sciences for university*

The candidate students for university at the department of Turkish and Mathematics Sciences, the important factors that affect students' university preference are consecutively, university's reputation, the type of the ownership of university, the campus style, the number of books in library, the location of campus according to the students' residency, education language, the number of students, education system, the profiles of academic personnel. The best level of each factor is shown bold font in the Table 3.15. The candidate students for university at the department of Turkish and Mathematics Sciences prefer to be educated in the university has problem based learning education system, education in foreign

language, small and fragmented campus, within the city campus, state university, young and dynamic academic personnel, less than 5,000 students, more than 300,000 books in the library and the most reputation.

Table 3.15 Utility values for candidate students who are in the department of Turkish and Mathematics Sciences

| | **Average Importance** | **Coefficient** | | **Utility Estimate** |
|---|---|---|---|---|
| SYSTEM | 7.22 | 0.0943 | Classic | 0.0943 |
| | | | **Problem Based Learning** | 0.1887 |
| EDUCATION LANGUAGE | 10.47 | 0.2547 | Turkish | 0.2547 |
| | | | **Foreign Language** | 0.5094 |
| CAMPUS | 11.53 | -0.6745 | **Small and fragmented** | -0.6745 |
| | | | Big and single | -1.3491 |
| LOCATION | 10.49 | -0.2736 | **Within the city** | -0.2736 |
| | | | Outside of city | -0.5472 |
| TYPE | 13.99 | 0.9245 | Private | 0.9245 |
| | | | **State** | 1.8491 |
| ACADEMIC PERSONNEL | 7.21 | 0.2406 | Experienced | 0.2406 |
| | | | **Young and dynamic** | 0.4811 |
| SIZE | 7.52 | -0.0815 | **Less than 5,000** | -0.0815 |
| | | | 5,000-15,000 | -0.1630 |
| | | | More than 15,000 | -0.2444 |
| LIBRARY | 11.30 | 0.1844 | Less than 100,000 | 0.1844 |
| | | | 100,000-300,000 | 0.3688 |
| | | | **More than 300,000** | 0.5532 |
| REPUTATION | 20.27 | -0.7710 | **Most** | -0.7710 |
| | | | Average | -1.5420 |
| | | | Least | -2.3130 |
| (CONSTANT) | | | | 5.9687 |

The general predicted score model is

$$S_{ij} = 5.9687 + (0.0943 * system) + (0.2547 * educationlanguage) + (-0.6745 * campus) + (-0.2736 * location) + (0.9245 * type) + (0.2406 * academicpersonnel) + (-0.0815 * size) + (0.1844 * library) + (-0.7710 * reputation)$$

The best university criteria are shown in Table 3.16 for the department of Turkish and Mathematics Sciences' candidate student for university based on the important factors. If the university has the following criteria and is selected by the candidate students who are at the department of Turkish and Mathematics Sciences, the maximum utility is obtained for them.

Table 3.16 The Best University Criteria for candidate students who are at the department of Turkish and Mathematics Sciences for university

| **Properties of University** |
|---|
| **1.** The most reputation |
| **2.** State university |
| **3.** Small and fragmented campus style |
| **4.** The number of books is more than 300,000 in library |
| **5.** Campus located within the city |
| **6.** Education in Foreign Language |
| **7.** The number of students is less than 5,000 |
| **8.** Problem based learning education system |
| **9.** Young and dynamic academic personnel |

### *3.4.4 Interpreting the result for candidate students who are in the department of Social Sciences for university*

The candidate students for university at the department of Social Sciences, the important factors that affect students' university preference are consecutively, the campus style, education language, the location of campus according to the students' residency, the number of students, the number of books in library, university's reputation, the type of the ownership of university, education system, the profiles of academic personnel. The best level of each factor is shown bold font in the table 3.17. The candidate students for university at the department of Social Sciences prefer to be educated in the university has classic education system, education in foreign language, small and fragmented campus, within the city campus, state

university, experienced academic personnel, more than 15,000 students, more than 300,000 books in the library and the most reputation.

Table 3.17 Utility values for candidate students who are in the department of Social Sciences

| | **Average Importance** | **Coefficient** | | **Utility Estimate** |
|---|---|---|---|---|
| SYSTEM | 8.49 | -0.4464 | **Classic** | -0.4464 |
| | | | Problem Based Learning | -0.8929 |
| EDUCATION LANGUAGE | 13.37 | 0.8214 | Turkish | 0.4107 |
| | | | **Foreign Language** | 0.8214 |
| CAMPUS | 15.77 | -0.8750 | **Small and fragmented** | -0.8750 |
| | | | Big and single | -1.7500 |
| LOCATION | 12.89 | -0.8036 | **Within the city** | -0.8036 |
| | | | Outside of city | -1.6071 |
| TYPE | 8.57 | 0.1964 | Private | 0.1964 |
| | | | **State** | 0.3929 |
| ACADEMIC PERSONNEL | 4.63 | -0.0893 | **Experienced** | -0.0893 |
| | | | Young and dynamic | -0.1786 |
| SIZE | 12.87 | 0.1591 | Less than 5,000 | 0.1591 |
| | | | 5,000-15,000 | 0.3182 |
| | | | **More than 15,000** | 0.4773 |
| LIBRARY | 12.02 | 0.1331 | Less than 100,000 | 0.1331 |
| | | | 100,000-300,000 | 0.2662 |
| | | | **More than 300,000** | 0.3994 |
| REPUTATION | 11.38 | -0.2045 | **Most** | -0.2045 |
| | | | Average | -0.4091 |
| | | | Least. | -0.6136 |
| (CONSTANT) | | | | 8.3377 |

The general predicted score model is

$$S_{ij} = 8.3377 + (-0.4464 * system) + (0.8214 * educationlanguage) + (-0.8750 * campus) + (-0.8036 * location) + (0.1964 * type) + (-0.0893 * academicpersonnel) + (0.1591 * size) + (0.1331 * library) + (-0.2045 * reputation)$$

The best university criteria are shown in Table 3.18 for the department of Social Sciences' candidate student for university based on the important factors. If the

university has the following criteria and is selected by the candidate students who are at the department of Social Sciences, the maximum utility is obtained for them.

Table 3.18 The Best University Criteria for candidate students who are at the department of Social Sciences for university

| **Properties of University** |
|---|
| **1.** Small and fragmented campus style |
| **2.** Education in Foreign Language |
| **3.** Campus located within the city |
| **4.** The number of students is more than 15,000 |
| **5.** The number of books is more than 300,000 in library |
| **6.** The most reputation |
| **7.** State university |
| **8.** Classic education system |
| **9.** Experienced academic personnel |

The comparison of the preferences of each department is shown in Figure 3.12. All the levels and averaged importance are shown in the graph below. As it can be illustrated for the departments of Natural Sciences and Turkish and Mathematics Sciences students, the reputation plays the most important role on selecting the university. While the campus style is the most important factor for department of Social Sciences students.

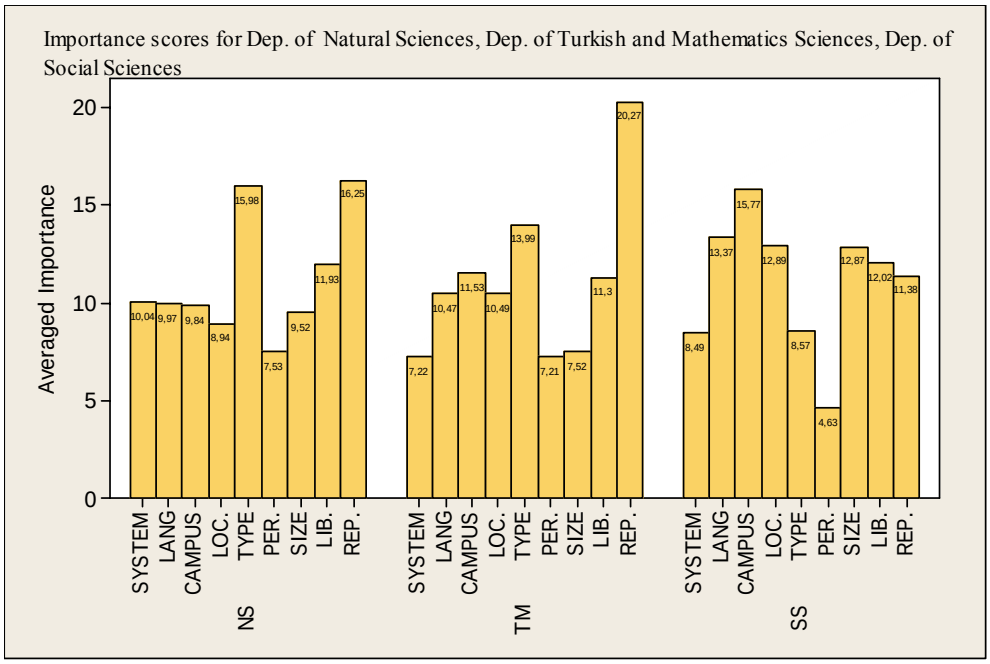


Figure 3 12 The importance values for department of Natural Sciences, department of Turkish and Mathematics Sciences and department of Social Sciences

## 3.5 Validation of the Results

The final step is to assess internally and externally validation. The estimated model that was used additive composition rule confirmed by the Pearson's R statistics.

Kendall's tau for holdouts statistics is significant at α=0.05, predicting actual choices in specific terms the issue of sample representativeness.

Kendall's tau for Holdouts=1.000 for 4 holdouts

p=0.0208

### 3.6 Descriptive Statistics

In total 173 questionnaires from the candidate students who attend the preparation courses in Izmir. The characteristic of sample are presented in Table3.19.

There are approximately 15,805(%53) female and 3,925(%47) male candidate students in İzmir. So, the percentage of the sample is very close to the percentage of population.

Table 3.19 Characteristic of the students

| | **Frequency** | **Valid Percent** |
|---|---|---|
| **SEX** | | |
| Female | 92 | 53.5 |
| Male | 80 | 46.5 |
| **DEPARTMENT** | | |
| Natural Sciences | 88 | 51.5 |
| Turkish and Mathematic Sciences | 74 | 43.3 |
| Social Sciences | 9 | 5.3 |
| **MOUNTLY INCOME** | | |
| 0-2000 New Turkish Liras | 99 | 63.5 |
| 20001-4000 New Turkish Liras | 39 | 25.0 |
| 4001-6000 New Turkish Liras | 8 | 5.1 |
| 6001-8000 New Turkish Liras | 4 | 2.6 |
| 80000-+ New Turkish Liras | 6 | 3.8 |

# CHAPTER FOUR
# CONCLUSION

This study analyzed the conceptualization of Conjoint Analysis concerning its usage, steps for implementation and its methods that are Traditional Conjoint Analysis, Adaptive Conjoint Analysis and Choice Based Conjoint Analysis

In the third chapter, a case study is conducted by using the method of Conjoint Analysis. The questionnaire which investigates the criteria for university selection of candidate students found out 9 influential factors that shapes the decision of students about their university choice. All of these 9 factors which also include levels are listed and interpreted according to their average importance scores. Afterwards, the comprised levels are also listed according to their utility values. Consequently, a model for a possible best university has tried to be identified through performing Conjoint Analysis. In addition, the model for a possible best university has also been identified for the students from 3 different departments namely, Natural Sciences, Social Sciences and Turkish and Mathematics.

The result of Conjoint Analysis demonstrated that the most influential factor which determines the candidate students' decision on university selection is the university's reputation. This factor is followed by the criteria of the type of the ownership of university and the students indicate their preference towards state university. The following third factor is found out to be the number of books in the library. As the fourth factor which refers to the campus type, the students prefer to study at a university which has small and fragmented campus style. The education in foreign language is the following factor. Coming to the sixth factor, the students prefer a university which has a campus located within the city of the student's residence. The number of students constitutes the seventh influential factor in the choice of the students and they also prefer to study at university which has more than 15,000 students. Next, concerning the education system, the students prefer to have a problem based learning education system. Lastly, the students care about the profile

of the academic personnel of the university and they prefer young and dynamic academic personnel.

This study does not aim to investigate the reasons behind the criteria which the students' care about in deciding about their university choice, however it only targets to define these most influential factors. In this regard, the study aims to provide a basis for further analysis in the similar area and it can ensure a general overview to the university and education administrators. In addition to that, this study can facilitate another further study regarding to find out the best relevant university according to the students' profile by segmentation.

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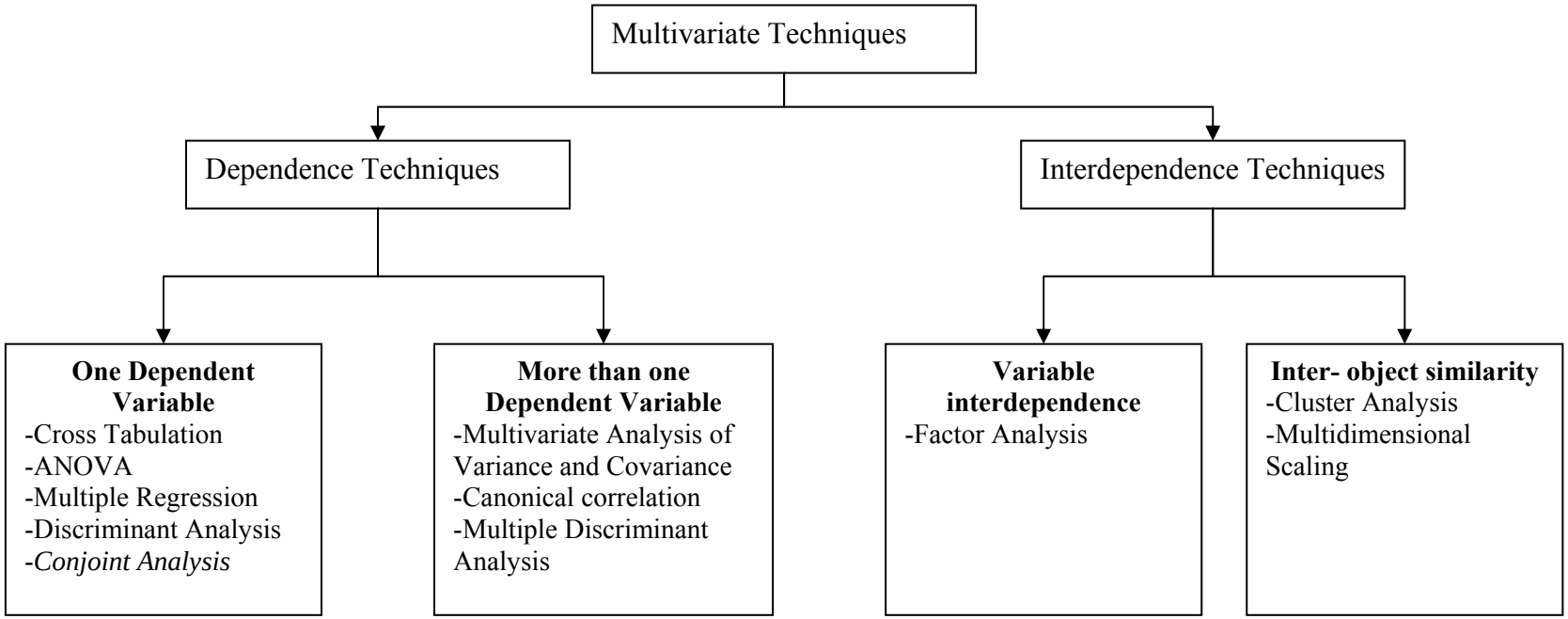
# APPENDICES

**APPENDIX A**

**A CLASSIFICATION OF MULTIVARIATE STATISTICAL TECHNIQUES**



## APPENDIX B

| Card | System | Education language | Campus | Location | Type | Academic personnel | Size | Library | Reputation | Status |
|---|---|---|---|---|---|---|---|---|---|---|
| **Stimuli Used in Estimation of Part-Worths** | | | | | | | | | | |
| 1 | PBL[13] | Foreign Language | B&S[14] | Outside of City | Private | Experienced | 5,000-15,000 | Less than 100,000 | Average | Design |
| 2 | PBL | Foreign Language | S&F[15] | Outside of City | State | Experienced | Less than 5,000 | 100,000-300,000 | Least | Design |
| 3 | PBL | Turkish | S&F | Within the city | Private | Young and Dynamic | 5,000-15,000 | More than 300,000 | Least | Design |
| 4 | Classic | Foreign Language | B&S | Outside of City | Private | Young and Dynamic | Less than 5,000 | More than 300,000 | Most | Design |
| 5 | PBL | Turkish | B&S | Within the city | State | Young and Dynamic | Less than 5,000 | Less than 100,000 | Average | Design |
| 6 | Classic | Turkish | B&S | Within the city | State | Experienced | 5,000-15,000 | 100,000-300,000 | Most | Design |
| 7 | Classic | Turkish | S&F | Outside of City | Private | Young and Dynamic | Less than 5,000 | 100,000-300,000 | Average | Design |
| 8 | PBL | Foreign Language | S&F | Within the city | State | Young and Dynamic | Less than 5,000 | Less than 100,000 | Most | Design |
| 9 | Classic | Turkish | B&S | Outside of City | State | Young and Dynamic | More than 15,000 | Less than 100,000 | Least | Design |
| 10 | Classic | Foreign Language | S&F | Outside of City | State | Young and Dynamic | 5,000-15,000 | Less than 100,000 | Most | Design |
| 11 | PBL | Turkish | B&S | Outside of City | State | Experienced | Less than 5,000 | More than 300,000 | Most | Design |
| 12 | Classic | Foreign Language | B&S | Within the city | Private | Experienced | Less than 5,000 | Less than 100,000 | Least | Design |
| 13 | Classic | Foreign Language | S&F | Within the city | State | Experienced | More than 15,000 | More than 300,000 | Average | Design |
| 14 | PBL | Foreign Language | B&S | Within the city | Private | Young and Dynamic | More than 15,000 | 100,000-300,000 | Most | Design |
| 15 | Classic | Turkish | S&F | Within the city | Private | Experienced | Less than 5,000 | Less than 100,000 | Most | Design |
| 16 | PBL | Turkish | S&F | Outside of City | Private | Experienced | More than 15,000 | Less than 100,000 | Most | Design |

[13] PBL is Problem Based Learning
[14] B&S is Big and Single Campus
[15] S&F is Small and Fragmented Campus

| Card | System | Education language | Campus | Location | Type | Academic personnel | Size | Library | Reputation | Status |
|---|---|---|---|---|---|---|---|---|---|---|
| **Holdout Validation Stimuli**[16] | | | | | | | | | | |
| 17 | Classic | Foreign Language | B&S | Within the city | Private | Experienced | More than 15,000 | Less than 100,000 | Most | Holdout |
| 18 | Classic | Turkish | B&S | Outside of City | State | Experienced | 5,000-15,000 | More than 300,000 | Most | Holdout |
| 19 | PBL | Turkish | B&S | Outside of City | State | Experienced | 5,000-15,000 | More than 300,000 | Most | Holdout |
| 20 | PBL | Foreign Language | S&F | Outside of City | State | Experienced | 5,000-15,000 | More than 300,000 | Average | Holdout |

[16] Validation stimuli is the set of stimuli that are not used in the estimation of the part-worths

**APPENDIX C**

**Conjoint Syntaxt**

```
CONJOINT PLAN='c:\university.sav'
   /DATA='c:\universitypref.sav'
   /SCORE=PREF1 TO PREF20
   /SUBJECT=ID
/FACTORS=SYSTEM LANGUAGE CAMPUS LOCATION (LINEAR)
TYPE (LINEAR MORE)
PERSONNEL (LINEAR)
SIZE (LINEAR)
LIBRARY (LINEAR MORE)
REPUTATION (LINEAR LESS)
/UTILITY='c:\utility.sav'
/PLOT=ALL
      /PRINT=ALL.
```

PLAN identifies the file containing the full concept profile. Plan file is prepared file generated by ORTHOPLAN that can be obtained by using SPSS. 'University .sav' file identifies an ORTHOPLAN in that all factors are orthogonal in the study. The plan file that is obtained at the end of the Orthogonal Analyses is shown in Appendix B

DATA identifies the file containing the subjects' preference score. 'Universitypref.sav' file involves the respondents' preference score in the study.

SCORE indicate the way which the preference data were recorded. The preference score of each respondent for each card is saved in the PREF1 to PREF20 columns on SPSS in the study.

SUBJECT specifies an identification variable. ID indicates the number of each respondent in the study.

FACTORS specify the way in which each factor is expected to be related to the scores. In the study, there is the linear relationship between scores and system, language campus location, personnel, size, and there is also the linear more relationship between scores and type, library, as well as the linear less relationship between scores and reputation

UTILITY writes a utility file to the file specified. ‘utility.sav’ file includes a total utility of each respondent for each factor and each card in the study..

PLOT produces bar chart of importance values for all factors, a utility bar chart for each factor level.

PRINT controls whether output includes the analysis of the experimental data and simulation data.