Investigating Gap between Customers' Taste and Market Variety and its Impact on the Customer Satisfaction: An Empirical Study in the Automotive Industry

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ABSTRACT

This study investigates and examines the gap between customer preferences and market variety in the Iranian automobile market and its impacts on customer satisfaction. A linear approximation is used for the utility function of customers of the Iranian carmaker (Iran Khodro Co). Also the SERVQUAL model for measuring customer satisfaction is used to determine, the gap between customer expectation and perceived quality. The moderator variable called “Role of car in the customer life” is introduced and its effect on the relationships between customer expectation, perceived quality and customer satisfaction is evaluated.

The results show that considering the history of car sales over the past five years compared with the value predicted by the existing car market share, a significant gap between the current sales of IKCO and a product assortment ideally adapted to the customers is detected. The highest gap occurred between the level of expectation and the perceived quality of factors, respectively belonging to sale, car accessories, technical and physical aspects and the after-sale services. In this way, companies can elaborate better strategies and production plans and can increase their market share.

As a contribution, this study provides a method for identifying customer behavior based on choices among options consisting of a set of qualitative and quantitative factors. So the method presented in this study can be used to empower automakers corporations to increase their competitive advantage and create the readiness to enter and compete in global market. This could prevent decline in automakers share and increase their profitability through achieving customer satisfaction.

We live in a dynamic and changing environment. Changes in customer tastes and purchasing power; Changes in technical standards specifically regulations related to polluting potential of cars and tariff regulations; Changes in market structure toward openness to global market and increasing competition, could reduce the applicability of this research results. So these are open questions for future researches. Also as a topic for further research, the number of vehicles and factors types can be changed to evaluate the market share. Also, the effect of the moderator variable on customer satisfaction for other useable products and services may be investigated.

Keywords: Utility function, Customer behavior, Microeconomics, Expectation, Perceived Quality, Customer Satisfaction, Moderating, Conditional Correlation.

ÖZ

Bu çalışma İran otomobil piyasasındaki müşteri tercihleri ve pazar çeşitliliği arasındaki boluğu ve bunun müşteri memnuniyeti üzerindeki etkisini araştırmakta ve incelemektedir. İranlı otomobil üreticisi (İran Khodro Co) müşterilerinin yarar fonksiyonu için doğrusal bir yaklaşım kullanılmıştır. Ayrıca müşteri beklenti ve algılanan kalite arasındaki boşluğu belirlemek ve müşteri memnuniyetini ölçmek için SERVQUAL modeli kullanılmıştır. "Müşteri hayatında arabanın rolü" adlı moderatör değişken olarak tanıtılarak müşterinin beklentisi, kalite algısı ve müşteri memnuniyeti üzerindeki etkisi değerlendirilmiştir.

Sonuçlar, son beş yıl içerisindeki otomobil satışlarıyla mevcut araç pazar payı içerisindeki değeri karşılaştırıldığında, IKCO'nun mevcut satış ve ideal müşterilerine uyarlanmış bir ürün yelpazesi arasında anlamlı bir fark tespit edilmiştir. En büyük fark, satış, araba aksesuarları, teknik be fiziksel donanım ve satış sonrası hizmetlerin beklenti düzeyi ve kalite faktör algıları arasında meydana gelmiştir. Bu şekilde, şirketler daha iyi strateji ve üretim planlarını hazırlayarakmak pazar paylarını artırabileceklerdir.

İleri bir araştırma konusu olarak, araç ve faktör türlerinin sayısı değiştirilerek pazar payı değerlendirilmesi önerilmektedir. Ayrıca, diğer kullanışlı ürün ve hizmetler için müşteri memnuniyeti moderatör değişkenin etkisi araştırılabilir.

Anahtar Kelimeler: Fayda fonksiyonu, Müşteri davranışı, Mikroekonomi, Beklenti, Kalite Algısı, Müşteri Memnuniyeti, Aracılık, Koşullu Korelasyon.

DEDICATION

To My Family

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INTRODUCTION

1.1 Preface

In the final decades of the 20th century, there has been a transformation in all sectors of industry and services. The global market has never been more competitive. Around the world, organizations and businesses are trying to gain some competitive advantage over other competitors through unique advantages. The automotive industry is not exempt from this as the market becomes more competitive. Considerable and continuous effort in providing a variety of services and high-quality products has become a focus of successful businesses.

On the other hand, customers are always looking for manufacturers who can provide better products or services. This influences a customer's choice in selecting the right products or services. Given the numerous suppliers that offer products with similar quality, when consumers want to buy products and services, various choices are possible. It is pertinent therefor that customer go beyond the external and physical characteristics of desired products to consider the quality factors.

A customer evaluates four criteria, price, quality, delivery time and innovation in products and services. If offers of a company are better, the market share of the company will be higher and the company's products and services will be more attractive for customers. For this purpose, the starting point is the understanding of

the needs of market and customers and the end point is the meeting their demands and customers satisfaction.

The automotive industry is a large industry with high financial turnover and contributes to the national economy. So providing a way to asses a car company's market position based on the customer's preferences and identifying products that customers prefer is inevitable. This enables policy makers in industry to be aware of the factors that create a competitive advantage to increase chances of survival and growth in the market.

Car makers operate and compete in a highly competitive market both domestic and international. Thus, a study of the market and the design of products based on customer's preferences will enable the success of a product in the market thereby increasing market share.

Iran Khodro Co. (IKCO) was founded in 1962, as Iran National and currently employs about 35,000 personnel. Over the years, IKCO has developed its capabilities and has become the largest industrial group in the MENA region in the automotive sector for both passenger cars and commercial vehicles with a production capacity of 1,000,000 units annually.

In this section, the research problem is described and the necessity of the research is expressed. The objectives and research questions are also raised. The general methodology in terms of population, sample size, sampling method, data collection, and method of data analysis are discussed and research concepts and terminology are defined. Finally, the research scope and limitations are considered.

1.2 Problem Statement

Competition and overcoming market complexities is possible by attracting loyal customers and increasing customer satisfaction. All organizations are looking to gain greater market share and increase profit. Effective operational models strategy, planning and technique are fundamental organizational functions required to attract loyal and satisfied customers.

So before identifying customer needs, it is necessary to evaluate a product’s current position in the market and customer preferences. This evaluation will lead to an understanding of the strengths and weaknesses of products from the customer's perspective and the gap between customer’s preferences and actual products in the market.

1.3 Purpose of the Study

The main purpose of this study is to identify the gap between customer taste and market variety and the impact of this gap on customer satisfaction. In this study, a new moderator variable “importance of car in a customers’ life” is introduced and its impact on the relationship between customer expectations, perceived quality and customer satisfaction is evaluated. This research provides a new dimension for further research to examine other products and companies by applying the method presented in this study, and also an in depth study of moderator variables used in this research in other areas of customer-related activities. This research could answer questions, be the roadmap for industry managers to optimize the use of financial capital and human resources, increase customers satisfaction, improve profitability and market share in the shortest possible time.

1.4 Research Objectives

The secondary objectives of this study seek to:

1- Determine the:

- Quantitative and qualitative car parameters chosen by customers.

- Weight of each of the identified parameters based on customer preferences.

- Value of existing and potential cars from different customer group perspectives.

- Market share of existing and potential cars.

- Gap between manufactured cars and its market share based on the customers' taste.

- Most important items in customer satisfaction in terms of technical and physical aspects of car, accessories, sales and after-sales services.

2- Evaluate if a significant relationship exists between:

- Customer expectations, perceived quality and customer satisfaction

- The four factors (physical aspects of car, accessories, sales and after-sales services) and overall customer satisfaction level.

-The moderator variable and overall customer satisfaction level.

And

3- Assess the:

- Impact of the moderator variable "importance of car in a customers' life" on the relationship between customer expectations, perceived quality and the satisfaction of the four relevant factors.

- Weaknesses in the Iranian car market based on the identified gap between customer preference and market variety.

1.5 Research Questions

1.5.1 Main Research Questions

Is there a gap between customer taste and market variety in the Iranian car market and how does it impact customer satisfaction?

1.5.2 Secondary Research Questions

- What are the quantitative and qualitative parameters that influence customer car selection?

- Based on customer preferences, what weight is assigned to each parameter?

- What is the utility value of existing and potential cars from the perspective of different groups of customers?

- What is the market share of existing and potential cars?

- What is the gap between manufactured products and market share based on the customers' taste?

- What are the most important items in customer satisfaction in terms of technical and physical aspects of a car, accessories, sales and after-sales services?

- Is there a significant relationship between customer expectations and perceived quality and customer satisfaction?

- Is there a significant relationship between the four presented factors and overall customer satisfaction?

- How does the "importance of car in customer's life" impact the relationship between customer expectations, perceived quality and satisfaction of the relevant factors?

- Is there a significant relationship between the moderator variables and overall customer satisfaction level?

- Based on the identified gap, where are the weak areas in the Iranian car market?

1.6 The Structure of the Thesis

This thesis is organized into four chapters. The first chapter lays out the structure and content of the entire thesis. The second chapter contains some definitions from literature review, the views of previous researchers and related works in this field. Some available literature in the areas of customer satisfaction in general and specifically in the automotive industry is reviewed, and an appropriated area for responding to the main and secondary research questions is prepared.

In the third chapter, the utility value of cars through paired comparisons is obtained. Mathematical methods and models are used to predict car market shares based on customer taste and existing gap identified for each product. The method is a generalization of the product differentiation theory of Tirole (1988) to the case in which the pairwise ranking of the products forms an acyclic network, not only a directed path. The chapter ends with some conclusions.

In the fourth chapter, various aspects of customer satisfaction in a market which contains gap between customer's taste and product in market are evaluated and areas where this gap is most affected have been determined. The new moderator variable, "importance of car in the customer's life" is introduced and the effect of this variable on the relationships between customer satisfaction with expectation levels and the perceived quality of the factors are examined.

1.7 Research Method

Qualitative and quantitative research is applied in this study. Mixed method studies that combine different methods (quantitative and qualitative), try to provide more detailed understanding and accurate conclusions. Another definition of mixed

research methods is expressed as the collection, analysis and combination of qualitative and quantitative data in a multi-level study or survey (Johnson, Onwuegbuzie, & Turner, 2007).

In the third chapter through interview with customers in the central workshop of the company (Iran Khodro co) and fourth chapter from interview with customers around the country in the 12 regional offices of the company, required information are obtained. In this way, the importance and priority of factors that influence customer purchasing behavior are identified, and the effects of these factors on customer satisfaction are investigated.

After defining the factors that affect customer purchasing behavior, the quantitative research methods is used.

1.8 Sample Size

The sample size obtained through quantitative data collection and listed in chapter three is 250.

Due to the lack of an exact sample size in chapter four, the sampling formula for unlimited population is used.

$$n = \frac{Z_{\frac{\alpha}{2}}^2 p(q)}{d^2} = \frac{(1.96)^2 * 0.5(0.5)}{0.02^2} = 2000$$

Where,

n = the number of sample

α = probability of type I error = 0.05 (2-sided), $Z_{0.025}$ =1.96

p = Expected proportion e.g., prevalence =0.5

q = 1-p =0.5

d = allowable error in estimating prevalence, (margin of error) = 0.02

1.9 Data Collection

Data used for this study is collected from interviews, questionnaires, factory sales data, research reports and experts views.

1.10 Scope of Research

- **Subject Scope**

Identify the gap between customer taste and factory production and its impact on customer satisfaction in various domains.

- **Geographic Scope**

Iran

- **Time Scope**

2011-2014

1.11 Limitations of the study

According to research done in the car industry, the results obtained may not be extended to other industries. In addition, the study is conducted in Iran, hence, cultural factors and other requirements that are contained in this research may make the application of these results in other communities with different cultures, especially in societies with different levels of income and other characteristics difficult.

Chapter 2

LITERATURE REVIEW

2.1 Utility

“Utility” means usefulness and benefits. Utility can be interpreted as the ability of goods and services to satisfy the customer's needs. Utility is an important concept in economics and decision theory.

When a customer buys something, the satisfaction and pleasure of the use of the product or service is not directly measurable. Thus, economists suggested Utility value to express people's willingness to pay different amounts for various goods or services, which are countable and measurable. In economics, utility exist only if the revealed preferences among a set of products and services, satisfy some conditions.

The concept of utility is very extensive and is synonymous to personal pleasure. Customers choose to pay for goods and services that are more pleasant and desirable. People are usually willing to pay money for a product or service, which has greater utility than its price.

2.1.1 Quantifying Utility

Given the challenge in quantifying utility, economics have proposed a method to drive from choices which have been observed fundamental relative utilities. ‘Revealed performances’ according to Paul Samuelson was evident in the people’s preparedness to pay. Hence, utility and desire are taken to be correlative.

Desires; cannot be directly measured as has been already proposed, but rather indirectly. Its measure is found in the price which a person is willing to pay for the performance or satisfaction of his desire (A. Marshall, 1920).

The utility cannot be measured by traditional scientific methods. However, there are two views to measure to utility: Cardinal utility and Ordinal utility.

2.1.2 Cardinal and Ordinal Utility

Can utility be measured? To answer this question, economists such as William Stanley Jones and Alfred Marshall argued that utility is measurable and can be measured numerically by a unit called (utile). They believed that utility is measurable and is even additive, that is, the utility obtained from the consumption of two goods can be gathered together. Economists such as Fisher and Edge Worth opposed the numeric utility theory. They believed that utility is a perceived value obtained while comparing consumed goods or services in one place with consumed good or services in another place. They also think that utility is measurable, but it is not additive (Faraji, 1999).

Later, other economists have proposed different theories. First, that utility cannot be measured and second Non-measurable utility can be ranked. For example, the utility of consumption of good X is greater than or less than or equal to good Y. But it cannot be said that by the consumption of goods X, or good Y, a certain amount of (300 or 400) utility is obtained. Pareto was the first person to investigate cardinal utility theory of consumer behavior based on Ordinal utility (Faraji, 1999).

Utility functions are used in modeling and analyzing human behavior indirectly. These models are often uniform and quasi-concave. Moreover, “it is

possible that the preferences are not representable by a utility function. An example is lexicographic preferences, which are not continuous and cannot be represented by a continuous utility function" (Ingersoll, Jonathan E., Jr, 1987).

2.1.3 Utility for Money

A utility function has various uses or applications, but utility expressed in money is used frequently, more so in economics. There are various properties of the utility function for money, including:

Bounded-ness: it is bounded about the origin which shows that beyond a given point the relevance (usefulness) of money ceases, an example is the size of an economy which bounded at any instance.

Asymmetry: the utility function for money is also asymmetric about the origin. This shows the varying implications; positively (gain) or negatively (loss) money has on a business or person.

- Nonlinearity: where utility expressed in money is influenced by various outcomes of choices, to obtain the optimal outcomes will depend on other possible decision outcomes for the same time-period.
- Concave: the utility function for money shows diminishing marginal utility as lies in the positive region and is concave. (Berger, J. O., 1985).

2.2 Customer Satisfaction

By definition, customer satisfaction is the difference between customer expectations and the perceptions of the quality of services or products (Hayes, 1997). Moreover, many experts define customer satisfaction as "the result of comparisons before purchasing among the expected performance with actual performance perceived and

price that is paid for a product or service" (Beerli & et.al, 2004). Customer satisfaction determines the success or failure of a company. So, knowing our customers and how satisfied they are is very important. Providing proper and on time delivery of products and services to customers, based on the company's commitments, are important factors that create satisfaction. Certainly customer dissatisfaction with product and services is the main challenge for companies. Some dissatisfied consumers send their complaints to the manufacturer but some of them transfer it to others and endanger the company's credit and prestige. Researchers estimate that 25 percent of customers are dissatisfied at any specific moment, but few dissatisfied customers complain. So, what should be done to satisfy customers? Measuring this satisfaction and creating a system for maintaining the satisfaction, are major challenges for companies and organizations.

2.3 Monitoring Customer Satisfaction

One of the most important developments in the analysis of company's performance in the last decade of the 20th century was the measurement of customer satisfaction. Customer satisfaction has become one of the key elements of the core requirements for management systems. Thus, the creation and implementation of tools to monitor and measure customer satisfaction as the primary indicator of performance is a basic need of business organizations.

In the 1990's despite downsizing efforts, many companies saw a decline in their income. As a result, researchers in Sweden and the United States followed later by other countries, proposed models to measure customer satisfaction in order to improve their businesses with the introduction of three main factors: perceived quality, perceived value and the price. (Fornell, Johnson, Anderson, Cha, & Bryant,

1996). Also many researchers have discussed the influence of the quality of products and services on customer satisfaction levels (Anderson, Fornell, & Lehmann, 1994).

2.4 Customer Satisfaction's Relationship

Many researchers have observed a direct relationship between customer satisfaction, loyalty and profitability of organizations (Hallowell, 1996). An immediate reduction of complaints and an increase in customer loyalty is present as a result of increasing levels of customer satisfaction (Formell & Wemerfelt, 1987). A loyal and satisfied customer is a free source of advertising for the company, while a dissatisfied customer acts in the contrary by expressing his or her negative experiences (Hartline & Jones, 1996).

Related to loyalty and profitability, studies have shown that even a 5% increase in customer retention (profitable customer) affects the profitability of the company by 25–95% in various industries (Richheld, 1995). However, the cost of attracting a new customer is five times more than the cost of retaining former and unsatisfied customers (Catler & Armstrong, 1991).

2.5 Models of Customer Satisfaction

The basic structure of customer satisfaction model is built on one of the most famous theories of customer satisfaction, the doctrine of "non-confirmation" expectations. (Divandari & Delkhah, 2005).

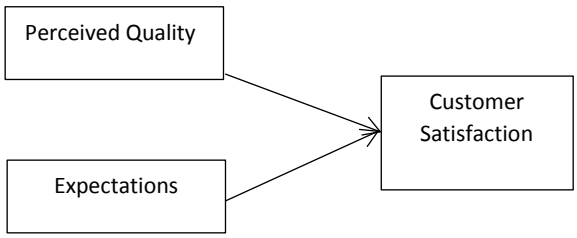

Figure 1. Basic model of customer satisfaction

Customer expectations are defined as the perceived value that customers request from the purchase of products and services. Moreover, the perceived value is equal to the received level of quality compared to the price paid. Quality compared to price is a measure that a customer uses to compare different products and services (Aydin & Ozer, 2005). Thus, it can be predicted that if the perceived value increases, satisfaction will increase as well.

2.5.1 Swedish Satisfaction Model

This is the first customer satisfaction model for products and services on a national level, which was introduced in Sweden in 1992. This model is based on two primary factors that drive customer satisfaction: perceived quality and customer expectation as seen in Figure 2.

Figure 2. Swedish Customer Satisfaction Model

By definition, perceived quality is a customer's level of understanding for consumed products or received services.

2.5.2 American Customer Satisfaction Index (ACSI)

The ASCI model was presented at the Michigan Business School in 1994 with the cooperation of the Quality Association of America. This model is drawn from the Swedish model. The customer satisfaction index model in America is a structured

model that includes number variables and the relationships between them. The customer satisfaction index is located in the middle of the chain as seen in Figure 3.

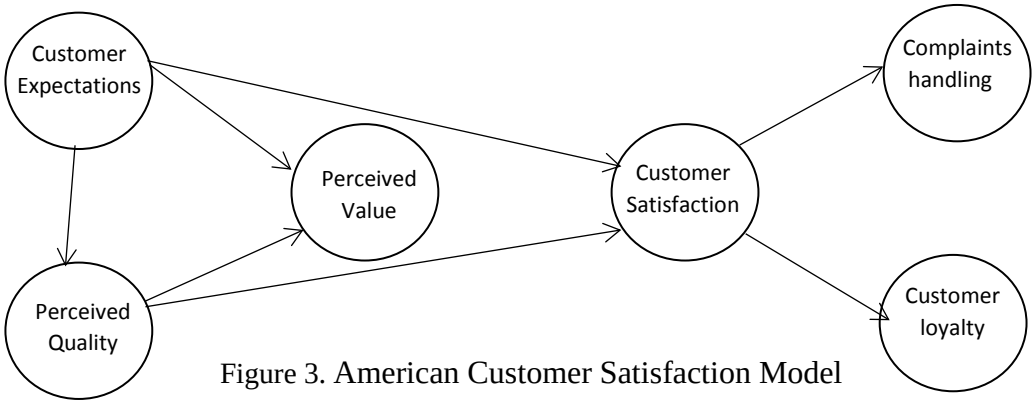

Figure 3. American Customer Satisfaction Model

Expectations, perceived quality and perceived value are factors that affect customer satisfaction while customer loyalty and complaints are outputs of the model as shown in Figure 3 above. The main difference between the Swedish model and this model is adding perceived quality as a separate factor (Johnson et al, 2000).

2.5.3 European Customer Satisfaction Model

Successful businesses in America and Sweden by designing customer satisfaction index models, forced European organizations such as the Quality Institute of Europe to create their own customer satisfaction index model.

The customer satisfaction index model in Europe presented in the figure below, shows European Customer Satisfaction Index.

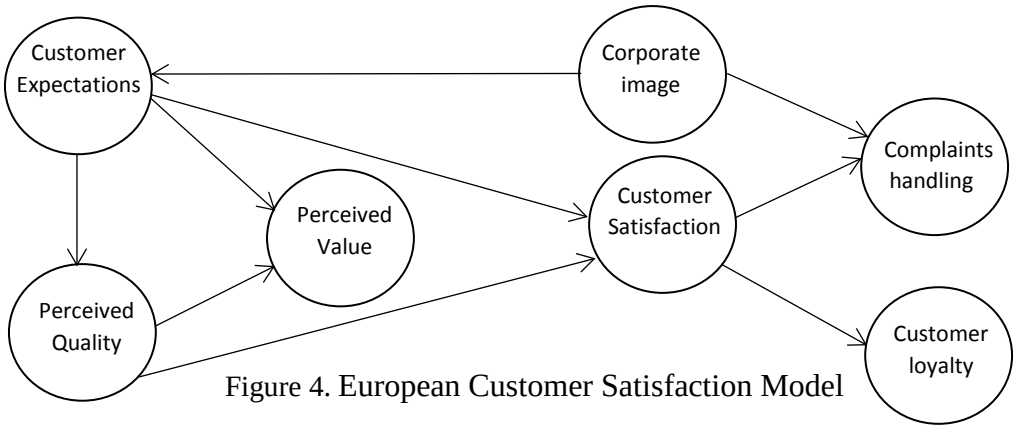

Figure 4. European Customer Satisfaction Model

This customer satisfaction model includes the corporate image and its impact on customer expectation levels and complaints. Corporate Image refers to the brand name and the kind of associations customers get from the product/brand/company (O'Loughlin, Christina & Coenders, 2002).

2.6 Customers' Satisfaction in the Automotive Industry

Population growth in the decades 1960s and 1970s as well as migration to major cities in order to obtain employment and livelihoods, caused changes in the social structure. As a result, there were then major changes in consumption patterns and family life. Due to the growing automotive demand, competition has now increased between automobile companies as they examine their strengths and weaknesses in order to increase competitive abilities and earn a greater market share.

Traditional models view customer satisfaction as the result of customer recognition, whereas the new concept suggests that recognition process may significantly influence describing and predicting customer satisfaction (Fornell & Werefelt, 1987; Oliver, 1997; Westbrook, 1987; Westbrook & Oliver, 1991). Particularly as it concerns the relationship between loyalty and customer satisfaction. This satisfaction if perceived with the output of single transaction may be too restrictive (Fornell, et

al., 1996). Hence, it is generally agreed that customer satisfaction should be understood as a multidimensional structure (Yi & Youjae, 1990). Some authors have claimed that satisfaction needs to be considered from many different perspectives, based on the empirical experience of a particular product or service, rather than solely on a certain transaction phenomenon (Anderson, et al., 1994; Bayus, 1992; Wilton & Nicosia, 1986). However, many studies have been conducted to determine the factors affecting customer satisfaction.

Accordingly, customer satisfaction is further determined by understanding and using effective evaluation instruments to judge the perceptions of actual performance with all the experience and satisfaction of the judgments obtained from a particular product, sales and after-sales service (Crosby et al., 1990). Product quality, service quality and the quality of the relationship between customer and supplier (Hoisington & Naumann, 2003), as well as the customer expectations and company's image in terms of products and services are considered (Eskildsen, et al., 2004).

Consumers' quality expectation levels have risen as consumers have gradually become more knowledgeable and sophisticated (Juttner & Wehrli, 1994). Considering that knowledge of customers and their needs gives car dealers a competitive advantage, (Chojnacki, 2000) it is important for dealers to understand that their good or bad performances will affect customer behavior (Illingworth, 1991). In an empirical study using Mitsubishi drivers in the Netherlands, dealer relationships (as opposed to price) represented a very important decision-making variable for customers when buying a car (Gaby et al., 2003). The safety, vehicle performance, quality of parts and repair are introduced as the most effective criteria that influence customer satisfaction levels in the Iran automobile market (Hoseini,

Asgharpour & Azizi, 2003). Factors that typically influence one's satisfaction with the product include durability, value for the money, ease of use and technical aspects (LaBarbera & Mazursky, 1983; Marr & Crosby, 1992). Other influential characteristics may include the interior quality of the car, easy set-up and use of the panel and quality of the driving experience (Hayes, 1998).

In the sales sector, an investigation was conducted in Fiat, Italy regarding satisfaction among car buyers in two areas: the satisfaction of the purchase and satisfaction of the delivery (Roscino, & Police, 2004). In addition, the influence of the selling behaviors of the sales person on customer satisfaction with products was reviewed. The findings indicate that customer satisfaction with a dealer is negatively related to a sales-orientation and positively related to a customer orientation (Goff, et al., 1997). Finally, the after-sale services satisfaction is frequently considered as a dimension that usually is associated with overall customer perceptions of service quality and assessment with the service providers (Ostrom & Iacobucci, 1995). In a study conducted in the German automotive industry, the biggest gap between the expected level of service and the perceived quality, mentioned as signal that management uses to improve the customer satisfaction (Danher, 1997).

Chapter 3

INVSTIGATING GAP BETWEEN CUSTOMERS' TASTE AND MARKET VARIETY

3.1 Introduction and Chapter Abstract

Various authors have worked on the empirical analysis of customer behavior. Earlier researchers, like John Cubbin (1975), examined some aspects of pricing behavior in the UK car industry, and Jonathan Murray and Nicholas Sarantis (1999) applied an extended version of the superior goods model to the UK car market. Recently, Economics for the Environment Consultancy (EFTEC) (2008) published a report aiming to understand how various attributes determine households' new car purchasing decisions and estimated a model of choice behavior that predicts the market share that a vehicle will command, based on its attributes, in the United Kingdom.

Determining the utility function based on criteria factors to explain customers' behavior and satisfy their needs is an interesting area that many authors have addressed, for example Monteiro Gomes and Duncan Rangel (2008) in the case of real estate.

A linear approximation is used in this study for the utility function of customers of the Iranian car maker IKCO. The analysis of this research uses five years' data (2007–2012) to confirm the findings of survey approximation.

IKCO abandoned its oldest model (Peykan) in 2006 because of environmental issues. Peykan was the second best-selling model, which was the cheapest car of IKCO and after this the company added some new car in variety models and price to its product basket, to cover the needs of customers and increase their satisfaction.

Customers' purchasing behavior is tested by comparisons of car models. Selected customers were questioned directly about their tastes. In each choice, each customer is assumed to select one model out of two. Customers' behavior is reconstructed based on the answers provided by customers covering the whole Iranian market. Knowing the customers' car selection behavior, it is possible to predict the response of the market to the changes in the physical and technical aspects of car such as size, body design, engine capacity, fuel type, *i.e.* or car accessories such as air bags , air condition, cruise control, *i.e.* and cost attributes of the vehicles.

The result of the analysis is shown that there is a huge gap between the customers' taste and the existing variety on the Iranian car market. For the purposes of the analysis, the undoubted complexity of customers' behavior is simplified into utility function. In effect, this utility function describes a score for each option, attributing a higher score to options that provide a greater surplus of advantages overall. The value of the utility function depends on the attributes of the car and the way in which the customer selects a car. Here, it is sufficient to note that the analysis accounts for customer income, vehicle purchase price and a host of other attributes describing the physical appearance and motoring capabilities of a vehicle. A mathematical model to achieve the highest consumer utility function based on Tirole (1988) and price as a function of quality referring to Gabszewicz and Thisse (1979) is used as the theoretical basis of the research.

3.2 Selection Factors

All products have series of qualitative and quantitative specifications and any change in the levels of factors and different combinations of the factor levels represent a different variety of the products. The cars are described by 11 factors (parameters or attributes) in this study. Each parameter has several, however finite many, values. The utility function is tested on realistic combinations of these values. In the next step, by using paired comparison, we will identify the best choices, based on the customer point of view. The nominated factors are:

1- Price: this factor is one of the most important in selecting and buying a car, and has six main classes on the Iranian market.
2- Car size: in three levels of small, medium and full-size.
3- Engine capacity: in three levels of < 1500, 1500–2000 and > 2000 cc.
4- Body design: in levels of hatchback, sedan and SUV.
5- Gearbox: manual and automatic types.
6- Fuel type: petrol and gas.
7- Fuel consumption: low and medium levels.
8- Car acceleration: medium and high levels.
9- Options: in levels of simple, medium and full. (Here simple means a car without equipment such as an air conditioner and hydraulic steering and medium means a car with equipment like glass lift, air conditioner and hydraulic steering but without options such as air bags or cruise control.)
10- Boot size: small, medium and large.

Passenger capacity: either four or five persons

Table 1 gives the possible values of the factors.

Table 1. Car factors and related levels

Price ($1000)	Car Size	Engine Capacity (cc)	Body Design	Gearbox	Fuel Type	Fuel Consumption	Car Acceleration	Options	Boot Size	Passenger Capacity
<10	Small	<1500	Hatchback	Manual	Petrol	Low	Medium	Simple	Small	4
10–15	Medium	1500–2000	Sedan	Automatic	Hybrid	Medium	High	Medium	Medium	5
15–20	Full	>2000	SUV					Full	Large	
20–30										
>30										

3.3 Conversion of Qualitative Parameters to Quantitative Parameters

All the values in Table 1 appear in the current assortment of IKCO. For two-level factors, such as gearbox type, fuel type or fuel consumption, zero and one are used to change qualitative to quantitative parameters. Numerical representations of the values in Table 1 are given in Table 2:

Table 2. Qualitative values for car factors in related levels

Price ($1000)	Car Size	Engine Capacity	Body Design	Gearbox	Fuel Type	Fuel Consumption	Car Acceleration	Options	Boot Size	Passenger Capacity
7.5	1	1.4	1	0	1	1	0	1	10	4
12.5	2	1.7	2	1	0	0	1	2	13	5
17.5	3	2.5	3					3	15	
22.5										
35										

3.4 Availability and Possible Options of Cars

Twenty-seven cars are defined by combining the values of the factors such that all the combinations make sense and could be produced (Appendix E). As a matter of fact, eight of them do not exist in the current product basket of the company. Three further models have been produced before and another model is in the launch phase. Even these twelve models could be produced in the future if their production seemed to be economic. The twenty-seven models are distributed across five groups according to the price of the cars in the following table:

Table 3. Twenty-seven cars in five price categories

Price	Car models					
<10	1	2	3	4	5	6
10–15	7	8	9	10	11	12
15–20	13	14	15	16	17	18
20–30	19	20	21	22	23	24
>30	25	26	27			

Note: Underlined numbers are cars that do not exist in the current product basket (Potential models).

3.5 Testing customers' Behaviors

A survey of customers was carried out, with fieldwork to investigate customers' behavior and to identify their interests and preferences when choosing a vehicle that meets their criteria. The main tool used was a questionnaire that was designed for this purpose. The questionnaire is based on paired comparisons between vehicles, which are defined exactly, and the respondents were asked to complete the questionnaire accurately.

Each questionnaire contains four pairs (a sample is available in the Appendix A); after asking the customers to fill in basic information such as gender, age and education level, they were asked to choose the car that is most compatible with their preferences.

In this study, only models belonging to the same price category or two consecutive categories are compared. There are 189 comparable pairs and they are shown in a matrix in the Appendix B. Each pair used is repeated, for example both (1, 2) and (2, 1) can be considered. A model cannot be compared with itself.

Because of customer diversity, five copies of each questionnaire were distributed randomly and customers were asked to answer it. Each pair of models was evaluated by five customers. A model is considered preferred to the other one if at least four out of the five customers prefer it. For example, in comparing Model No. 2 and Model No. 5, all of the five customers chose Model No. 5, which means that No. 5 is the winner in this comparison. In comparing Model No. 1 and Model No. 8, four customers selected No. 1, which means that No. 1 is the winner. Altogether 57 winners were obtained in this way. These results are used in the mathematical model as constraints.

3.6 Mathematical Modeling

The following notations are used throughout the paper:

P = the number of parameters

W_i = the weight of parameter i (this is a variable of the model)

P_{ij} = the value of parameter i in the car of type j (this is a fixed value discussed above; see Table 2)

The scores of cars are supposed to be a linear function of the parameters:

$$L_j = \sum_{i,j=1}^{11,27} W_i \ P_{ij}$$

The first step is to find the weights of the parameters, *i.e.* the W_i values, and then based on those to define the score values of cars, *i.e.* the L_j values. The value of the utility function is discussed below.

If a model is the winner over another model, then its score must be strictly greater than that of the other model. The minimal difference in the score is claimed to be at least Δ, where Δ is a positive constant. Assuming that model j is the winner over model k, then the weights must satisfy the linear inequality:

$$L_k + \Delta = \sum_{i,k=1}^{11,27} W_i \ P_{ik} + \Delta \leq L_j = \sum_{i,j=1}^{11,27} W_i \ P_{ij} \quad (1)$$

Two main issues are involved in building a score function:

1. The constraints of type (1) must be consistent, *i.e.* they may not contain any contradiction.
2. If the constraints of type (1) are consistent, then there is an infinite number of $\underline{W}$ vectors that satisfy all the constraints, with the exception of some very unlikely degenerated cases. If there is an infinite number of $\underline{W}$ vectors, then a robust one must be selected. Generally, a vector is considered more robust if it is not on the surface of the polyhedral set defined by type (1) constraints.

3.7 Elimination of Contradictions

Let E be the set of pairs such that there is a winner in the above-mentioned sense. If (j, k) is in E, then model j is the winner over k. Let V be the set of the 27 models. Obviously, the directed graph G (V, E) may not have directed circuits as any directed circuit represents a contradiction.

Unfortunately, the answers of the customers contain several contradictions. Thus, some (winner, loser) pairs must be disregarded. In order to lose as little information as possible, the number of disregarded pairs must be minimized. This problem is solved by the integer programming problem by using optimization software "Lingo":

$$\text{Min} \sum_{(j,k) \in E} y_{jk}$$

$$\text{s.t} \quad L_k + \Delta \leq L_j + M y_{jk}, \ (j,k) \in E$$

$$\forall \ i: \ -1 \leq W_i \leq 1$$

$$y_{jk} = 0 \text{ or } 1,$$

where M is a large positive number and Δ is a small positive number.

The lower and upper bounds of the W_i's give the l_∞ normalization of the W vector. Normalization must be applied; otherwise, some optimization problems mentioned below would be unbounded. l_∞ normalization is one of the simplest options. Let y^* be the optimal solution of the problem and F $=\{((j,k)|y^*_{jk}=1)\}$. If $y^*_{jk}=1$, then the term M helps to satisfy the constraint of type (1) concerning the (j,k) pair. The objective function is the minimization of the number of this type of help. Thus, the alue of the W_i's can be determined on the set of $E \setminus F$. The optimal solution suggested disregarding 12 pairs.

3.8 Determination of a Robust Solution

If the contradictions are eliminated, then the remaining inequalities of constraints (1) determine a polyhedral set. The determination of a robust solution is carried out in two main steps. In the first one, only a feasible solution is determined. In the second step, it is shifted into the interior of the polyhedral set.

3.8.1 Step 1. Generation of a Feasible Solution

To determine a feasible vector W, the linear programming problem.

$$\begin{aligned} &\text{Min} \sum_{11} W_i \\ &\text{s.t} \quad L_k + \Delta \lessgtr L_j \\ &L_j \,,\ L_k \geq 0 \\ &(j,k) \in E \setminus F \qquad (2) \\ &\forall\, i:\ -1 \leq W_i \leq 1 \end{aligned}$$

is solved.

The linear programming problem gives a basic feasible solution; it is an extreme point of the polyhedral set. Thus, it is on the surface of the set. The objective function of problem (2) has no special importance as the feasible set of (2) is

bounded because of the normalization. After solving the problem, a feasible solution is achieved by the following W_i's: The reason for some negative *W* values is the essence of those parameters, for example price, fuel type, fuel consumption and car acceleration have negative values that are interpretable by their nature and customer taste.

Table 4. The values of the factors for customer group 1

W_1	W_2	W_3	W_4	W_5	W_6	W_7	W_8	W_9	W_{10}	W_{11}
-0.054	0.1	0.833	0.11	-0.1	0.109	0.26	-0.04	0.26	-0.02	-0.021

3.8.2 Step 2. Find an Interior Point in the Polyhedral Set

In step 1, an optimal feasible solution is found on the surface of the set; this extreme point is determined by the active constraints. The role of step 2 is to find a robust solution. It is obtained by shifting the extreme point into the interior of the polyhedral set. To achieve this purpose, first a direction $\underline{f}$ showing the middle of the polyhedral set is obtained and then one step moving in that direction is needed. The optimal solution satisfies the active constraints by equation and all the other constraints by strict inequalities. Let I be the set of active constraints; if $i \in I$ then a_i is the left-hand side vector of the active constraints. If an interior point exists, then it satisfies all the constraints with strict inequality. The interior point is obtained in the form $W+ \lambda \underline{f}$, where $\lambda > 0$ is a real number and the direction f satisfies the inequalities

$$\forall i \in I: a_i f < 0. \tag{3}$$

In some cases, $\underline{f}$ can be computed by the formula:

$$f = -\sum_{i \in I} \frac{a_i}{\|a_i\|}.$$

However, this does not work in all cases. If so, then let $\varepsilon > 0$ be a small positive number. If l_∞ normalization is used, then a feasible solution of the constraint set

$$\forall i \in I: \frac{a_i f}{\|a_i\|} \leq -\varepsilon$$

$$\forall j: -1 \leq f_j \leq 1$$

must be obtained. This second method had to be applied in the case of customer group 1.

Table 5. f values for active constraints

f_1	f_2	f_3	f_4	f_5	f_6	f_7	f_8	f_9	f_{10}	f_{11}
-0.199	0.746	1	0.135	1	1	0.388	0.580	1	-0.009	0.223

Let *H* be the hyperplane defined by the linear equation *cx=d*, where *c* and *x* are n-dimensional vectors and *d* is a real number, *i.e.* H= {*x*| *cx=d*}. Let *y* be any *n*-dimensional vector. It is well known that the signed distance of *y* from *H* is:

$$\frac{c}{\|c\|} y - \frac{d}{\|c\|}.$$

Let h be a lower bound for all the distances of the vector $W+ \lambda f$ from all the constraints of the above-mentioned polyhedral set. To determine h and λ, the following linear programming problem must be solved:

$$\text{Max } h$$

$$\frac{\boldsymbol{a_{j,k}}}{\|\boldsymbol{a_{j,k}}\|} (W+ \lambda f) - \frac{\Delta}{\|\boldsymbol{a_{j,k}}\|} \leq -h \text{ for all } (j,k) \in E \setminus F \text{ with } \boldsymbol{a_{j,k}} = L_j - L_k$$

To determine the signs in the constraints, the fact that the normal vectors of the constraints show out of the set must be taken into consideration. The optimal values of h and λ are 0.3234 and 0.0533, respectively. The robust point is chosen as W^*=W+λ f, where W is the optimal solution of problem (2).

Table 6. W_i^* value

W_1^*	W_2^*	W_3^*	W_4^*	W_5^*	W_6^*	W_7^*	W_8^*	W_9^*	W_{10}^*	W_{11}^*
-0.064	0.1398	0.8867	0.1172	-0.046	0.1622	0.2807	-0.009	0.3133	-0.020	-0.009

Table 7. The score values of the cars based on W_i^*

Car	1	2	3	4	5	6
Value	1.0848	1.3027	1.154	1.2711	1.42	1.537
Car	7	8	9	10	11	12
Value	1.1954	1.2927	1.2827	1.3999	1.41	1.5272
Car	13	14	15	16	17	18
Value	1.1855	1.6566	1.2828	1.39	0.9892	1.3026
Car	19	20	21	22	23	24
Value	1.16	1.404	1.378	1.3326	1.1754	1.2926
Car	25	26	27			
Value	1.3093	0.07	0.8209			

3.9 The Analysis of the Remaining Category of Customers

As the exclusion of 12 constraints also excluded some customers, the whole procedure was repeated by claiming the previously excluded constraints to be satisfied. The other constraints must be excluded to avoid contradictions. They were selected by the following optimization problem.

$$\text{Min} \sum_{(j,k) \in E} y_{jk}$$

$$\text{s.t} \quad L_k + \Delta \le L_j \qquad (j,k) \in F$$

$$L_k + \Delta \le L_j + M * y_{jk} \qquad (j,k) \in E \setminus F$$

$$L_j ,\ L_k \ge 0$$

$$\forall i: \ -1 \le W_i \le 1$$

$$y_{jk} = 0 \text{ or } 1 \qquad (j,k) \in E \setminus F$$

The optimal solution suggested disregarding 16 pairs. Then, another set of values of W_i can be determined, solving another optimization problem of type (2). To find a robust solution for the second group of customers, it was enough to apply formula (3). The new vector W_i^* and cars' values are computed in the following tables:

Table 8. The values of the factors for customer group 2

W_1^*	W_2^*	W_3^*	W_4^*	W_5^*	W_6^*	W_7^*	W_8^*	W_9^*	W_{10}^*	W_{11}^*
0.087	-0.998	-0.418	-0.625	0.06	-0.413	-0.166	-0.604	-0.43	0.3518	-0.144

Table 9. The scores of the cars for customer group 2

Car	1	2	3	4	5	6
Value	0.9527	0.9691	0.8652	0.2394	0.7398	0.11406
Car	7	8	9	10	11	12
Value	0.2035	0.9743	0.8655	0.2397	0.745	0.1193
Car	13	14	15	16	17	18
Value	0.2087	0.7693	0.9796	0.245	0.689	0.2597
Car	19	20	21	22	23	24
Value	0.2547	0.7532	1.1442	0.5545	0.8907	0.2649
Car	25	26	27			
Value	0.6645	1.2429	0.20487			

3.10 Estimation of the Customers' Demand and its Comparison with the Current Assortment

Tirole (1988) suggested a linear utility function in the form: Θ*L – p

Θ = the parameter that transforms quality to money,

L = the value of the quality (real number) and

p = price

The general assumption in microeconomics is that Θ as a parameter differs from customer to customer and later it is considered as a random number in the model.

In the solution of the models discussed below, the assumption suggested by Gabszewicz and Thisse (1979) is used in that the price is a quadratic function of the quality, *i.e.*

$$p(L) = kL^2,$$

where k is a parameter. The necessary condition for a customer with parameter value Θ to buy car model A with quality L_a and price p^a is necessary:

$$\Theta L_a - p^a \geq 0 \text{ or } \Theta \geq \frac{p^a}{L_a}$$

Product A is preferred to product B if:

$$\Theta L_a - p^a \geq \Theta L_b - p^b$$

Assuming that $L_a > L_b$, the lower bound

$$\Theta \geq \frac{p^a - p^b}{L_a - L_b}$$

(4) is obtained. Substituting the value of the price, this condition is equivalent to

$$\Theta \geq \frac{p(L_a) - p(L_b)}{L_a - L_b} = \frac{kL_a{}^2 - kL_b{}^2}{L_a - L_b} = k(L_a + L_b) \qquad (5)$$

3.11 The Tastes of the two Customer Groups

The two customer groups determined in sections 3.8 and 3.9 have different properties. The favourite factors in group 1 are low price, large body size, high engine capacity, manual gearbox and sedan and SUV body design. In contrast, a lack of interest in cheap cars, small body size, compact engine, hatchback design, automatic gearbox and low consumption are favourite factors in customer group 2. Based on the data obtained in the questionnaires, some characteristics of the two groups of customers are summarized in Table 10.

Table 10. Portion and properties of groups

Group		Members	Gender		Age				Education status				
			Male	Female	18–30	31–45	46–60	>60	<High school	High school	Associate	Bachelor	Master & higher
1	Q	52	35	12	14	21	10	2	6	9	16	12	6
	P	54.17	74.47	25.53	29.79	44.68	21.28	4.26	12.24	18.37	32.65	24.49	12.24
2	Q	42	29	13	23	14	3	0	1	6	13	20	2
	P	43.75	69.05	30.95	57.5	35	7.5	0	2.38	14.29	30.95	47.62	4.76

Note: Q is quantity and P is percentage

As can be seen in Matrix 1 of the Appendix, 189 paired comparisons between the 27 cars are evaluated by 250 clients. Based on the responses received from customers through our questionnaire, 52 customers are exclusively in group 1, 44 customers are exclusively in group 2 and due to common taste in choosing between the two groups, 110 customers are placed in the intersection of the two groups, making a total of 206 persons. In fact, we can say that the results of the study cover 82.4% of customers, which is acceptable. The majority of men, older members of the population (aged over 30) and lower levels of education status belong to group 1. That is fully compatible with and justified by the vehicle type selected by each group.

3.12 Estimation of the Market Shares of the Car Models

As explained in section 3.5, only models belonging to the same price category or two consecutive categories are compared. According to the results of sections 3.8 and 3.9, group 1 and group 2 contain 45 and 41 active constraints, respectively.

To gain a better understanding, pair comparison networks for both groups are drawn and shown in Figures 6 and 7; both networks contain all of the 27 cars, their pair comparisons and their relationships.

The logic of the calculation of the determination of market shares consists of the following steps. Each thread is considered a market that has only the models included in the thread. Then, it is possible to apply the theory of vertical product differentiation explained by Tirole (1988). As Θ is random, each market, *i.e.* each thread, has its own cumulative distribution function, which can be approximated by a partially linear function based on the inequalities (5). These cumulative distribution functions are transformed into a single united cumulative distribution function (UCDF). Models may be included in several threads. If so, then the union of these intervals is the selling interval of the model. This means that several models are sold at the same Θ value and it is necessary to determine the share of each model in the intervals of two consecutive break points of the UCDF.

The next step is to select a few directed paths in the network such that they cover all 27 models. Figure 7 represents all of the mentioned threads for customer group 1. Each thread is represented by its cumulative distribution function under the assumption that there are no other cars on the market but the cars included in the thread. The breaking points are at the values obtained from the right-hand side of (4).

The first value Θ for all consecutive pairs existing in the 14 threads is defined by formula (5). According to (5), k is only a linear factor and what is important is the ks products. Thus, $k = 1$ can be assumed without loss of generality.

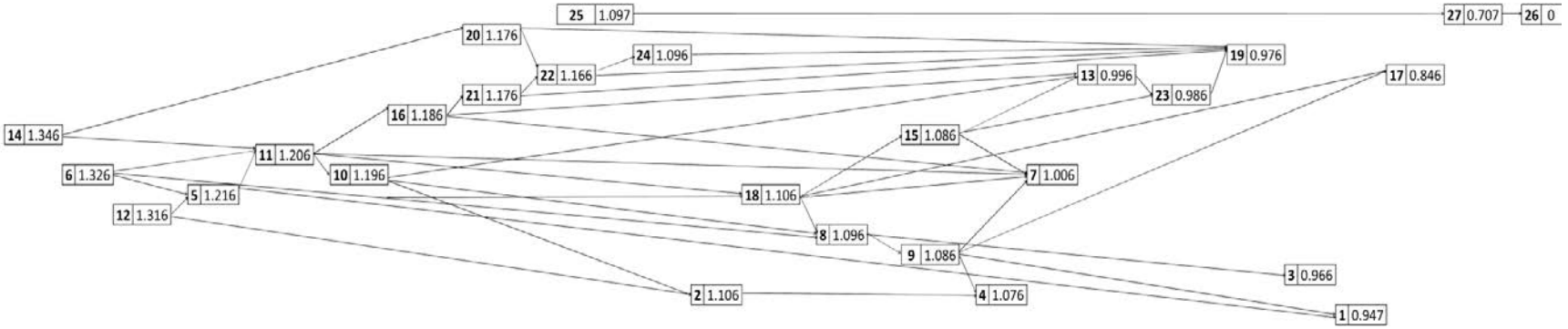

Figure 5. Car network for group 1

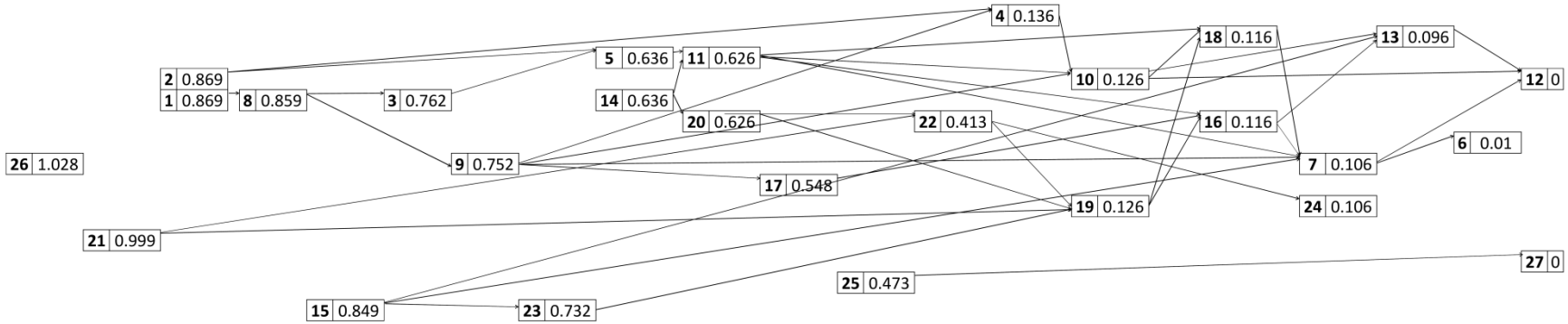

Figure 6. Car network for group 2

For example, the thread (14-11-16-21-22-24-19) in group 1 consists of 7 cars and their Θ values determine the break points of the cumulative distribution function.

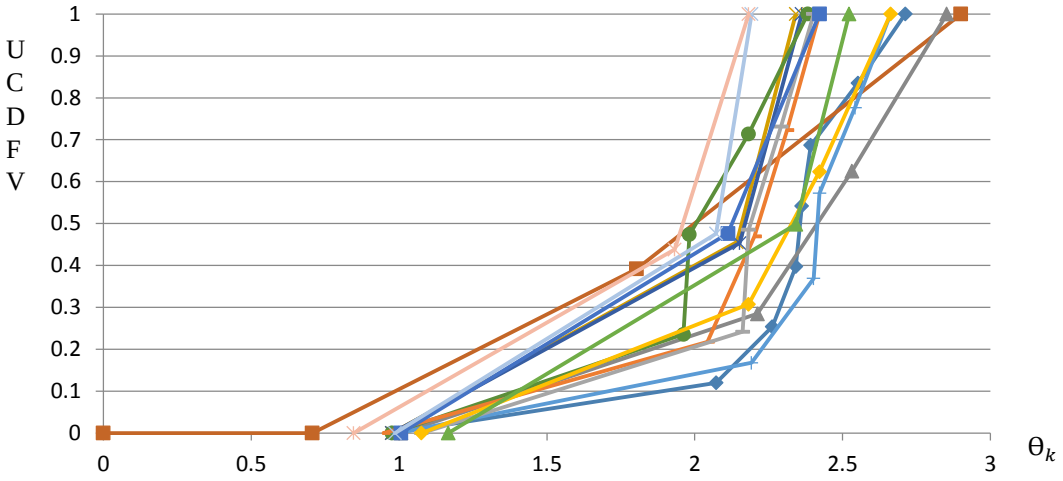

Figure 7. Selected threads to compute the unified cumulative distribution function (group1)

In general, the slope of the cumulative distribution function of a thread between two break points is denoted by:

$$m_{k,t} = \frac{a_{j-1,t}}{100*(\Theta_k - \Theta_{k-1})}$$

$m_{k,t}$ = the slope of thread t to Θ_k from Θ_{k-1}, $t = 1, \dots 14$ *and* $k = 1, \dots, 56$

$a_{j,t}$ = the weight of model j in threads t achieved by $a_{j,t} = \frac{L_j}{\sum_{j=1}^{27} L_j}$, where L_j is defined as in section 3, *i.e.* $L_j = \sum_{i,j=1}^{11,27} W_i \; P_{ij}$

Θ_k = the value of break point k achieved by $\Theta_k = L_j + L_{j-1}$

Then, the cumulative distribution functions' value (CDFV) of break points k in thread t is computed by:

$$CDFV_{k,t} = CDFV_{k-1,t} + [m_{k,t} * (\Theta_k - \Theta_{k-1})]$$

The calculations were performed for all the points in all the threads; a sample result is shown in Table 11. Finally, the weight of each of the threads based on the existing cars' values in each thread was determined to estimate a unified cumulative distribution function (UCDF) that contains all of the 27 cars.

Table 11. Sample thread to compute CDF

Car	L_j	a_j	θ_k	m_k	$CDFV_k$	w_t
14	1.3461	16.51	2.552	0.924	0.8348	
11	1.2061	14.79	2.392	4.850	0.6869	
16	1.1861	14.55	2.362	7.215	0.5414	
21	1.1761	14.43	2.342	1.788	0.3971	0.1676
22	1.1661	14.3	2.262	0.707	0.2541	
24	1.0961	13.44	2.072	0.109	0.1197	
19	0.9761	11.97	0.9761	0	0	

To obtain the UCDF values for all the break points in Figure 1 first, similarly to Table 11, for all the selected threads the computation is made, then in a different table the break points are sorted by descending value with related slopes and threads' weight and the UCDF is calculated by the following formula:

$$UCDF_k = UCDF_{k-1} + (\theta_k - \theta_{k-1}) \sum_{k,t=1}^{56,14} m_{k,t}\, w_t$$

Based on Figure 1 and considering formula (5), 56 break points are used to compute UCDFs, which include 45 paired comparisons in group 1 plus 7 θ values for cars (26, 19, 17, 7, 3, 4, 1) on the right-hand side of threads that are equal to L_j and 4 models (25, 14, 6, 12) on the left-hand side of threads for which θ is estimated by

$2L_j + L_{j-1}$. Here, w_t is the weight of threads and is determined by dividing the summation of the values (L_js) of the existing models in the thread by the summation of all the threads' value. Further on, $\Theta_k > \Theta_{k-1}$ and Θ_{k-1} are the previous break points in the united set of all break points of the threads relative to Θ_k.

Note 1: To compute $UCDF_k$, $\sum_{k,t=1}^{56,14} m_{k,t}\, w_t$ in the interval $[\Theta_{k-1}, \Theta_k]$ is the summation of the multiplication of the slope of the thread from the previous break point on the same thread and the last break points on the other threads by the current break point, in related weights of the threads.

Note 2: The initial UCDFV is zero and the last break point UCDFV based on the above formula is 1.

Note 3: If any of the previous break points are the last point in the related thread, it does not affect the next break point UCDFV.

After defining the UCDFV, by generating 100,000 random numbers on [0, 1], the probability of occurrence of each interval of UCDF is determined. The probability of an interval is estimated by the relative number of cases that fell into the interval. Due to the overlap of vehicles' intervals, several cars are located in each interval of consecutive break points of the UCDF. The weight of a model is determined in each of the intervals. The market share of the model is the sum of the shares of the model in the intervals weighted by the probability of the intervals.

$$C_j = \sum_{j,k=1}^{27,56} I_k\, P_{j,k} \tag{6}$$

C_j = car model j predicted market share for all 27 models

I_k = probability of interval k (k = 1,2, … . ,56)

$L_{j,k}$= value of model j in the interval k

$P_{j,k}$ = share of model j in the interval k computed by $\frac{L_j}{\sum_{j,k=1}^{27,56} L_{J,K}}$

The computation is repeated for group 2 with 51 intervals in formula (6). The average market share of all 27 models is achieved and shown in Table 12.

Table 12. Twenty-seven cars' market share for both groups

Car number	Car name	Group 1	Group 2	Estimated market share
1	Potential	6.27%	3.03%	4.48%
2	Renault L90(E0)	7.95%	7.38%	7.63%
3	Potential	4.66%	4.78%	4.72%
4	ROA	6.18%	1.78%	3.75%
5	Potential	0.45%	1.80%	1.20%
6	Peugeot 405(GLI)	2.84%	0.30%	1.44%
7	Peugeot 206(V2)	7.53%	1.97%	4.45%
8	Renault L90(E1)	7.88%	0.76%	3.94%
9	Potential	0.16%	2.47%	1.44%
10	Peugeot 206-SD(V8)	3.78%	1.07%	2.28%
11	Potential	3.63%	7.24%	5.63%
12	Peugeot 405(GLX)	2.75%	0.02%	1.24%
13	Peugeot 206(V3)	1.96%	1.02%	1.44%
14	Peugeot 207-M	1.06%	4.80%	3.13%
15	Renault L90(E2)	0.99%	6.92%	4.27%
16	Potential	0.49%	1.67%	1.15%
17	SAMAND	3.22%	9.55%	6.72%
18	SAMAND-LX	3.27%	1.67%	2.39%
19	Peugeot 206(V5)	6.19%	2.09%	3.92%
20	Peugeot 206(V6)	3.65%	3.37%	3.50%
21	Peugeot 207-A	0.65%	13.14%	7.56%
22	Peugeot 206-SD(V19)	2.36%	7.76%	5.35%
23	Potential	0.80%	10.60%	6.22%
24	Peugeot Pars	4.01%	1.01%	2.35%
25	Suzuki Kizashi	13.96%	3.65%	8.26%
26	Suzuki Vitara	0.19%	0.11%	0.15%
27	Potential	3.10%	0.02%	1.40%

3.13 Empirical Results

According to Table 13, the first sign of deflection for current products is desirable from a consumer's perspective. First of all, it is worth mentioning that 45% of the total market belongs to cars that are not currently in the production basket.

The car market share for the 15 existing models, the shares of the models produced in the last 5 years and the difference from the value predicted by considering the contribution of each of the groups are shown in Table 13:

Table 13. Existing cars' market share for both groups

Car number	Car name	Group 1	Group 2	Ave.	History	Def.
4	ROA	14.01%	1.98%	8.49%	9.24%	0.75%
7	Peugeot 206(V2)	12.26%	2.55%	7.81%	12.77%	4.96%
8, 15	Renault L90(E1,E2)	14.42%	36.40%	24.49%	2.62%	-21.87%
10	Peugeot 206-SD(V8)	3.52%	2.30%	2.96%	4.08%	1.12%
12	Peugeot 405(GLX)	11.05%	0.11%	6.04%	32.62%	26.58%
14	Peugeot 207(M)	8.78%	11.69%	10.12%	0.76%	-9.36%
17	SAMAND	5.32%	10.02%	7.48%	3.12%	-4.36%
18	SAMAND-LX	2.53%	2.80%	2.65%	13.92%	11.27%
19	Peugeot 206(V5)	8.39%	3.69%	6.24%	0.98%	-5.25%
20	Peugeot 206(V6)	8.82%	3.27%	6.28%	1.24%	-5.04%
21	Peugeot 207(A)	2.86%	15.50%	8.65%	0.61%	-8.04%
22	Peugeot 206-SD(V19)	4.75%	7.78%	6.14%	6.18%	0.05%
24	Peugeot Pars	3.27%	1.57%	2.49%	11.08%	8.59%
26	Suzuki Vitara	0.02%	0.34%	0.17%	0.77%	0.60%

Note: The reason for cars 8 and 15 being shown in the same row is that there are no separate data for these two cars.

3.14 Chapter Conclusion

This study elaborates a method for estimating customers' behavior through the utility function based on factors of the product. Then, by using Tirole's (1988) and Gabszewicz and Thisse's (1979) formulas, which were described in section 4, the market share of all the vehicles is investigated.

Finally, considering the history of car sales over the past five years and compared with the value predicted by the existing cars' market share, a significant difference between the current productions of Iran Khodro Co. and a product assortment ideally adapted to the customers is detected. The results generally confirm the paper by Rahmati and Yousefi (2011), which claimed that 'the Iranian automobile market is an example of oligopolistic differentiated products market with two domestic manufacturers and a number of importing firms'. With this feature, here, the estimated difference between the producer and the consumer is provided through simulation techniques.

To confirm the difference between the taste of the clients and the production status, in Table 14 it can be seen that about 70% of the current production belonging to the 5 models (4, 12, 17, 18, 24) has the same size (big) and body design (sedan). In addition, 92% of the negative differences correspond to 6 models – 206-V5, 6, 207 and L90 (E1, E2) – which hold 55.77% of the predicted car shares.

In Table 14, models(14, 19, 20 and 21 with a 31.28% share are in the small, hatchback and full options car category, indicating a desire to buy a car by this kind of client, which, with 3.59% of the production share, has been neglected.

It can be stated that the willingness of customers to buy cars with a small size, hatchback design and full options is much higher than the current shares of these models. Thus, the market demand could be served if greater production capacity is allocated to these models.

Table 14. Negative model differences

Car number	Car name	Group 1	Group 2	Ave.	History	Def.
8, 15	Renault L90(E1,E2)	14.42%	36.40%	24.49%	2.62%	-21.87%
14	Peugeot 207(M)	8.78%	11.69%	10.12%	0.76%	-9.36%
19	Peugeot 206(V5)	8.39%	3.69%	6.24%	0.98%	-5.25%
20	Peugeot 206(V6)	8.82%	3.27%	6.28%	1.24%	-5.04%
21	Peugeot 207(A)	2.86%	15.50%	8.65%	0.61%	-8.04%
17	SAMAND	5.32%	10.02%	7.48%	3.12%	-4.36%

After IKCO abandoned Peykan, with a 10.86% market share, in 2006, the Renault L90 was supposed to be a suitable alternative in the IKCO product basket. However, due to limitations in supplying the parts for this car, the operational planning of production was not fulfilled; thus, a significant change in the product basket did not take place and the most required model accounts for the greatest difference between production and demand, which is 21.87%.

As a contribution, this study provides a method for identifying customer behavior based on choices among options consisting of a set of qualitative and quantitative factors. The number and type of factors and vehicles can be changed to evaluate the market share of any kind of product, which could include current products, products in the launch period or products that need to be introduced into the market. However the method could be used for an entrepreneur much more easily in comparison to a large sized company. Because a large sized company to adopt itself with customer needs should bear the costs of changing of production plan, production line, production processes and so on. An entrepreneur by applying this method for their

business model by adapting the business structure with market needs can be sure about the profitability and success in the market.

Furthermore the production profit estimated by the company can justify the difference between the market shares of existing products and the predicted shares; because these data are confidential, a comparison of the existing and potential profits is not possible. The reduction of current customs on import cars or the entry of other automakers into the Iranian car market after joining Iran to the world trade organization (WTO) will evoke market polarization, so the method presented in this study can be used to empower automakers corporations to increase their competitive advantage and create the readiness to enter and compete in global market. This could prevent decline in automakers share and increase their profitability through achieving customer satisfaction that will be describe in the next chapter.

Chapter 4

IMPACT OF RECOGNIZED GAP ON THE CUSTOMER SATISFACTION

4.1 Introduction and Chapter Abstract

Satisfaction can refer to “a person’s feeling of pleasure or disappointment that results from comparing a product’s perceived performance or outcome with their expectations” (Kotler & Keller, 2009). “Customer satisfaction is defined by one author as “the consumer’s response to the evaluation of the perceived discrepancy between prior expectations and the actual performance of the product or service as perceived after its consumption” (Tse & Wilton, 1988). Hence, it is important to consider satisfaction as part of an overall post-purchase evaluation by the consumer (Fornell, 1992). Customer satisfaction has also been defined as, “the extent to which a product’s perceived quality matches a buyer’s expectations” (Kotler et al., 2002).

Ho (1995) was quoted as saying, “You cannot manage what you cannot measure.” After extensive field studies that were conducted for nearly a decade, the SERVQUAL method was designed as a tool to be used for measuring customer satisfaction (Parasuraman et al., 1985; 1988). Some researchers have objections and criticisms of this model. Criticism of the model is quite evident in the study by Cronin and Taylor (1994) that presented the SERVPERF model versus the SERVQUAL model. These researchers suggested that the current quality of the organization is an important basis for the evaluation. However customer expectations in terms of quality should be involved. Other researchers, such as Babakus

and Buller (1992) and Teas (1993) have also criticized the SERVQUAL model, but Parasuraman continued to advocate for his model (Asubonteng & Mc Cleary, 1996).

In this chapter, an extensive field study is performed using a SERVQUAL model for measuring customer satisfaction. Due to the need to create a competitive advantage in products, sales and after-sales service, the expectations and perceptions of quality and value have been measured.

Questionnaires were designed and collected from different regions of Iran. Exploratory factor analysis was employed to check dimensionality of the measurements and the reliability is tested through Cronbach's alpha coefficient. Testing of the hypothesis correlation and Hierarchical Regression Analysis (HRA) was performed using SPSS.

4.2 Measuring Tools and Study Population

In terms of customer satisfaction, 12 regional offices conducted empirical data collection from large-scale studies of IKCO’s customers. IKCO was chosen because it is the largest carmaker in the Middle East and North Africa.

Up to 80% of existing criteria obtained from the operating instructions of the Iran Ministry of Industries and Mines were used to measure customer satisfaction in three areas: car quality, sales experience and after sale-services. Data was collected by conducting interviews and making phone calls every six months to Iranian carmakers in order to measure the level of customer satisfaction. However, in the current study, while existing criteria were kept, several important criteria were added, including the design of car, available options, marketing and branding concepts in sales and the length of warranty services in the after-sale service area.

After a brief summary of customer requirements derived from previous studies, the criteria for monitoring the quality, including customer perception of the product and the service received, as well as the questionnaire, were designed to include three main sections. The first part of the questionnaire included general information about the customer, such as age, Geographic location, and education level. Vehicle information was also obtained, including the vehicle type, fuel type, service status, the length of time the customer owned the newest vehicle, the length of time the customer owned his or her previous vehicle, whether the customer used IKCO products in the past, the customer's favorite car in terms of size and model, and what is the most used vehicle and where. The second section included five questions in order to try to understand the role of the car in the customer's life and realize what his or her vision was for the car in order to be able to respond to the obvious and latent needs of customers appropriately. In the third section, there were four main factors investigated, including the technical and physical aspects of car, accessories or options available for the car, the sales experience and the after-sales service. These factors were investigated using 39 items. To measure the degree of importance and perception of factors, five-point Likert scale was used. Its use was proposed for measuring customer satisfaction (Appendix C).

In the expectations questionnaire, a scale was used where a zero represented unimportant and a four represented critical importance, and for the perceptions of quality, a scale was used where a zero meant dissatisfied and a four meant completely satisfied with the items. After preparing the initial version of the questionnaire, duplicate and ambiguous questions were identified, and the final version was created by merging, deleting or modifying these items. A random sample of the population was used in this study, which involved conducting

interviews with customers while those customers were receiving services in dealers. The general information related to first part of the questionnaire is available in the appendix. Information from both questionnaires, based on market share of each of the regional offices was gathered. The population included 1378 individuals and there was a 68.9% response rate.

4.3 Role of Car in Customer's Life as Moderator

One of the issues which is addressed less often in the literature regarding customer satisfaction is the determination of customer satisfaction based on the characteristics and preferences of customers. This requires a detailed understanding of what the role of the product in their life is. Identification of customers is meaningful and useful and would be an important aspect of the evaluation in order to analyze the external validity of the study (Punj & Stewart, 1983).

The literature review related to the moderator variables that affect the relationship between customer satisfaction and the previous items, like expectation and perceived quality of the product, salesperson and after-sales services (Gilbert & Warren, 1995), as well as subsequent elements like loyalty (Homburg & Giering, 2001), complaints and recommendations to others, can be categorized using some demographic variable. The variable may include traits, such as gender. Categorizing the relationship by gender or other factors has caught the interest of some researchers (Jasper & Lan, 1992; Slama & Tashlian, 1985; Zeithaml, 1985). Researchers in the field have also categorized using age as a factor (Moscovitch, 1982; Roedder & Cole, 1986; Smith & Baltes, 1990; Walsh, 1982). In addition, Zeithaml (1985) categorized the relationship by level of education and income. In addition, psychological factors, like involvement in the process, have been studied (Beatty, Kahle, & Homer, 1988;

Burton & Netemeyer, 1992; Kapferer & Laurent, 1993; Mittal, 1995; Zaichkowsky & Sood, 1988; Zzichkowsky, 1985). Finally, Faison (1977) researched the perceived need for variety in daily life as a factor in customer satisfaction.

The lack of consideration for the presented moderator as a separate factor is observed in the literature. To understand the importance of the role of a car in the customer's life, customers were asked to rate the following statements as true or false: (i) A car means of self-expression to me, (ii) I like driving, (iii) I consider myself a car-specialist, (iv) I like to speak on cars with my friend and (v) My car helps me to solve a lot of problems.

4.4 Mathematical Model

In order to use a mathematical model, Expectations (E) and Perception (P) from Item (I) are measured in the range of 0–4. The difference between expectations and perceptions is the existing gap (G) between the current and desired status ranges from 0 to 4 where 0 represents complete satisfaction and 4 represents complete dissatisfaction.

In order to analyze this number based on the degree of satisfaction, the result was subtracted from four to achieve the customer satisfaction level from item (I).

$$E_I - P_I = G_I$$

$$S_I = 4 - G_I$$

4.5 Survey Hypotheses

The hypotheses for this study include the following:

H1.1–H1.4: The expectation levels of factors affect the level of related satisfaction.

H1.5–H1.8: The perceived levels of factors affect the level of related satisfaction.

H2: Satisfaction with the four independent variables affects the overall customer satisfaction.

The lather on can be further divided into four hypotheses:

H2.1: Satisfaction with the technical and physical aspects of the car affects the overall customer satisfaction.

H2.2: Satisfaction with the car's accessories of affects the level of customer satisfaction.

H2.3: Satisfaction with sale affects the overall customer satisfaction.

H2.4: Satisfaction with after-sale services affects the overall customer satisfaction.

H3: The levels of importance of the role of the car in the customer's life affect the overall customer satisfaction.

H4: The levels of importance of the role of the car in the customer's life influence the relationship between the expectations and perception of factors and related satisfaction as the moderators.

Hypothesis H4 contains four additional hypotheses:

H4.1– H4.4: The levels of the importance of the role of the car in the customer's life influence the relationship between the expectation of factors and related satisfaction.

H4.5–H4.8: The levels of the importance of the role of the car in the customer's life influence the relationship between perception of factors and related satisfaction.

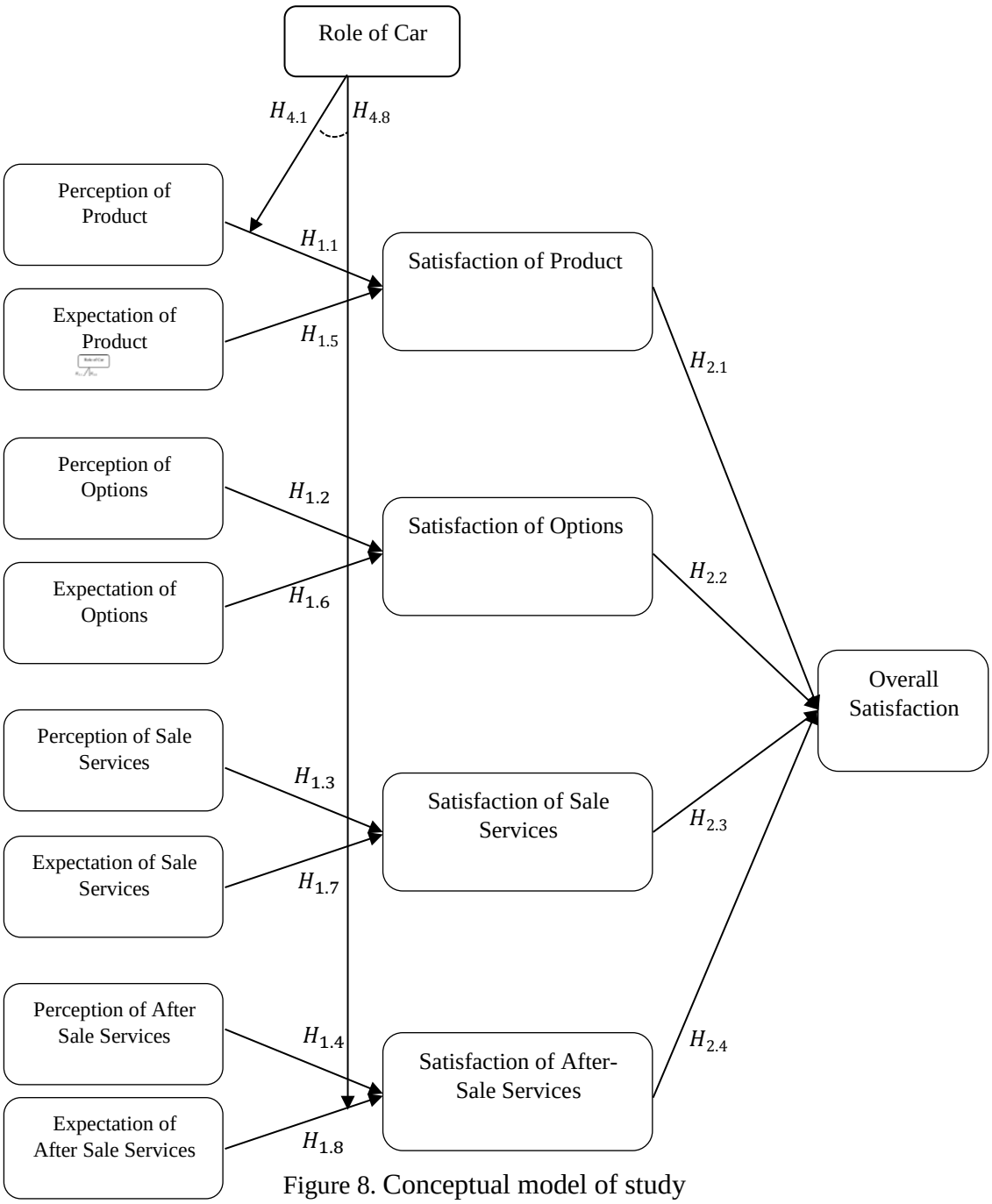

Figure 8. Conceptual model of study

4.6 Hypothesis Testing

During the exploratory factor analysis, some items were deleted in order to provide the scale validation suggested by Churchill (1979). The results of Kaiser-Meyer-Olkin revealed that the number of respondents was adequate (*KMO = 0.962, P<0.01*). There was a total of 61% variance in customer satisfaction that may be

explained by four main factors which contains 39 items. The items with adequate loading factors are presented in Table 15. The results of the exploratory factor analysis indicated that all of the sub items loaded their related factor with the loadings' values all being higher than 0.40. For the moderator variable, three items and for main factors nine items with loadings' values less than 0.40 are eliminated.

Table 15. Results of Exploratory Factor Analysis

Factor Factor (λ)	Item	Loading
Role of Car in the Customer Life	A car means of self-expression to me	0.76
	I like driving	0.45
	I consider myself as a car-specialist	0.65
	I like to speak on cars with my friend	0.47
	My car helps me to solve a lot of problems	0.78
Satisfaction with Technical And Physical Aspect of Car	Body Design	0.70
	Interior Designs	0.76
	Interior Space	0.69
	Engine power	0.79
	Car Acceleration	0.74
	Limitation Speed	0.51
	Car Reliability	0.55
	General and body Insurance	0.50
	Driving Quality	0.54
Satisfaction with car accessories (Options)	Audio system	0.60
	Rims and tires	0.70
	GPS	0.79
	Electrically Adjustable side mirror	0.80
	Electric Adjustable Seats	0.80
	Cruise Control	0.64
	Air Condition	0.65
	Parking Sensors	0.63

Satisfaction with Sales Services	Advertising	0.73
	References and experiences	0.72
	Conditional sales (Leasing)	0.78
	Sale Discount	0.57
	Selling on Credit	0.71
	Sales Flexibility on your request	0.50
Satisfaction with After Sales Services	Accessibility to Dealer	0.65
	Quality of Repair	0.74
	Cost of maintenance	0.70
	The spent time for delivery	0.74
	Complete register of your requests	0.74
	Doing all of your requests	0.79
	Responsibility of Dealers about services	0.81
	Availability of Spare parts	0.79
	Fees paid in proportion to the services	0.77
	Spent Time in proportion to the services	0.75
	Informing about some services that is out of warranty	0.75

Descriptive statistics (mean and standard deviation), correlations matrix, and results of the reliability test (Cronbach's alpha) are provided in Table 16.

Table 16. Mean, Standard Division, Correlation Matrix of the variables, and Internal Consistency

	Variable	M	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Age	1.958	0.794															
2	Education	2.939	1.197	-0.213**														
3	RL	2.206	0.686	0.051	-0.010													
4	PTP	2.184	0.796	0.078**	0.053	-0.006	(0.877)											
5	PO	1.953	0.849	0.022	0.041	0.018	0.556**	(0.883)										
6	PS	1.359	0.912	0.040	-0.030	-0.011	0.298**	0.406**	(0.866)									
7	PAS	2.281	0.827	0.022	-0.028	0.021	0.342**	0.303**	0.254**	(0.918)								
8	ETP	2.994	0.755	-0.052	0.082**	0.281**	0.039	0.047	0.040	0.023	(0.886)							
9	EO	2.981	0.804	-0.080**	0.119**	0.186**	0.037	0.054**	0.044	-0.008	0.636**	(0.916)						
10	ES	2.572	0.779	0.013	0.011	0.278**	0.045	0.049	0.052	0.035	0.384**	0.448**	(0.818)					
11	EAS	3.032	0.788	-0.037	0.079**	0.127**	0.026	0.067*	0.055*	0.000	0.555**	0.528**	0.435**	(0.948)				
12	STP	2.804	0.623	0.102**	0.023	-0.079**	0.521**	0.284**	0.125**	0.148**	-0.299**	-0.179**	-0.093**	-0.131**				
13	SO	2.689	0.627	0.080**	0.002	-0.034	0.255**	0.526**	0.166**	0.159**	-0.195**	-0.346**	-0.100**	-0.184**	0.412**			
14	SS	2.521	0.661	0.057*	-0.027	-0.079**	0.135**	0.204**	0.491**	0.070*	-0.142**	-0.157**	-0.343**	-0.143**	0.131**	0.185**		
15	SAS	2.746	0.598	0.069*	-0.042	0.009	0.172**	0.164**	0.125**	0.512**	-0.127**	-0.133**	-0.080**	-0.233**	0.240**	0.236**	0.164**	
16	CSI	2.715	0.407	0.110**	-0.033	-0.062*	0.384**	0.409**	0.305**	0.408**	-0.265**	-0.278**	-0.192**	-0.273**	0.626**	0.638**	0.461**	0.775**

** Correlation is significant at the 0.01 level (2-tailed).

*Correlation is significant at the 0.05 level (2-tailed). () Cronbach's α

Note: RL: role of car in customer's life, PTP: perceived quality of physical and technical aspects of car, PO: perceived quality of option, PS: perceived quality of sale, PAS: perceived quality of after sale service, ETP: expectation of physical and technical aspects of car, EO: expectation of option, ES: expectation of sale, EAS: expectation of after sale service, STP: satisfaction with physical and technical aspect of car, SO: satisfaction with option, SS: satisfaction with sale, SAS: satisfaction with after sale service.

According to Table 16, customer satisfactions have a positive correlation with related level of perceived quality and a negative correlation with related level of expectation in all four factors. The results are as follows, perceived quality of physical and technical aspects of car ($r=0.384$, $p < 0.01$), perceived quality of options ($r=0.409$, $p < 0.01$), perceived quality of sale ($r=0.305$, $p < 0.01$), and perceived quality of after-sale services ($r=0.305$, $p < 0.01$) have a positive correlation with the related levels of customer satisfaction. Also, expectation of physical and technical aspects of the car ($r= -0.265$, $p < 0.01$), expectation of the options ($r= -0.278$, $p < 0.01$) expectation of sale ($r= -0.192$, $p < 0.01$), and expectation of after-sale service ($r= -0.273$, $p < 0.01$), have a negative correlation with the related levels of customer satisfaction. This means that the higher level of expectation dropped the level of customer satisfaction and the higher level of perceived quality increased the customer satisfaction in the presented factors.

Regarding the second assumption, the relationship between the level of satisfaction with four factors and the overall customer satisfaction, positive correlations were observed as follows: satisfaction with the physical and technical aspects of the car ($r=0.622$, $p < 0.01$), satisfaction with options ($r=0.638$, $p < 0.01$) satisfaction with

sale (r=0.461, $p < 0.01$), and satisfaction with after-sale service (r=0.775, $p < 0.01$). Finally, the role of the car in the customer's life, at α=.05, has a negative correlation with overall customer satisfaction (r= -0.062, $p < 0.05$).

Separate regression analyses were performed with the following outcomes. The results summarized in Table 17, proved that hypothesis H1 associated with eight sub-hypotheses: $(H_{1,1} - H_{1,8})$ and H2 associated with four sub-hypotheses:$(H_{2,1} - H_{2,4})$ were confirmed. A MANOVA test examined whether respondents' demographic characteristics have significant effects on study variables including STP, SO, SS and SAS. One advantage of conducting the MANOVA is reducing the accumulative error variance of a series of one-way ANOVAs. The results of the MANOVA indicate that age can positively affect STP (β=0.050, $p < 0.05$), SO (β=0.044, $p < 0.05$) and SAS (β=0.049, $p < 0.05$). This is compatible with previous findings (Hulin & Smith, 1965; Hunt & Saul, 1975).

According to Table 17, a significant relationship between expectations and perceptions of quality with customer satisfaction in the relevant item is observed and the first hypothesis can be confirmed, as follows: H1.1:ETP (β=-0.322, $p < 0.01$): H1.2:EO (β= -0.379, $p < 0.01$), : H1.3:ES (β= -0.389, $p < 0.01$) and H1.4:EAS (β= -0.233, $p < 0.01$) negatively and : H1.5:PTP (β=0.529, $p < 0.01$), : H1.6:PO (β= 0.545, $p < 0.01$), H1.7:PS (β= 0.526, $p < 0.01$) and : H1.8:PAS (β= 0.511, $p < 0.01$) positively affect the related satisfactions.

In addition, our second hypothesis (H2) is supported indicating more satisfaction with after-sale services, technical and physical aspects, car accessories and sale

increased the overall satisfaction level. H2.1: STP (β=0.626, p < 0.01), H2.2: SO (β= 0.638, p < 0.01), H2.3: SS (β= -0.461, p < 0.01) and H2.4: EAS (β= 0.775, p < 0.01).

Table 17. Results of Linear regression

Variable	STP(β)	T	Variable	CSI(β)	t
Age	.050*	2.233			
Education	.035	1.570			
ETP	-.322**	24.153	STP	.626**	38.981
PTP	.529**	14.716			
	SO(β)				
Age	.044*	2.032			
Education	.041	1.905			
EO	-.379**	-17.80	SO	.638**	29.941
PO	.545**	25.77			
	SS(β)				
Age	.039	1.748			
Education	.004	.190			
ES	-.389**	-17.862	SS	.461**	18.593
PS	.526**	24.081			
	SAS(β)				
Age	.049*	2.093			
Education	.001	.040			
EAS	-.233**	-10.114	SAS	.775**	44.304
PAS	.511**	22.271			

Moreover, hypothesis H3 investigates the levels of importance of the role of the car in the customer's life influenced the overall satisfaction level. Hypothesis H4, associated with four sub-hypotheses ($H_{4,1} - H_{4,4}$), found that the levels of importance of the role of the car in the customer's life influenced the relationship between the expectation of factors and related satisfaction. Further hypotheses ($H_{4,5} - H_{4,8}$) found that the levels of importance of the role of the car in the customer's life influenced the relationship between the perception of factors and related satisfaction

To evaluate these hypotheses, hierarchical regression analysis is applied. A hierarchical regression analysis is conducted in three steps as following: step 1 evaluates the influence of the control variable on the satisfaction level of four factors, the independent and moderating variables at Step 2, and the interaction terms at Step 3. The results of hierarchical regression analysis for investigating the moderating of the role of the car in the customer's life and the relationship between expectations, perceptions and satisfaction are reported in Table 18.

The results from Step 1 indicated that age is significantly related to STP (β =0.112, $p<0.001$). Similarly, it is positively associated with other satisfaction aspects, including: SO (β =0.083, $p<0.05$), SS (β =0.055, $p<0.05$) and SAS (β =0.061, $p<0.05$). Moreover, according to Table 2, the moderator negatively impacts the STP (r= -0.079, p<.01), SS (r= -0.079, p<0.01) and overall customer satisfaction (r= -0.062, p<0.05), lending support to Hypothesis 3. The results from Step 3 indicated that five of the eight interactions between customer expectation and perceived value with satisfaction level are moderated by the role of the car in the customer's life.

Table 18. Results of Hierarchical regression analysis

		STP (β)	
	step1	step2	step3
Variables			
Age	.112**	.051*	.051*
Education	.047	.033	.036
ETP		-.323**	.084
PTP		.526**	.137
Role		.013	.241*
ETP*Role			-.789**
PTP*Role			.523**
R2	.013**	.375**	.410**
ΔR2		.362**	.048**
		SO (β)	
Age	.083*	.043*	.043*
Education	.019	.034	.035
EO		-.375**	-.349**
PO		.539**	.431**
Role		.024	.015
EO*Role			-.093
PO*Role			.134
R2	.007*	.412**	.414
ΔR2		.405**	.009
		SS (β)	
Age	.053*	.04	.04
Education	-.015	.001	.002
ES		-.366**	-.352**
PS		.501**	.383**
Role		.029	-.01
ES*Role			-.25
PS*Role			.135
R2	.002	.362**	.362
ΔR2		.360**	.002
		SAS (β)	
Age	.063*	.048*	.046*
Education	-.028	.002	.001
EAS		-.233**	-.179*
PAS		.508**	.381**
Role		.026	-.016
EAS*Role			-.096
PAS*Role			.175
R2	.005*	.314**	.315
ΔR2		.311**	.004

*p < .05, two-tailed test. **p < .01, two-tailed test

In order to interpret the results, three branches of psychological theory (contrast theory, dissonance theory and disconfirmation of expectations theory) provided the basis for making specific statements about the relationship among expectation, perceptions and satisfaction.

In order to interpret the results, three branches of psychological theory (contrast theory, dissonance theory and disconfirmation of expectations theory) provided the basis for making specific statements about the relationship among expectation, perceptions and satisfaction.

Contrast theory implies that a customer who received a product or service less valuable than he expected will magnify the difference between the product and service received and the product and service expected. Those whose expectations were negatively disconfirmed viewed a reward less favorably than did subjects who expected and received the same reward (Spector, 1956). Dissonance theory implies that a person who expected a high-value product or service and received a low-value product would recognize the disparity and experience cognitive dissonance.

Satisfaction/dissatisfaction comes from evaluation process in which the expectation or prior beliefs about a product or services compared to the actual understanding or perceived quality on consumption of that product or service. This evaluation and comparison process is the disconfirmation or expectations model. The comparison result of expectation and realized outcome which is called expectancy disconfirmation may range from: Negative: where expectation is higher than realized outcomes. Zero: where expectation and realized outcomes are equal.

Positive: realized outcomes are higher than expectations (Westbrook & Reilly, 1983).

Many empirical studies have confirmed the direct effect of the disconfirmation or expectations model (Cardozo 1968; Cohen & Goldberg 1970; Olson & Dover 1976) and satisfaction responses (Oliver 1980; Swan 1977; Westbrook 1980).

The relationship between expectations and satisfaction with the product is frequently addressed in the literature. Customer satisfaction is lower when the product does not meet the expectation than when the product meets expectations (Cardozo, 1965). Many researchers claimed that customer expectation is intuitive and fundamental and has a direct and negative effect on the perceived quality or performance, as well as on overall customer satisfaction.

Available research on comparison of young and elderly customer focused mainly on differences required to evaluate a product based on information-processing abilities (Moscovitch, 1982; Roedder & Cole, 1986; Smith & Baltes, 1990; Walsh, 1982). Most results from these studies show that a decline in age affects information-processing (Gilly & Zeithaml, 1985).

Perceived value has proven to be a difficult concept to define and measure (Holbrook, 1994; Woodruff, 1997; Zeithaml, 1988). For this investigation, perceived value will be defined as the consumers' overall assessment of what is received relative to what is given (Zeithaml, 1988). A perceived value is always based upon the expectations of the customer (Zeithaml, 1988).

Perceived value has been found to be a pre-requisite to customer satisfaction (Cronin et al., 2000; Dodds et al., 1991; McDougall & Levesque, 2000). Perceived value positively impacts customer satisfaction (Chang, 2009). Overall satisfaction of the customer is positively influenced by the perceived quality of the product (Helgesen, 2010). Therefore, here is expected results obtained by previous researchers, that a positive relationship between perceived quality and customer satisfaction and negative relationship between expectation and customer satisfactions is observed, be observe.

Two hypotheses, H_4,1 and H_4,2, are supported as following: 〖 H〗 _4,1: RL are moderating the relationship between ETP and STP (β = -0.789, $p<0.001$), H_4,2: RL are moderating the relationship between PTP and STP (β = 0.523, $p<0.001$) , Thus Hypotheses H_4,3, 〖H_(4,4) 〖,H〗 _4,5,H_(4,6) 〖,H〗 _4,7 and H〗 _4,8 are rejected. Summary of hypotheses results are shown in Table 19.

Table 19. Results of hypotheses testing

Hypotheses	Description	Result
$H_{1,1}$	The expectation of technical and physical aspects of car affecting the related satisfaction level	Accepted
$H_{1,2}$	The expectation of option affecting the related satisfaction level	Accepted
$H_{1,3}$	The expectation of sale affecting the related satisfaction level	Accepted
$H_{1,4}$	The expectation of after sale service affecting the related satisfaction	Accepted
$H_{1,5}$	The perceived quality of technical and physical aspect of car affecting the related satisfaction level	Accepted
$H_{1,6}$	The perceived quality of option affecting the related satisfaction level	Accepted
$H_{1,7}$	The perceived quality of sale affecting the related satisfaction level	Accepted
$H_{1,8}$	The perceived quality of after sale service affecting the related	Accepted

	satisfaction level	
$H_{2,1}$	The satisfaction with technical and physical aspect of car affecting the total customer satisfaction	Accepted
$H_{2,2}$	The satisfaction with option affecting the total customer satisfaction	Accepted
$H_{2,3}$	The satisfaction with sale affecting the total customer satisfaction	Accepted
$H_{2,4}$	The satisfaction with after sale service affecting the total customer satisfaction	Accepted
H_3	The levels of importance of role of car in the customer's life affecting the overall customer satisfaction	Accepted
$H_{4,1}$	The role of car in the customer's life moderates the relationship between expectation of technical and physical aspect of car and related satisfaction level	Accepted
$H_{4,2}$	The role of car in the customer's life moderates the relationship between expectation of option and related satisfaction level	Accepted
$H_{4,3}$	The role of car in the customer's life moderates the relationship between expectation of sales and related satisfaction level	Rejected
$H_{4,4}$	The role of car in the customer's life moderates the relationship between expectation of after sale service and related satisfaction level	Rejected
$H_{4,5}$	The role of car in the customer's life moderates the relationship between perceived quality of technical and physical aspect of car and related satisfaction level	Rejected
$H_{4,6}$	The role of car in the customer's life moderates the relationship between perceived quality of option and related satisfaction level	Rejected
$H_{4,7}$	The role of car in the customer's life moderates the relationship between perceived quality of sales and related satisfaction level	Rejected
$H_{4,8}$	The role of car in the customer's life moderates the relationship between perceived quality of after sale service and related satisfaction level	Rejected

4.7 Conditional Correlation

The conditional correlation is a distribution independent method that used here in order to accurately assess the eight hypotheses (4.1–4.8), which show the effect of the new moderator on the relationships between expectation and perceived quality

with related customer satisfaction, the following steps were conducted. First, in order to gain further information regarding how customers gave scores, the following histogram was drawn in order to show the dispersion of the different levels of moderator variables.

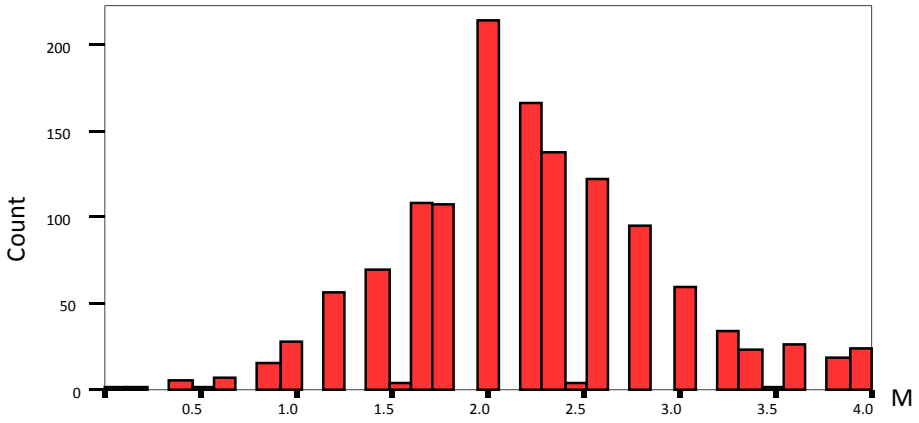

Figure 9. Scattering the level of moderator

As seen in above figure, current distribution is not normal as in some intervals the values are missing that trust to SPSS as statistical software make difficult and so the presented method is applied. Figure 9 represents the largest number of customers placed with an average rating of two. It also indicates that for most of the customers, the importance of a car in their life is higher than average. Another remarkable point is the lack of customers in some intervals, which are used to separate customers into two parts with lower and higher levels of the specific of moderator.

According to Figure 9, ten intervals for the moderator variable (R) are identified. Table 6 represents the correlations between expectation and perceived quality of all factors that are associated with customer satisfaction levels. To evaluate the effect of the rate of the moderator in correlations at each interval, the correlations for customers with a level of moderator (M) higher than R are calculated. In following

table each row contains the customers with moderator variable's value more than a specific amounts (Intervals with missing value in Figure 9).

Table 20 shows the results obtained from the conditional correlations, which confirm the results obtained in the previous section. The correlation between expectations of the technical and physical aspects of the car and satisfaction of this factor is increased by increasing the level of importance of the car to the customer for the same observation in which the correlation between perceived quality of this factor and satisfaction level is accrued. However, the moderator impact demonstrates a slight relationship between the perceived quality of accessories and the perceived quality of after-sale services and the related satisfaction level, but it cannot be considered as a moderator that significantly influences the relationships with any certainty.

In the eight following figures the vertical axis belongs to the correlation between two factors and the horizontal axis is the importance role of the car in the customer's life. The eight diagrams below where each figure corresponds to a factor with two dimensions help to provide a better understanding of the correlations between expectation and perceived quality of factors, and the level of customer satisfaction with the relevant factors when the rate of the moderator is changed.

Table 20. Results of Conditional Correlations in different level of Moderator

Moderator		ETP/STP	PTP/STP	EO/SO	PO/SO	ES/SS	PS/SS	EAS/SAS	PAS/SAS
R1	>.5	-.304	.510	-.342	.533	-.362	.499	-.230	.501
R2	>.75	-.304	.509	-.342	.534	-.362	.500	-.230	.501
R3	>1.1	-.336	.532	-.341	.540	-.363	.502	-.239	.509
R4	>1.3	-.344	.536	-.346	.541	-.362	.506	-.247	.498
R5	>1.8	-.367	.543	-.340	.529	-.352	.515	-.242	.481
R6	>2.1	-.360	.608	-.343	.549	-.337	.517	-.236	.518
R7	>2.6	-.384	.691	-.317	.602	-.312	.486	-.235	.567
R8	>2.8	-.404	.721	-.304	.684	-.259	.536	-.292	.613
R9	>3.1	-.409	.720	-.304	.684	-.260	.537	-.288	.613
R10	>3.5	-.417	.770	-.274	.722	-.356	.477	-.292	.743

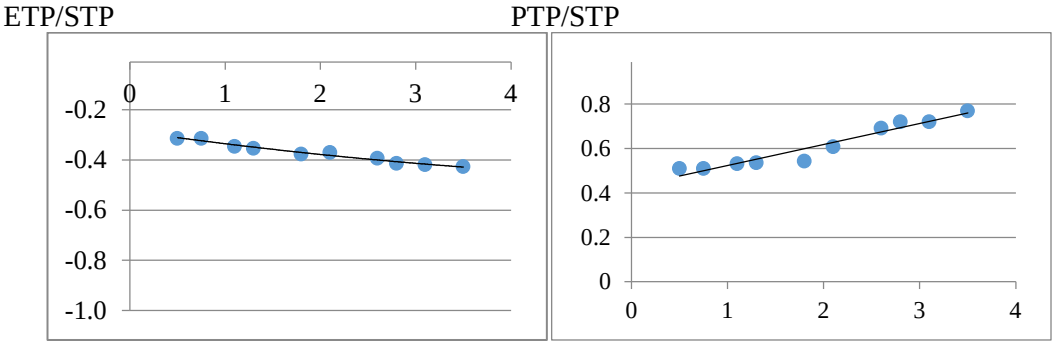

Figure 10. The relationship between Moderator and Correlation for ETP, PTP and STP

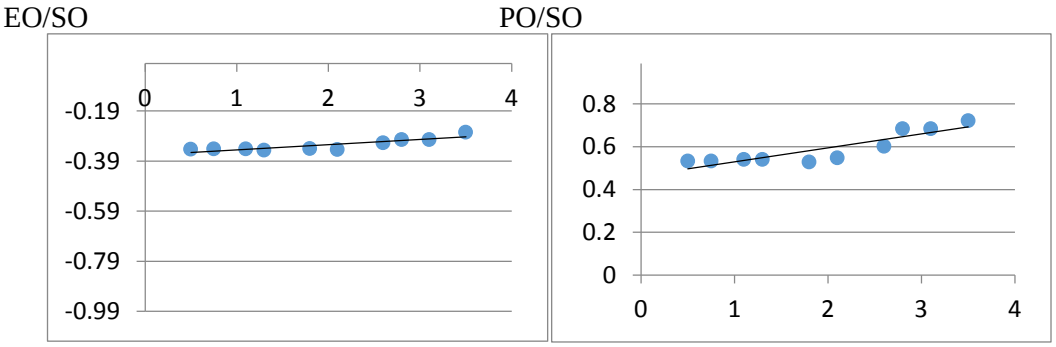

Figure 11. The relationship between Moderator and Correlation for EO, PO and SO

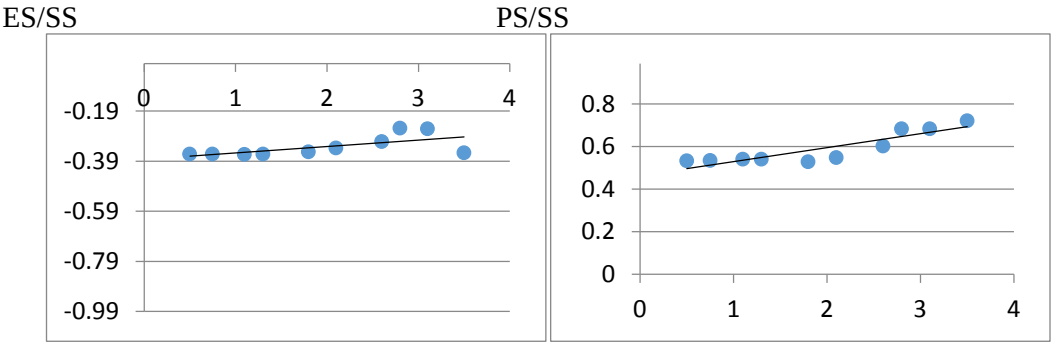

Figure 12. The relationship between Moderator and Correlation for ES, PS and SS

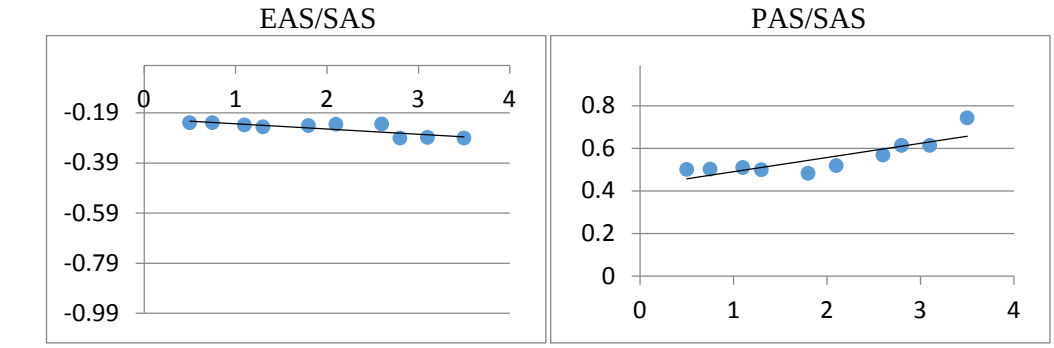

Figure 13. The relationship between Moderator and Correlation for EAS, PAS and SAS

One of the primary achievements of this research is the assurance of an existing positive direct effect of the moderating variables on the correlations between expectation and perceived quality of technical and physical aspects of car with the related satisfaction level. In future studies, investigating the other cases, such as the correlations between the perceived quality of accessories and the perceived quality of after-sale services with related satisfaction level, in which a slight impact of the moderator is observed, might be an interesting topic**.**

4.8 Discussion and Managerial Recommendation

Based on the importance ratings by the customer, the needs of a customer can be organized into a hierarchy that includes primary, secondary and tertiary needs in order to properly define what is truly desired by the customer.

Researchers who work on customer satisfaction suggest that the qualitative attributes are divided into three categories: basic factors, performance factors and motivated factors (Anderson & Mittal 2000; Gale 1994; Johnstone, 1995; Matzler & Hinterhuber, 1998; Metzler et al, 1996 and Oliver 1997).

IPA metrics can be considered a simple but effective tool (Hansen & Bush, 1999). However, considering the importance of each of these criteria for our customers and their satisfaction of these criteria, four zones occur on the coordinate axes.

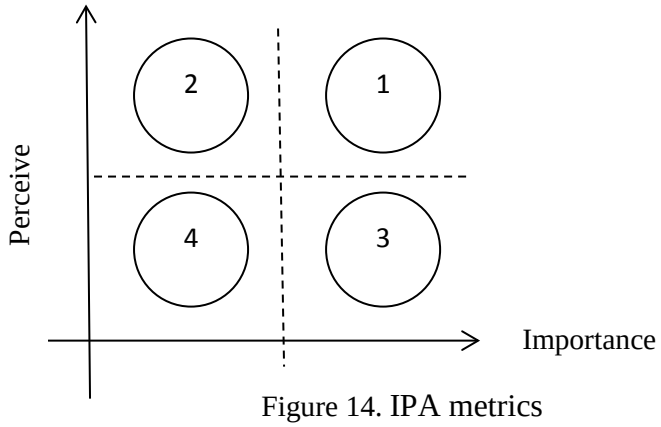

Figure 14. IPA metrics

District 1 – Important strengths: The criteria are those that are important to customers and have a high degree of customer satisfaction.

District 2 – Unimportant strengths: The criteria are those that, despite a high degree of customer satisfaction, they do not have much importance.

District 3– Important weaknesses: The criteria that are important to customers, but due to the poor performance of these criteria, the satisfaction level is low.

District 4– The criteria that the customer satisfaction level is low and the criteria for clients of lesser importance.

Understanding the criteria, which are in District 1, can be a big step in increasing customer satisfaction, retention and strengthening relations with those customers.

The test of the hypothesis shows a significant relationship between overall customer satisfactions and satisfaction with factors with a confidence level of 99%. The increase in each of the following variables will occur, however, the intensity correlation is different for each of these factors. The criteria that include the technical and physical aspects and after sale-services have a greater impact on customer satisfaction, and by increasing the quality of each, customer satisfaction will be greatly increased. Other criteria, such as car accessories and option and sale, have a lower impact on customer satisfaction, and changes in any of these criteria will have little impact on customer satisfaction.

By using survey results, the criteria that impact the customer satisfaction are identified and knowledge of these factors helps to design better services and products. As a result, a more accurate theoretical model was designed to order to explain the nature of satisfaction and customer satisfaction.

In terms of customer expectations, the most important factors were after-sale services, physical and technical aspects, options and the sale experience. These factors demonstrated a high level of importance.

In terms of the sales person’s performance, higher scores were present for after sale-services and technical and physical aspects. Finally, the highest gap occurred

between the level of expectation and the perceived value of factors belonging to sale, car accessories, technical and physical aspects and the after-sale services. Results are shown in Table 21.

Table 21. Results of Importance and Perceived quality level of factors

Factor	Factor title	Importance (Expectation)	Perceived quality	Gap
F1	Technical and physical aspect	2.99	2.18	0.81
F2	Car accessories (Option)	2.98	1.95	1.03
F3	Sale	2.57	1.36	1.21
F4	After Sale Services	3.03	2.28	0.75

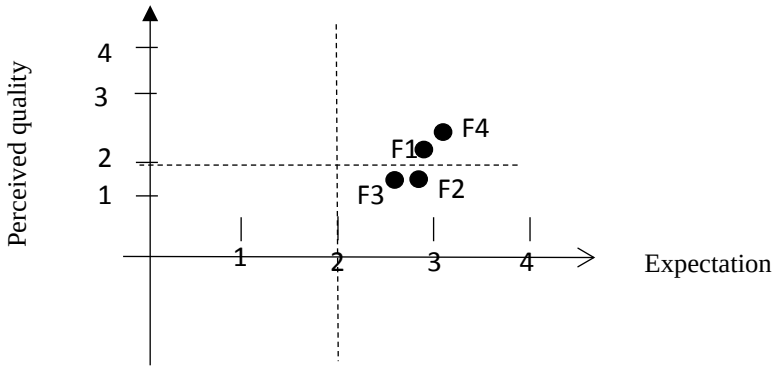

Figure 15. IPA metrics for main factors in research

4.9 Conclusion

In this study, the satisfaction of Iran Khodro customers were measured on a large-scale study that included four areas of the car buying experience, including the technical and physical aspects of the car, the car's accessories or options, the sales experience and the after-sales service. The data was analyzed using a gap analysis with SERVQUAL.

For this purpose, we proposed several assumptions and tested the effects of feedback on the level of customer satisfaction as it relates to the quality of the product and

services. Introducing the importance of a car in the customer's life as the expectation moderator, together with age and education level, has drawn the attention of researchers.

The effect of the four introduced factors on overall customer satisfaction and covering 61% variance of the independent variable, while also acknowledging the previous works carried out in this field, represents an important new knowledge of the role of car accessories as a differentiating factor in a competitive market.

So, our main contributions can be mentioned as follow:

1- Considering the car accessories as a differentiating factor, this has not yet been considered as a separate factor in the current literature.
2- Introducing the new moderator variable "importance of car in a customers' life" and its effect on the relationship between customer expectations, perceived quality and the satisfaction of the four relevant factors.
3- Finally, as an achievement and significant contribution, our results show that the relationships between expectations and perceived quality and customer satisfaction of technical and physical aspects of car significantly influenced by presented moderator variable "importance the role of car in a customer life". This is evaluated by applying hierarchical regression analysis and conditional correlation as a distribution independent method.

The gap analysis method and IPA matrix were found to be useful tools for managers in order to help them invest in areas that produce a higher level of customer satisfaction. Here, car accessories and sales are two factors with the biggest gap between expectation (importance) and perception, which shows that the Iranian

carmakers are experiencing weakness in these areas. Out of 21 proposed assumptions, 15 of them are confirmed, as shown in Table 19, and only moderating the relationship between expectations and perceived quality of car accessories, sales and after-sales service with related customer satisfaction by variable has not been confirmed. This indicates the complexity of the proposed factors, which could be of interest to researchers in future studies.

Moreover, the negative relationship between this moderator and the overall satisfaction is very noticeable, as shown in Table 16. It is demonstrated in the negative relationship between this variable and customer satisfaction in the physical and technical aspects of car and sales sectors.

As a topic for further research, investigating the effect of the presented moderator (the importance of product in the customer's life) in customer satisfaction for long-term and short-term useable products and services, as well as comparing the priorities in gap's factors that influence in the overall customer satisfaction in other types of markets can be taken to consideration.

4.10 Proposals for Future Researches

We live in a dynamic and changing environment. Changes in customer tastes and purchasing power; Changes in technical standards specifically regulations related to polluting potential of cars and tariff regulations; Changes in market structure toward openness to global market and increasing competition, could reduce the applicability of this research results. So these are open questions for future researches. Also as a topic for further research, the number of vehicles and factors types can be changed to

evaluate the market share. Also, the effect of the moderator variable on customer satisfaction for other useable products and services may be investigated.

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APPENDICES

Appendix A: Sample Questionnaire

Questionnaire

Gender: Male ☐ Female ☐ | Age: 18-30 ☐ 31-45 ☐ 46-60 ☐ +60 ☐

Degree: <High School ☐ High School ☐ Associate ☐ Bachelor ☐ Master and higher ☐

Dear customer, Thanks for your participation in this research, Please in following paired comparisons, Select Which model is more desirable for you.

2) Model No. ….. is more desirable for me.

Factors	Model No.	Model No.
Price (1000$)		
Car Size		
Engine Capacity(cc)		
Body Design		
Gearbox		
Fuel Type		
Fuel Consumption		
Max Speed(Km)		
Car Acceleration		
Options		
Boot Size		
Passenger Capacity		

1) Model No. ….. is more desirable for me.

Factors	Model No.	Model No.
Price (1000$)		
Car Size		
Engine Capacity(cc)		
Body Design		
Gearbox		
Fuel Type		
Fuel Consumption		
Max Speed(Km)		
Car Acceleration		
Options		
Boot Size		
Passenger Capacity		

4) Model No…... is more desirable for me.

Factors	Model No.	Model No.
Price (1000$)		
Car Size		
Engine Capacity(cc)		
Body Design		
Gearbox		
Fuel Type		
Fuel Consumption		
Max Speed(Km)		
Car Acceleration		
Options		
Boot Size		
Passenger Capacity		

3) Model No…... is more desirable for me.

Factors	Model No.	Model No.
Price (1000$)		
Car Size		
Engine Capacity(cc)		
Body Design		
Gearbox		
Fuel Type		
Fuel Consumption		
Max Speed(Km)		
Car Acceleration		
Options		
Boot Size		
Passenger Capacity		

Appendix B: Matrix 1. Paired Comparison between Twenty-seven Cars

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
1	0	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	1	0	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	1	1	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	1	1	1	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	1	1	1	1	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	1	1	1	1	1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
8	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
9	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
10	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
11	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
12	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	0	0	0
14	0	0	0	0	0	0	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	0	0	0
15	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	0	0	0
16	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	0	0	0
17	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	0	0
18	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1
20	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1
21	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1
22	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1
23	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1
24	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	1
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	1
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0

Appendix C: Sample of Questionnaire

Questionnaire						
Customer Information						
Age	18-30 ☐	31-45 ☐	46-60 ☐	+65 ☐	Town/State:	
Do you have children under 10 in your family?	Yes ☐ No ☐				Gender	Men ☐ Woman ☐
Education	High School ☐	Diploma ☐	Associate Degree ☐		Master Degree &Up ☐	
Automobile Information						
Automobile Name:					Type:	
Fuel Type:	Petrol ☐	Hybrid ☐			Service State:	Warranty ☐ Guarantee ☐
Period of using car:	Current Car…..Month		Previous Car …..Year		It was IKCO?	Yes ☐ No ☐
Your Favorite Car?	Size:	Small ☐	Mid-size ☐	Full-size ☐		
	Model:	Hatchback ☐	Sedan ☐	Sport ☐	Coupe ☐	Pick-up ☐ SUV ☐ Luxury ☐
Your Car is using for which of these Purpose?	Tool of work ☐	"Family" car ☐	Tool for hobby ☐	A tool for independence ☐	within towns ☐	between towns ☐

Please indicate the level of your acceptance of the below statements.
0: Highly disagree 1: Disagree 2: leverage 3: Agree 4: Highly agree

1	**What is the importance of your car in your life?**	**0**	**1**	**2**	**3**	**4**
1-1	A car means of self-expression to me					
1-2	I like driving					
1-3	I consider myself as a car-specialist					
1-4	I like to speak on cars with my friend					
1-5	My car helps me to solve a lot of problems					
2	**Technical and physical aspects of car**	**0**	**1**	**2**	**3**	**4**
2-1	Body Design					
2-2	Interior Designs					
2-3	Interior Space					
2-4	Engine power					
2-5	Car Acceleration					
2-6	Limitation Speed					
2-7	Car Reliability (Brake - Body Strong, …)					
2-8	General and body Insurance					
2-9	Driving Quality (Steering - Smoothie, …)					

3	Option	0	1	2	3	4
3-1	Audio system					
3-2	Rims and tires					
3-3	GPS					
3-4	Electrically Adjustable side mirror					
3-5	Electric Adjustable Seats					
3-6	Cruise Control					
3-7	Air Condition					
3-8	Parking Sensors					
4	**Sales**	**0**	**1**	**2**	**3**	**4**
4-1	Advertising					
4-2	References and experiences					
4-3	Conditional sales (Leasing)					
4-4	Sale Discount					
4-5	Selling on Credit					
4-6	Sales Flexibility on your request					
5	**After Sales Services**	**0**	**1**	**2**	**3**	**4**
5-1	Accessibility to Dealer					
5-2	Quality of Repair					
5-3	Cost of maintenance					
5-4	The spent time for delivery					
5-5	Complete register of your requests					
5-6	Doing all of your requests					
5-7	Responsibility of Dealers about services					
5-8	Availability of Spare parts					
5-9	Fees paid in proportion to the services					
5-10	Spent Time in proportion to the services					
5-11	Informing about some services that is out of warranty					
5-12	Behavioral of personnel of the dealers					
5-13	Care about safety and cleaning in dealer during repair time					
5-14	Length of Warranty					

Appendix D: Questionnaire General Information

General Information			Quantity	Percentage
Customer Information	Age	18-30	606	33.2%
		31-45	805	44.1%
		46-60	346	19%
		+65	67	3.7%
	Education status	High school	232	12.7%
		High school	510	28%
		Associate	440	24.2%
		Bachelor	501	27.5%
		Master & higher	138	7.6%
Automobile Information	Fuel Type	Petrol	1248	68.5%
		Hybrid	573	31.5%
	Service Status	Warranty	1198	68.7%
		Guarantee	545	31.3%
Was your previous car IKCO?		Yes	1082	59.8%
		No	728	40.2%
Your Favorite Car	Size	Small	367	20.8%
		Mid-size	1019	57.7%
		Full-size	380	21.5%
	Model	Hatchback	183	11.9%
		Sedan	767	43.3%
		Sport	231	14.5%
		Coupe	85	6.1%
		Pick-up	5	2.3%
		SUV	276	16.7%
		Luxury	78	5.2%
Your Car is using for which of these Purpose?		Tool of work	388	20.9%
		"Family" car	1015	54.7%
		Tool for hobby	293	15.8%
		A tool for independence and freedom	206	11.1%
		Use within towns	813	43.8%
		Use between towns	363	19.6%

Appendix E: 27 Models Specifications

Factors	Model No.1	Model No.2	Model No.3	Model No.4	Model No.5	Model No.6
Price	< 10	< 10	< 10	< 10	< 10	< 10
Car Size	Small	Small	Medium	Medium	Medium	Medium
Engine Capacity-cc	<1500	<1500	<1500	<1500	1500-2000	1500-2000
Body Design	Hatchback	Sedan	Hatchback	Sedan	Hatchback	Sedan
Gearbox	Manual	Manual	Manual	Manual	Manual	Manual
Fuel Type	Hybrid	Petrol	Hybrid	Hybrid	Hybrid	Hybrid
Fuel Consumption	Medium	Medium	Medium	Medium	Medium	Medium
Speed Limit	<200 km/h	<200 km/h	<200 km/h	<200 km/h	<200 km/h	<200 km/h
Car Acceleration	Medium	Medium	Medium	Medium	Medium	Medium
Options	Simple	Simple	Simple	Simple	Simple	Simple
Boot Size	Small	Medium	Medium	Medium	Medium	Medium
Passenger Capacity	4 Person	4 Person	5 Person	5 Person	5 Person	5 Person
Factors	Model No.7	Model No.8	Model No.9	Model No.10	Model No.11	Model No.12
Price	15-10	15-10	15-10	15-10	15-10	15-10
Car Size	Small	Small	Medium	Medium	Medium	Medium
Engine Capacity-cc	<1500	<1500	<1500	<1500	1500-2000	1500-2000
Body Design	Hatchback	Sedan	Hatchback	Sedan	Hatchback	Sedan
Gearbox	Manual	Manual	Manual	Manual	Manual	Manual
Fuel Type	Petrol	Petrol	Petrol	Petrol	Hybrid	Hybrid
Fuel Consumption	Low	Medium	Low	Low	Medium	Medium
Speed Limit	<200 km/h	<200 km/h	<200 km/h	<200 km/h	<200 km/h	<200 km/h
Car Acceleration	High	Medium	Medium	Medium	Medium	Medium
Options	Simple	Medium	Simple	Simple	Medium	Medium
Boot Size	Small	Medium	Medium	Medium	Medium	Medium
Passenger Capacity	4 Person	4 Person	4 Person	4 Person	5 Person	5 Person
Factors	Model No.13	Model No.14	Model No.15	Model No.16	Model No.17	Model No.18
Price	15-20	15-20	15-20	15-20	15-20	15-20
Car Size	Small	Small	Small	Medium	Full-Size	Full-Size
Engine Capacity	<1500 cc	1500-2000	<1500	<1500	1500-2000	1500-2000
Body Design	Hatchback	Hatchback	Sedan	Sedan	Sedan	Sedan
Gearbox	Manual	Manual	Manual	Manual	Manual	Manual
Fuel Type	Petrol	Petrol	Petrol	Petrol	Hybrid	Hybrid
Fuel Consumption	Low	Low	Medium	Low	Medium	Medium
Speed Limit	<200 km/h	<200 km/h	<200 km/h	<200 km/h	<200 km/h	<200 km/h
Car Acceleration	High	High	Medium	Medium	Medium	Medium
Options	Medium	Full	Full	Medium	Simple	Medium
Boot Size	Small	Medium	Medium	Medium	Big	Big
Passenger Capacity	4 Person	4 Person	4 Person	4 Person	5 Person	5 Person

Factors	Model No.19	Model No.20	Model No.21	Model No.22	Model No.23	Model No.24
Price	20-25	20-25	20-25	20-25	20-25	20-25
Car Size	Small	Small	Small	Medium	Full-Size	Full-Size
Engine Capacity-cc	1500-2000	1500-2000	1500-2000	1500-2000	1500-2000	1500-2000
Body Design	Hatchback	Hatchback	Hatchback	Sedan	Hatchback	Sedan
Gearbox	Manual	Automate	Manual	Manual	Manual	Manual
Fuel Type	Petrol	Petrol	Petrol	Petrol	Hybrid	Hybrid
Fuel Consumption	Medium	Low	Low	Low	Medium	Medium
Speed Limit	>200 km/h	<200 km/h	<200 km/h	<200 km/h	>200 km/h	>200 km/h
Car Acceleration	High	Medium	High	Medium	Medium	Medium
Options	Full	Full	Full	Medium	Full	Full
Boot Size	Small	Small	Medium	Medium	Big	Big
Passenger Capacity	4 Person	4 Person	4 Person	4 Person	5 Person	5 Person

Factors	Model No.25	Model No.26	Model No.27
Price	30-40	30-40	40-50
Car Size	Full-Size	Full-Size	Full-Size
Engine Capacity-cc	>2000 cc	>2000 cc	1500-2000
Body Design	Sedan	Hatchback	SUV
Gearbox	Automate	Automate	Automate
Fuel Type	Petrol	Petrol	Petrol
Fuel Consumption	Medium	Medium	Medium
Speed Limit	>200 km/h	>200 km/h	<200 km/h
Car Acceleration	Medium	Medium	Medium
Options	Full	Full	Full
Boot Size	Big	Big	Medium
Passenger Capacity	5 Person	5 Person	5 Person