Chinese Consumer Attitudes towards the Electric Vehicle

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Objective:
The aim of this study is to find coherence between the theory of consumers' attitudes and the challenge of product acceptance.

The relationship between consumer attitudes and product acceptance will be explored using the example of the Electric Vehicle (EV), an innovative and much debated product, in China. This study will analyze the attitudes of the Chinese toward the EV and how these attitudes might affect the acceptance of this particular product.

The reason China was chosen as the target market was because that country seems to be a non-researched area.[1] This study will shed some light on the mentioned concepts and offer findings from the Asian continent. These findings will be crucially important for the academic world, as they will be a solid base for future research. More importantly, this research can be used by marketers for their strategies in regards to EV sales in China.

Key words: China, consumer attitudes, Electric Vehicle, behavior, acceptance

[1] Literature in the specific chosen topic was not found by the authors.

Preface

The interest for this paper and the choice of theme came in the context of the authors' study program. The Chinese business environment had a specific role during the study, as the current developments on the Asian continent were and still are a topical issue. The Linköping campus hosts many Chinese students who encouraged our interest in this subject. The connection with the Electric Vehicle was created when the authors realized that the EV was an entirely new concept being introduced in China right now. In the past decade, China has emerged as a significant player in the consumer market. The attitudes of Chinese consumers have been considerably impacted by external influences and are rapidly changing even as this is being written.

Acknowledgement

We would like to thank our supervisor, Mrs. Åsa Käfling, who was our mentor and coach for the purpose of developing the current thesis. Only because of her insightful feedback did we manage to develop and finish this paper. Also, our appreciation goes to our Chinese colleagues who helped us with the survey in Chinese: Zhe Li, Sun Lu.

This paper is dedicated to our parents who supported us through the Master Degree and always stood by our sides.

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Abstract

During the information gathering process, there are many factors which shape the consumers' decision to purchase a particular product. One of these determinants is the consumer's attitude which can have a significant effect on his/her decision-making and whether or not to make the purchase.

This paper aims to analyze consumers' attitudes in relation to a specific product, the Electric Vehicle. There have been a lot of debates about environmentally friendly products and their ability to solve the planet's environmental issues. The problematic issue is the consumers' acceptance of such products mainly because of their unconventionality brought to consumers' routine consumption behavior.

Consumers' attitudes towards the Electric Vehicle in China are consistent with new product introductions around the world that require the consumer to change. China is a country with tremendous economic growth and where consumers are in the process of learning new consumption habits. EVs have entered the market as part of the solution to Chinese energy sustainability and environmental problems. However, as anywhere else, the consumers' acceptance of such product is a real challenge.

It can be argued that analyzing the attitudes can be the contributing factor to overcome this challenge. In this context, the theory about consumer attitudes is presented as well as the influential determinants toward attitudes like demographics or product knowledge. The concept of the Electric Vehicle is presented so that the reader can have a better understanding of this product. Included is a discussion of the Electric Vehicle in the Chinese market presenting its development, strong and weak sides, and the challenges it faces. This theoretical framework and secondary data research provide a good base for the empirical study, which consists of a survey conducted with Chinese Master students. Master students were chosen because of their educational background, young age, and consideration of them as future consumers. The study reveals high awareness of environmental problems and a positive attitude towards innovative products. It also shows positive attitudes towards the Electric Vehicle. What is more interesting is that no matter how much the Chinese consumer likes the product, he/she perceives it more from a practical perspective and evaluates the ability to match its attributes and characteristics with his/her daily needs.

Background

"Consumer attitudes are changing at faster pace, probably never seen until now. Signs of consumers' changing attitudes are everywhere, and they provide a warning to managers about the seismic changes ahead." (Hagel & Rayport, 1997, p. 69)

While there is consistent research made towards consumer behavior and attitudes in developed countries, the body of knowledge is missing data from the Asian continent and of importance for this paper – from China. Studies (Li & Xiao, 1999) have shown that the availability of research regarding Chinese attitudes is to a great extent limited, and further research needs to be undertaken. The reasons are related to the shift that China has gone through in the last decades, one of them being the major development in the domain of consumer understanding. "*We are not only witnessing the dawn of a new millennium in China but a new era in which the emotions, attitudes, and perceptions of the man and woman on the street increasingly matter."* (McEwen et. al, 2006, p. 75) As a consequence, the attitudes of Chinese consumers have been fluctuating, and for that matter, it is hard to keep pace with the shifting attitudes of Chinese consumers, and more trying to understand that they are still changing. (Dixit et. al, 2008)

The importance of understanding these attitudes stems from the fact that China is now the world's second largest consumer economy, with a population of over 1.3 billion, which is almost five times bigger than US and twice bigger as Europe. This undoubtedly makes it important for both scholars and practitioners. (Xin-an et. al, 2008) Also, Clifford et. al (2005) show that the new passenger vehicle sales in China has been constantly growing in the last years. This leads to the importance of having a better knowledge of the attitudes of the prospect customers.

China is an emerging market, and as such, it has been defined as "*a country in which its national economy grows rapidly*, [and] *its industry is structurally changing"*. (Luo, 2002, p. 5) "*Today the Chinese automotive industry is the fourth largest in the world behind the European Union, USA and Japan, boasting an annual output of circa 8–9 million units."* (p. 290) Trying to see an international development, China needs to do a lot of changes and to go through a lot of challenges, but according to Donnelly & Beckley (2010), two are the most important. First are the structural problems that will help create a more viable and sustainable auto industry, and second China has to catch up with the more advanced global competitors, especially in areas such as design, technology and brand equity. In the context of international competition, China must address these issues, if they desire to achieve the targets they have set until 2020-2030, which is to hold a 10% share of the global car market outside their domestic borders. (Donnelly & Beckley, 2010)

Recently authors have been discussing intensely regarding the future of the Chinese automobile industry. This is happening because of the rapid developments that China has been going through, but also due to the major struggles that it has – structurally, technical or organizational. (Donnelly & Beckley, 2010, p. 289) Another reason is because the automotive has been referred to as a 'Pillar Industry', and China has constantly attempted in upgrading and modernizing this industry, bringing it closer to Western standards and models. (Donnelly & Beckley, 2010, p. 290) It has been recently shown that in China, 25 out of 31 provinces state automotive industry is a local pillar industry, (Donnelly & Beckley, 2010, p. 293 – originally quoted in Liu and Dicken, 2006) with an approximate number of 120 car producers in China, as of 2004. (Donnelly & Beckley, 2010, p. 292[2])

Furthermore, in the context of emerging countries, it has been said by researchers that because of a strong automotive industry (as a pillar industry), the country has a series of benefits, such as it generates "*employment, skills and advanced forms of work organization and wealth creation,* [and it] *can stimulate local industry through the development of components and related services."* (Donnelly & Beckley, 2010[3])

[2] Originally from Thun, (2004)
[3] Originally from Harwit (1995)

1. Consumer attitudes

1.1 Introduction to attitudes

"It is difficult to imagine a psychological world without attitudes. […] Our environment would make little sense to us; the world would be a cacophony of meaningless blessings and curses. Existence would be truly chaotic and probably quite short" (Fazio & Olson, 2003, p. 139) Using dramatic words, the authors paint the picture of how the world would look if mankind were spared of its attitudes towards everything. This makes it easy to see the importance of understanding how and why people feel and act in a certain manner to a situation, object or anything that surrounds them.

Attitude research has been popular beginning in the 1900s. One of the main reasons for this, as described by Wicker (1969), is that theorists have believed and have seen a real connection between attitudes and behavior. The idea is strengthened also by recent authors (Jansson, 2010) who affirm that attitude explains consumer behavior, even better than other factors (e.g. age, income, etc.).

The interest of this chapter is to try to understand the concept of attitudes and see the underlying connection between attitudes and behavior. As Fishbein & Ajzen (1975) put it, attitude is a concept that is believed to guide or influence behavior. So, first of all, it is important to understand what attitudes are.

1.2 Definition of attitudes

Early conceptions of attitude were largely restricted to specific predispositions or mental sets. (Fishbein & Ajzen, 1975) Today, attitude occupies a central role in the theories and research regarding consumer behavior. (Ajzen, 2008) As some researchers would put it – it is not only important, it is essential. (Faris, 1928)

"In fact, the term 'attitude' was introduced in social psychology as an explanatory device in an attempt to understand human behavior." (Fishbein & Ajzen, 1975, p. 336)

A fairly easy to understand definition is that attitudes represent what one likes and dislikes (Blackwell et. al, 2001), or the amount of positive and negative feelings one has towards an object. (Schlenker, 1978) A consistent number of authors (Schlenker, 1978; Fishbein & Ajzen, 1975; Insko & Schopler, 1967; Peabody, 1967) expand and define attitudes as learned tendencies when responding to an object in a consistently favorable or unfavorable manner. Ajzen & Fishbein (1977), Peter & Olson (1999) add to the main idea behind attitudes by

defining the notion as a person's overall evaluation of a concept. Recent studies of Ajzen (2008) place the evaluation at the core of a person's attitude.

In a more scientific manner, Thurstone (1928) affirms that attitude denotes "*the total sum of a man's inclinations and feelings, prejudice or bias, pre-conceived notions, ideas, fears, threats, and convictions about any specified topic."* (p. 531) One of the most extensive researches made on the specific concept of attitude is done by Doob (1947), who takes defining attitude seriously, especially for the fact that so few do in their papers – as he acknowledges. He defines attitude in a more complex way, *"as an implicit, drive-producing response considered socially significant in the individual's society."* (p. 136)

Not surprisingly, with so many understandings of the same concept, it can become a confusing process to clearly see a straightforward definition of what an attitude really is. Fishbein & Ajzen (1975) discuss in their work that it becomes an ambiguous concept, even more when analyzing the individual terms in the definition.

Besides the meaning of the concept, there is also a very interesting psychological implication that has to be explained, and useful to acknowledge in the context of attitude definition. "*Attitude expressions communicate aspects of the person's social identity and world view."* (p. 352) Attitudes carry a diagnostic value and reflect the image of the person holding them. Since they can and will associate a person to specific groups of people, attitudes will reveal one's personality, will show the person's positive or negative orientation, and also can be used to gain approval or avoid disapproval. (Schlenker, 1978)

It can be seen that the attitude is not a stand-alone concept, as it is directly connected and dependant on other concepts. The following chapter offers the reader a better understanding of the main aspects that interconnect with attitudes to create a clear view of the process that an individual goes through until he/she reaches a specific behavior regarding a product, situation, etc.

1.3 Belief formation

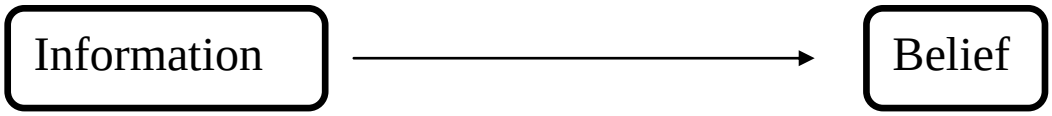
"In trying to understand attitudes, beliefs play a crucial role, because it has been shown that attitudes are measured by assessing a person's beliefs." (Fishbein & Ajzen, 1975, p. 131)

1.3.1 Definition and concept

"By the means of direct observation or information received from outside sources, or by various inference processes, a person learns or forms beliefs about an object by associating attributes to the given object. (p. 14) *Beliefs relate to the subjective judgment of a person of himself and his environment."* (p. 131) As opposed to attitudes, a person's favorable or

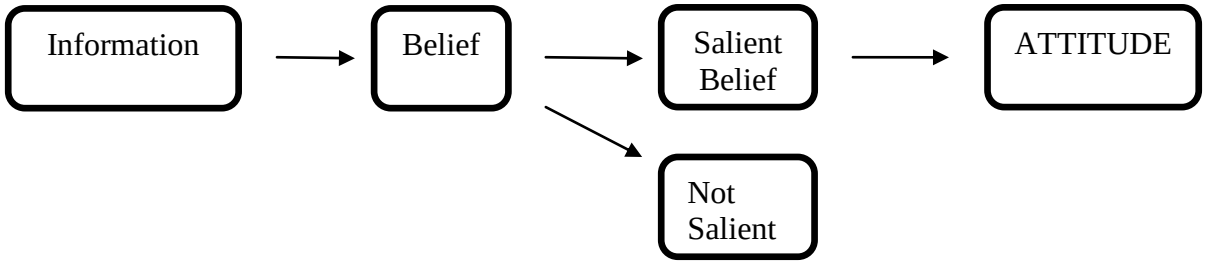
unfavorable evaluation of an object, beliefs represent the information he/she has about the object. (Fishbein & Ajzen, 1975) The relationship can be very easily understood (See Figure 1). It shows that the consumer gets information about something (e.g. an object) and he/she automatically transforms it into a belief.

Figure 1: Formation of beliefs[4]



In the above figure, another element can be added, and that is the strength of beliefs. Beliefs that have a high degree of strength about a given object are called salient beliefs, and they are directly connected to attitude formation. (See Figure 2) This figure gives a wider understanding of the whole process that an individual takes from the information stage all the way to attitude formation. The difference in comparison to figure 1 is that it shows that only the salient beliefs are those that are significant in the process of developing a certain attitude. It also claims that not all beliefs are correlated to attitude formation.

Figure 2: Formation of beliefs and of attitudes[5]



1.3.2 Salient beliefs

Several authors (Blythe, 1997; Peter & Olson, 1999), when talking about salient beliefs, start with the consideration that the cognitive capacity of people is limited, and because of this, only a few of the beliefs can be considered at once. The activated beliefs are in fact the salient beliefs, and they will be the ones that the consumer holds as most important, but they can also be the ones that have been most recently acknowledged. Fishbein & Ajzen (1975) add to this understanding by saying that only a small number of beliefs are considered toward

[4] This is authors' understanding from readings.
[5] This is authors' understanding from readings.

an attitude at a given moment. Because only the salient beliefs about an object create a person's attitude, it can be argued that it is important to identify and understand these beliefs.

Ajzen & Fishbein (2000) define the belief saliency as the "*subjective probability of a link between the attitude object and an attribute."* (p. 4) Thus, if the subjective probability is relevant, the stronger the belief will be. The causality relationship defined by the authors is that if the beliefs are accessible in the memory, then they will constitute the foundation for attitudes to be created.

1.3.3 Processes of belief formation

Beliefs are formed by establishing a link between direct observation and inference processes by which the individual creates beliefs about a given object. There are three ways to form a belief (Fishbein & Ajzen, 1975):

a. Observational. By observation, a person will perceive attributes of a product, which will then be translated into descriptive beliefs.

b. Inferential. These beliefs are, at their core, observational. After the observation process, the individual uses his/her observations to make certain inferences about a given object.

c. Informational. The person is being provided with the information from an external source such as someone else.

1.4 Attitude formation

The totality of a person's beliefs serves as the informational base that ultimately determines his/her attitudes, intentions and behaviors. *"An attitude represents a person's general feeling of favorableness or unfavorableness toward some stimulus object, and […] as a person forms beliefs about an object, he automatically and simultaneously acquires an attitude toward that object."* (Fishbein & Ajzen, 1975, p. 216) Attitudes are learnt and not instinctive, which means that a customer develops his/her attitudes from experience. Blythe (1997) writes that the formation of attitude can be based either on direct experience with the product (e.g. driving a car), or indirect experience - where the consumer forms his/her attitudes from other's recommendations and communicated experiences.

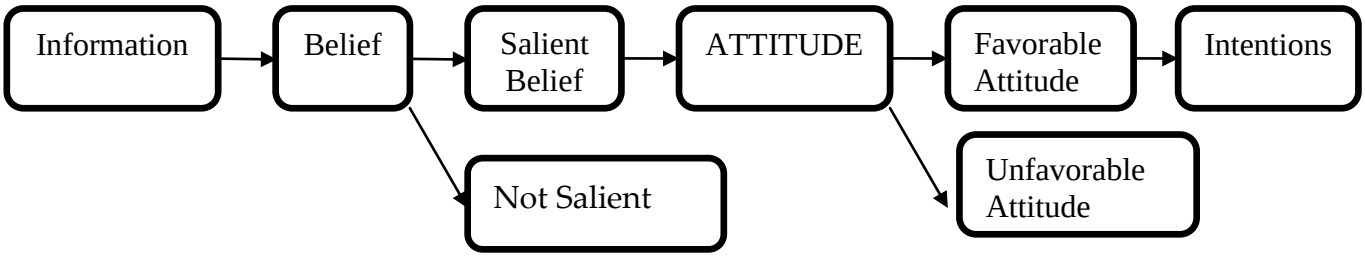
Beliefs may be present for a long time. Some may be forgotten and leave room for others to be formed. However, the beliefs that are the most critical in relation to attitude formation toward behavior are the salient ones. In the course of a person's life, his/her experiences lead to the formation of many different beliefs about various objects, actions, and events. "*Some beliefs may persist over time, others may be forgotten, and new beliefs may be formed. At any point in time, however, a person's attitude toward an object may be viewed as determined by his salient set of beliefs about the object."* (Fishbein & Ajzen, 1975, p. 218)

1.5 Formation of intentions

A person's attitude toward an object can be measured by considering his/her intentions with respect to that object. The more favorable a person's attitude is, the higher the chances he/she will have intentions to perform positive behaviors. Intentions involve four different elements: the behavior, the target object at which the behavior is directed, the situation in which the behavior is to be performed, and the time at which the behavior is to be performed. (Fishbein & Ajzen, 1975) For example, a person may intend to buy (behavior) a car (target) in a dealership (situation) after work (time).

Literature has agreed that attitudes determine the favorability of a person's intentions but not a given intention. (Fishbein & Ajzen, 1975) For example, two people may hold the same attitude towards a product, but they may hold different intentions concerning their behaviors towards it. Later, Fishbein & Ajzen (1975) add to their idea and state that they see no relationship, or one that is low and insignificant between attitudes and intentions, because there is no empirical evidence to prove otherwise. As in the case of the relationship between attitudes and behavior or attitudes and beliefs earlier discussed in the paper, it also can be said that there is a relationship between attitudes and intentions. However, it will not necessarily determine a causal connection. Thus, a favorable attitude will not necessarily mean a person will hold a buying intention.

Figure 3: The formation of beliefs, attitudes and intentions[6]



1.5.1 Fishbein's model for the prediction of intentions

According to this theory, there are two major factors that determine behavioral intentions: a personal or "attitudinal" factor, which is the person's attitude toward performing the behavior (Ab), and a social or "normative" factor, which is the person's subjective norm (SN). According to Fishbein's theory, the intentions are developed from these variables. The author admits there are also other variables that can indirectly influence the model. (Fishbein &

[6] This is authors' understanding from readings.

Ajzen, 1975) This model can be better understood and visualized in the context of attitude-behavior relationship, which is detailed in figure 5.

1.6 Prediction of behavior

Research has stressed that a person's behavior is, to a great extent, determined by a person's attitude toward an object. Studies have shown this by the fact that people who differed in their behavior also differed in their attitudes. (Fishbein & Ajzen, 1975)

In the following part, the relationship between attitude and behavior is analyzed and arguments are raised in order to shed some light on this phenomenon which, in the last decade or so, has not raised so much interest[7] as before 2000.

1.6.1 Relationship of Attitude and Behavior

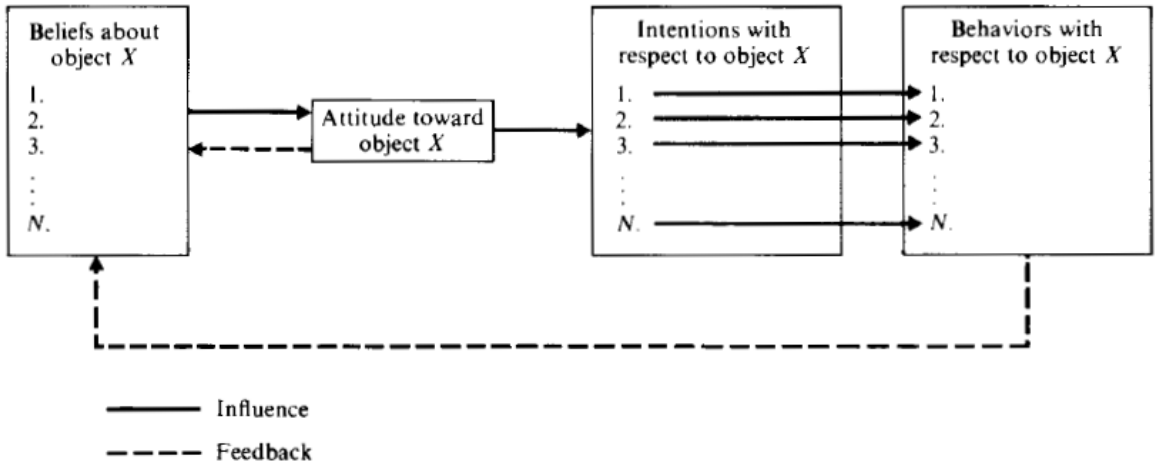
Attitudes have been of interest to researchers mainly because it creates a connection to behavior. (Schlenker, 1978) Needed to be mentioned is that, while connected, the two variables are distinctly different as attitudes are held and behavior is performed. (Ajzen & Fishbein, 1977)

"Attitudes are expected to predict and explain human behavior" (p. 12), because positive attitudes will have stronger chances of elicitation as compared to negative attitudes. Research has placed increased stress on evaluation as the primary element of attitude (Ajzen, 2008). For that reason, attitudes predict behavior in a more consistent manner when both attitude and behavior refer to the same 'evaluative dispositions'. (Ajzen & Fishbein, 2000)

In 1975, Fishbein & Ajzen wrote a comprehensive study on understanding the complex process that a person goes through from his/her initial beliefs until he/she reaches a certain behavior toward an object. In their first chapters, the authors develop a very clear and easy to understand framework (See Figure 4) that takes the reader on a journey from beliefs, through attitudes, then intentions, and finally to behaviors.

[7] This statement is made in the context of attitude-behavior research. It has come to the attention of this paper's researchers that many of the articles are old. This is mainly because attitude theory has not changed, and the findings tend to be consistent with studies that date back to the period between 60's to 90's. However, while recent articles were found, they did not contain new pieces of information and mainly had reviews to the articles written earlier in history.

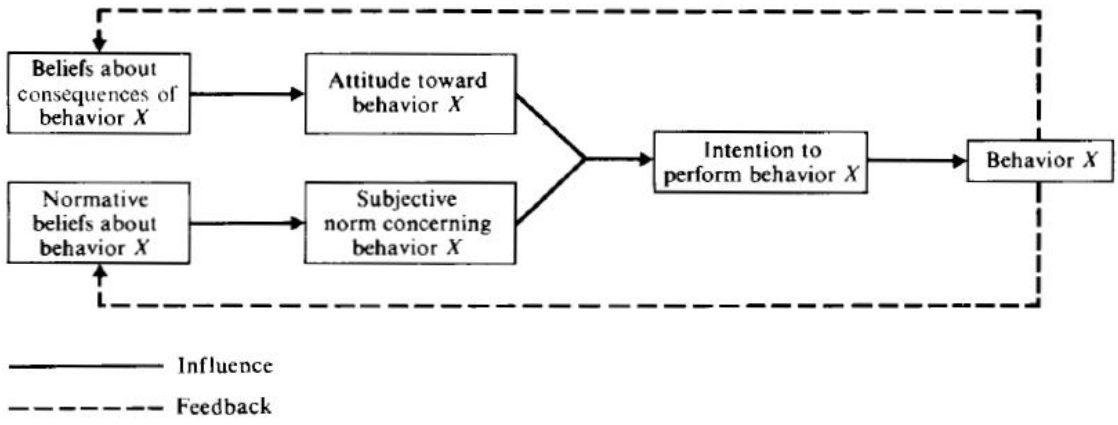
Figure 4: Schematic presentation of conceptual framework relating beliefs, attitudes, intentions and behaviors with respect to a given object. (Fishbein & Ajzen, 1975)



In comparison to the understanding of this paper's authors (See Figure 3), Fishbein & Ajzen (1975) promote a more simplistic perspective about behavior formation. They state that a belief about an object creates an attitude toward that object, which then transforms into an intention regarding that object. Finally, the intention can transform into a behavior towards that object. Their model adds the feedback connections that get created in this process. Besides the influence beliefs have on attitudes, there is also a feedback relationship between the two. Another feedback connection is created between behavior and beliefs. While there is no direct explanation by the authors of these feedback relationships, one can assume that once the attitude/behavior are formed, they contribute to the initial knowledge that the individual has, because in this stage the beliefs are tested and thus it might be that the individual changes or upholds his/her initial beliefs.

Because the purpose of the authors is to understand and predict behavior from various variables (e.g. beliefs, intentions), they further developed the initial figure (See Figure 4) by adding some components that ease the understanding of the process of predicting behavior.

Figure 5: Schematic presentation of conceptual framework for the prediction of specific intentions and behaviors (Fishbein & Ajzen, 1975)



The difference, in comparison to figure 4, is that Fishbein & Ajzen (1975) have transformed the initial picture into a more specific understanding, including Fishbein's intention prediction model. Besides this, the behavior is found as an influence coming from intention. Fishbein & Ajzen (1975) have argued that "*a person's behavior is determined by the intention he has toward performing that behavior."* (p. 381) In the attitude-behavior relationship, the intention variable appears to gain consistent attention, mainly because it is the intention that translates into a behavior, while the attitude first translates into an intention, as shown in figure 5. If intentions do affect a given behavior, this can be found by analyzing, for example, the level of specificity correspondence or the stability of an intention. In the case where intention is measured at the same level of specificity as the behavior, this will generally mean that there will be a higher correlation between the two. (Fishbein & Ajzen, 1975)

Because intentions may change over time, this will of course influence behavior. Thus, *"the longer the time between the measurement of an intention and the observation of the behavior, the greater are the chances that the person will reach new information and he might change his original intention."* (Fishbein & Ajzen, 1975, p. 370) It can be assumed that the stability of the intention is highly dependent on the time variable.

Fishbein & Ajzen have shown that many times that when there is an intention, an individual may fail to have a behavior because of some external influences that are outside the reach of the person. (Fishbein & Ajzen, 1975, p. 370) A simple case is that a person may intend to buy a car, but he/she may not have the money to purchase one. The subjective norm has also been shown to be one of the factors, besides attitudes, that determine behavior. The subjective norm is seen by the authors as a measurement of the influence of social environment on behavior.

Intervening factors that may lead to changes in intentions will therefore need to be taken into consideration. Another example is that if a person intends to buy a car in the near future, any change in price or budget may influence his/her intention.

"If behavioral prediction is the primary objective, the simplest and probably most efficient way to accomplish this is to obtain an appropriate measure of the person's intention. If understanding his behavior is the primary objective, the factors determining his intentions must be specified." (Fishbein & Ajzen, 1975, p. 382)

Having these aspects in mind, one can see the interconnections of factors that influence an individual in performing a behavior toward a given object.

Faris (1928) was maybe one of the first authors to define attitude in the context of a behavior. He said that attitude is a predisposition toward an activity, and he clearly mentioned later in the article that attitudes are "*essential to the adequate interpretation of behavior."* (p. 275)

Investigations have shown that knowing the attitudes of a person will permit a prediction of one or more specific behaviors. (Fishbein & Ajzen, 1975) The most conclusive statement of this relationship has been made by Doob (1947), who said that behavior can be predicted only by knowing the attitude. Research in this field has proven that whether a product will be bought or not depends to a large extent on the consumer's attitude toward it. (Blythe, 1997)

Nevertheless, the relationship between the two concepts has failed to be acknowledged as a clear science. Tittle & Hill (1967) say that the relationship is problematic because of the constant debate in attitude research regarding the relevance of attitudes to behavior.

Likert (1932)[8] has a very simple understanding of the attitude-behavior relationship as he argues that the probability of acceptance is extremely dependent on the type of attitude. The more favorable it is, the more the person will be inclined to have a favorable behavior.

It is argued that there is a connection between attitudes and behavior, and it depends largely on the degree of correspondence between attitudinal and behavioral entities. (Fishbein & Ajzen, 1977) If the correspondence is lacking, it can be seen that the relationship between attitude and behavior is low and insignificant. At the other end of the pole, it has been shown that there is a significant relationship between attitude and behavior as long as there is a high correspondence. In a total of 14 studied researches, Ajzen and Fishbein (1977) found, without exception, strong and significant attitude-behavior relationships. And the correlation between the two increased with the rise of correspondence degree. Another aspect that has been shown to improve the relationship between attitudes and behavior is the level of consistency. (Insko & Schopler, 1967; Peabody, 1967; Ajzen & Fishbein, 1977) Peabody (1967) argues that the consistency of the relationship is mainly dependant on whether the attitudes are favorable or not.

Nevertheless, there are several studies that go against this claim. It is believed and has been showed that there cannot be any evident connection between the attitudes and the behavior of a given consumer. These studies consider that attitude is only a mere factor, one of many that determine behavior. The conceptual framework of Fishbein & Ajzen (1975) suggests that performance or non-performance of a specific behavior cannot be predicted from the knowledge of a person's attitudes. For example, when a consumer considers the purchase of an automobile, in order for the person to buy it, a favorable attitude will not be enough to do so. Thus, one can see that the attitude plays only one role in regards to behavior, and that holding a favorable attitude toward an object will not necessarily lead to behavior. To complete this understanding, the authors argue that a specific behavior depends on the person's intention.

[8] Originally quoted in Fishbein & Ajzen (1975)

Snyder & Kendzierski (1982) clearly state that there may be no relationship whatsoever between attitudes and behavior, but they leave space for interpretation as they mention that knowing a person's attitudes may be used as a "*potential guide to action."* (p. 166) The authors put under question the validity of such a relationship, as it might be that some individuals may have an increased connection, while others not at all, and that some situations will have a higher degree of predicting behavior from attitudes, while others will not.

When speaking about the limitations that raise the skepticism toward the attitude-behavior relationship, several authors name relevance, accessibility and correspondence as main determinants. As such, Tittle & Hill (1967) talk about the relevance of the situations in which the individual finds himself. If one is in a situation that is unfamiliar, he/she is likely not to have organized attitudes that would be relevant for a behavior in that given situation. Also the issue of accessibility can be discussed, as the individual may not access the appropriate attitude in a given context. With this is mind, it can be assumed that a higher relevance and accessibility of attitudes will happen in a familiar situation, which will increase the correspondence between attitudes and behavior. Fazio et. al (1986) add to the accessibility concern by writing that attitudes that have strong object-evaluation relationship will make the attitudes more accessible. Furthermore, the strength of an attitude at a given moment will determine to a greater extent the relationship between attitude and a behavior. Snyder & Kendzierski (1982) also consider availability and relevance of attitudes as "*necessary requirements for generating correspondence between attitude and behavior,"* and their findings are consistent with this statement. (p. 167) They see that relevance alone can make individuals adopt a "'*believing means doing' orientation,''* which provides an *'action structure'* that will lead to "*enacting specific behaviors that accurately reflect general attitudes"* (p. 181). To strengthen the above statements, Tittle & Hill (1967) found that three out of four studies show attitude as highly related to behavior.

To sum up, one can consider that there is a relationship between attitudes and behavior. This relationship can have a high degree of impact, but at the same time, it can be said that having favorable attitudes will not always translate into a favorable behavior. This only shows that attitudes are important but are only one factor that can influence the behavior of a consumer. While this being true, authors have shown that there is a real connection that is created as long as there is a high degree of inter-dependency between the two factors – attitude and behavior.

1.7 Attitude theory and measurement

In 1947, Doob was stating that attitude measurement has been discussed and demonstrated for more than 25 years, and the general concept of attitude measurement is still one of intense debate and discussion. This clearly shows that it is of interest to many stakeholders (e.g.

marketers, companies) to know what the consumers' attitude is toward a product. (Blythe, 1997) In the previous part, it has been shown that attitudes play a major role in regard to consumer behavior. Thus one may consider that measuring consumer attitudes can be a good way of making a connection between the consumer (and his/her attitudes) and the product (and a specific behavior) with the purpose of having a better understanding of this relationship.

"Attitude has to be inferred from statements or behavior; it is intangible and not directly observable. [...] although we can observe and measure behavior, we have to ask people about their attitudes to various things." (Blythe, 1997, p. 70)

Attitude measurement is related to an evaluative dimension in most of the cases. Fishbein & Ajzen (1975) discuss that two of the main attitude measurements are a person's preference for a given object (e.g., like-dislike) or his/her favorability with respect to the object (e.g., favorable-unfavorable, approve-disapprove). Attitudes will always be measured toward different entities that may be objects, persons, institutions, etc.
There are several ways of measuring attitudes: measuring one's beliefs, opinions, or the actual behavior.

1.7.1 Beliefs as indicants of attitude

"Beliefs are a matter of associating an object and an attribute, so the key to measuring a belief is to identify the attribute that is linked to the object. Thus any judgement linking an object to an attribute category or to a position on an attribute dimension constitutes a measure of belief content. [Furthermore]*, it can be viewed that a person's attitudes can be assessed by considering beliefs about the attitude object and evaluations of attributes associated with the object. It can be concluded that attitudes are a function of an individual's beliefs."* (Fishbein & Ajzen, 1975, pp. 57, 86, 88)
The above authors consider beliefs as the only way to measure attitudes, but there is research that adds other ways as alternative or complementary measures.

1.7.2 Opinions as indicants of attitude

The relevance of opinions as measures of attitudes has been discussed by several authors. Thurstone (1928) & Doob (1947) say that the opinion symbolizes/expresses the attitude. In his study, Thurstone (1928) specifically uses opinions as a measurement method of attitudes. However, he acknowledges that the use of opinions is a considerable limitation to this measurement type due to the possibility that a person can intentionally or unintentionally avoid presenting his/her real attitude.

1.7.3 Behavior as indicant of attitude

Another possibility that has been discussed is whether attitudes can be measured by analyzing one's behavior. One would assume that a behavior will show what the attitudes of the person were before the actual behavior. Thurstone (1928) says that this method is actually invalid because a person may hide his/her real attitude for various reasons and perform a behavior that is in contradiction with the attitude. Thus it makes no real connection or proof that behavior will be guided by attitudes.

One of the most conclusive studies that used behavior as attitude measurement was LaPiere (1934), who travelled with two Chinese nationals in the US. During that period, they were accepted at all hotels and restaurants, with 2 minor exceptions. However, 6 months later, LaPiere sent out a survey to the visited establishments and surprisingly the results showed that 98% of respondents would not accept Chinese clients in their hotels or restaurants. This shows that having a certain attitude toward something will not mean that the person will act congruently with the attitude.

1.7.4 Measurement scales

Fishbein & Ajzen (1975) have agreed that there are unlimited measurement procedures that have been used and are still used in the attitude domain. The major attitude scaling methods as found by the authors are as follows: (pp. 68-76)

a. Guttman Scalogram Analysis – This method gives an attitude score through the consideration of a person's beliefs or intentions and their associated evaluations. The procedure of measuring attitudes, accepted and used by Guttman, is characterized by a number of questions that are arranged on a scale. (Doob, 1947)

b. Thurstone's Equal-Appearing Interval Scale – This method involves the collection of a large pool of beliefs or intentions related to an attitude object. In his paper, Thurstone (1928) describes that the scale consists of statements of opinions, and that each will appear on a base line. Then it is only about counting the number of statements chosen on the continuum.

c. Likert's Method of Summated Ratings – This method consists of collecting a large pool of items, and respondents are asked to answer on a five point scale (e.g. agree strongly, agree, undecided, disagree and disagree strongly).

d. Osgood's Semantic Differential Technique – This method states that a person's attitude toward a given object can be measured by asking that person to rate the object on a set of scales.

"All measures relate the attitude concept to a person's beliefs or intentions and their associated evaluations." (Fishbein & Ajzen, 1975, p. 87)

It can be agreed that all these methods address the same concept and can be used individually or together. Fishbein & Ajzen (1975) write that while the scales seem similar or very close related, studies have shown that different results will be obtained when using one or another. The underlying complexities are not of use in the current study, but they can be developed in another more contemporary research, since these studies date back to as much as 40-50 years ago. Seeing this, companies are in the process of deciding what new methods of measuring consumer attitudes can be adopted (Court et. al, 2009), so that the results will be congruent with reality.

All the existing scales in use, as well as the ones described above, can be unipolar or bipolar. "*Thus a scale ranging from favorable to unfavorable is a bipolar or bidirectional scale, whereas scales ranging from not at all favorable to favorable are unipolar or unidirectional."* (Fishbein & Ajzen, 1975, p. 55)

In the above chapter it could have been seen that attitudes can be had towards many entities. Thus a person may have attitudes in regards to products, institutions, situations and many more, as an individual is entitled to having attitudes towards everything that surrounds him. In the past decades, consumer attitudes have had grown interest, both from researchers as well as marketers. This is consistent with the continuous need to understand and better address the consumer.

For the purposes of this paper, the authors will go further with attitudes in the automotive industry, and find the certain particularities that attitudes have in this specific industry. Because attitudes are different depending on the entity they are towards to, it is expected that in the context of automotive industry consumers to have specific attitudes, that are applicable only to this market.

2. CONSUMER ATTITUDE INFLUENCING FACTORS

Consumer attitudes have been and still are a key factor for companies. As one of the key concepts in psychology, it provides an understanding of the 'pre-stage' of one's behavior. From a business perspective, consumer attitudes are responsible for an evaluation of a product or service and consequently the purchase or not of this product or service. (Fishbein, Ajzen; 1975)

The purpose of this chapter is to describe, discuss and analyze consumer attitudes in the automotive industry. Factors and dimensions that influence attitudes in the automotive industry are also analyzed.

2.1 Car attributes

In order to understand consumer attitudes in the automotive industry, it is necessary to define the object to which the consumer addresses his/her attitude. In the case of this paper, the object is a car. The car, as a product, consists of different attributes which affect consumers' attitudes. These different attributes cannot all be known by each consumer, so consumer knowledge about car attributes is limited or varies. Because car attributes can affect consumer attitudes, they need to be analyzed by marketers, as this might raise consumers' attraction toward a specific car. Attributes can be classified into two categories: tangible and intangible. Tangible are those which consumers have contact with (e.g. the material the steering wheel is made of, how many gadgets this particular car has and what is their usefulness), while the intangible attributes are those which provoke consumer senses and create an impression based on abstract observations (e.g. design or stylishness of interior). (Olson & Peter; 1999) Therefore consumers are judging a car for both its physical and abstract characteristics.

Even though attributes have an effect on attitudes, not all attributes of a product are important to consumers. That is why defining the important attributes should be considered from perspective of consumers. It can be hardly proven that, for example, the relationship between the car's horse power and its weight is important knowledge for the vast majority of consumers. Gupta and Lord (1995) addressed the issue of defining decisive attributes of a car for consumers. Their study revealed that consumers are evaluating cars regarding their 'price, reliability, gas mileage, rear leg room, ride, front seating, acceleration, routine handling, and luggage capacity.' (Gupta and Lord; 1995) Car attributes are thus defined and evaluated based on the subjectivity of the individual consumer which is consequently shaping his/her attitude. These subjective evaluations can be dependent on more factors, and as the following section discusses, these factors significantly affect individuals' attitudes and their actions.

2.2 Factors affecting consumer attitudes in the automotive industry

2.2.1 Consumer experience

Attitudes of consumers are built around the specifics of a particular product. In the case of a car, these specifics could be car attributes like fuel economy, safety, reliability, acceleration, styling, and workmanship. These attributes are perceived by consumers differently. One of the ways to perceive car attributes is by regarding the country of origin where certain car manufacturers are operating. Brown et al. (2007) analyzed consumer attitudes in the U.S. towards foreign importers from Japan and Europe. Already mentioned attributes were matched to the car manufacturers in respect to the country they came from, and consequently these manufacturers (countries) were ranked. According to this study, the highest overall ranking, while taking into consideration all mentioned attributes, was received by Japanese and German (West Germany at that time) car manufacturers. They were considered as manufacturers producing the most reliable, stylish cars with solid fuel economy and workmanship. (Brown et al., 2007)

The study of Brown et al. (2007) can be questioned as it might be viewed out-of-date. The opposite is true because consumer attitudes are rarely being changed. As Blythe (1997) argues, the attitudes can hardly be changed with new circumstances, objects, or in this case, cars. Consumers will simply consider and prefer one product from another because they have 'first' or 'second-hand' experience. (Blythe; 1997) In other words, consumers in the U.S. would buy rather Japanese or German cars, or at least have a higher inclination towards them than to the others because of their own experience or from other people's experience. Therefore experience from the past is one of the determinants of consumer attitudes.

2.2.2 Gender

One of the criteria of understanding the consumers' attitude is gender, more specifically the difference between genders. For marketers, it is very important to understand this distinction since men and women have different attitudes toward different product attributes. On a very general level, women are characterized by literature as generous, nurturing, and more cooperative. Men, on the other hand, are more dominant, competitive, and more likely willing to take risks. In the past, marketers were more oriented on the male population as they were considered to be the main purchasing class.[9] This homogeneous view is not valid anymore, and the female population is equally of interest to marketers. In the other words, both male and female attitudes are pursued with the same importance. (Peter & Olson, 1999)

[9] General illustration of the way how gender characteristics could be distinguished

From the purchase perspective, the difference in male and female attitudes is also significant. According to literature, besides being attracted to a particular product attribute(s), males and females have different ways of evaluating of a product. Females tend to examine and analyze a product in detail before they make a purchasing decision. Males tend to think in simpler ways and evaluate the overall characteristics of a product. Males are also more open-minded to trends, while females tend to be more skeptical to new products and even scared of them. Distinction between consumer attitudes based on whether they are female or male is not sufficient, though. It seems, according to literature, that masculine and feminine traits have to be taken into account. In other words, some females' and some males' consumer attitudes can be positive, more or less, to the features of the product that are perceived to be attractive for the other gender (e.g. females can be inclined toward male products). (Hoyer & MacInnis; 2007)

Male and female consumer attitudes depend also on the characteristics of the product and their involvement in it. An important facet in this case is their product overview. According to Creusen (2010), females respond to products differently as they appreciate the more symbolic facets of the product. In their mind, beauty, prestige, or any other emotional aspect is of high importance for them. Men, on the other hand, evaluate products from their functional perspective and practicality. (Creusen; 2010) Involvement is also important as products tend to have gender as well. Douglas et al. (2010) argue that based on perception in society, products and services have their feminine and masculine identities, and consumers tend to identify themselves with them. Thus, the gender of products and services has an effect on consumer attitudes. (Douglas et al., 2010)

Coming back to Hoyer & MacInnnis (2007), the gender of products does not seem to be strictly set. Nowadays, there are many products on the market which are less sex-typed and more oriented to satisfy the shifting needs of consumers. For example, females are starting to have a more positive attitude towards motorbikes and cars which have been considered a male domain for a long time, or men are using more skin-care products. (Hoyer & MacInnis; 2007)

2.2.3 Age

Consumer attitudes can vary depending on the age of the consumer. They express different attitudes towards products during their lives. Consumer attitudes at a particular age also reflect the lifestyle consumers prefer. Thus, their attitudes are changing with respect to their age. Consumers are usually divided into several age groups. Most commonly used are youth (under 18), 'generation X' (ages 18-29), 'baby boomers' (ages 30-mid 50s), and seniors (age 50+).[10] (Hoyer & MacInnis; 2007) For the purpose of this paper, the 'generation X' is the

[10] This distinction is illustrative since many theoretical sources provide readers with different classifications

most important. However, there is also a need to explain the following two because 'generation X' will be there in a few years.

'Generation X' consumers are characterized a highly potential group of consumers for marketers in the long-term perspective. These consumers are creating their own attitudes towards particular products in this stage of life. Consumers in this age category usually have a free spirit and are open-minded. Usually they do not have a materialistic attitude and do not respond to brand names. They respond positively if marketers communicate in a language understandable for them, usually reflecting their lifestyle. These consumers treat products in the same way, too. (Schiffman & Kanuk; 2000) 'Baby boomers,' on the other hand, are a group of people who are the most attractive to marketers since they hold high purchasing power and are starting to spend money on more expensive products like cars, for instance. They also have a positive attitude towards consumerism since they usually have families. This obliges them also to care more about the future, and life stability. They also tend to be involved and identify themselves with their favorite products. (Schiffman & Kanuk; 2000)

The seniors group is the most overlooked group of consumers. According to Bartos (1980), 76% of all seniors are promising consumers. They also have variable attitudes, and what cannot be forgotten is the fact that they have fewer expenses than the previous two groups. Seniors tend to enjoy their lives since their children are already self-supporting. An interesting fact is that for most of the seniors, their age is not so important, and they do not like being marked as old. This group of people usually has enough wealth and is less concerned about spending it. Seniors have already developed attitudes toward some products and can have problems modifying these attitudes. (Bartos, 1980)[11] The research by Bartos is supported by Myers and Lumbers (2008), who also discussed complexity of senior group of consumers. In their study, senior consumers are marked as group affected by different historical events which shaped their attitudes. Myers and Lumbers (2008) argued that senior consumers' behavior express certain chronological variability, even though they are being analyzed within the same age group. The main finding in this study was that current seniors express 'younger' attitudes than their parents, which is in line with Bartos' finding regarding seniors' resistance of being marked as old.

If a car is taken as an example of a product, for car companies, 'baby boomers' and seniors are the most attractive groups. In those stages, consumers are having a kind of self-identification with a particular model of car. The car reflects their status but also serves a functional side, depending on the consumer's preferences (safety, family orientation, leisure, enjoyment, etc.). (B&T Weekly; 2006)

[11] There is a certain limitation that needs to be said. The study was conducted in developed countries. Therefore these findings cannot be considered as ultimate.

These age groups are not the ultimate distinction of consumers. Demographics, age included, is changing overtime and is dependent on many variables causing changes in society (technology, aging the population, etc.). (Pol, 1986) The classifications above served as an illustration of the effects they could have on the formation of attitudes. One can conclude that consumer attitudes are changing and dependent on the current stage of life one is in. These changes can be considered an evolution of attitudes rather than an ultimate shift to different attitudes.

2.2.4 Social class

Another important facet defining consumer attitudes is the social class to which the consumer belongs. Based on people's identification with a particular social class, they express certain attitudes towards particular products, not only consumption by itself. (Williams; 2002)

Products have their specific attributes which are evaluated by consumers. Cars are a complex product consisting of many attributes. Thus they are subjected to consumers' evaluation, which is based on their belonging to a certain social class.

Therefore, social class is of interest to researchers and marketers as well. From the marketers' perspective, the proper analysis of social class, or segmenting consumers into social classes, has immense significance for their product development and marketing strategies. They usually analyze social classes using these variables: education, occupational requirements, and economic power. (Blythe; 1997)

Consumers can be put into social categories. In these categories, the consumers act differently, but individuals within the same social class mostly share similar kinds of attitudes and consequently, purchasing behavior. Belonging to some social group, however, does not mean permanent status. Individuals can eventually move to higher or lower social class. This act is called social mobility. One can expect that attitudes and behavior can be changed due to social mobility. But most of the researchers argue that attitudes and behavior cannot be different within a same social class. (Kanuk & Shiffman; 2000)

Consumers within a same social class also share lifestyle which is considered an external reflection of their attitudes and behavior. Particular social classes can have different lifestyles which can be changed, to some extent, with migration to another social class. For an illustration, the lower classes worry about day-to-day living expenses, whereas the upper classes tend to enjoy the conspicuous spending of their wealth. (Kanuk & Shiffman; 2000) This is a very simplified distinction since characteristics of different lifestyles are rather complex. The point of mentioning the lifestyle concept is that it is closely interrelated to consumer attitudes. When measuring lifestyles, for instance, consumers are approached with questions regarding their activities, opinions, and interests. (Blackwell et al., 2001) On the

other side, when measuring attitudes one has to take into account different lifestyles and social class.

Social class is defined by level of education, occupational requirements, and economic power. According to Williams (2002), occupation refers to the status the individual or the family has. This status is defined by owning some property but mostly with labor class, which means the kind of job position the individual has. Economic power refers to the level of income and wealth. Education is defined by Williams (2002) as an important facet characterizing social class. It has a high correlation with occupation and economic power. Williams (2002) argues that highly educated people put more emphasis on getting more knowledge about products; and they base their evaluation on already acquired knowledge and the 'investigation' they executed before making a decision. (Williams; 2002)

The relationship between social status and products can be found in the work of O'Cass & McEwen who examined how consumers tend to choose certain products which correlate with their social status. O'Cass & McEwen argue that individuals tend to express their social status through material possession. Moreover, they identify themselves with those products. Thus, cars, as other products, reflect one's social status. Consequently, having a certain social status defines attitudes and leads to the ownership of a specific car. (O'Cass & McEwen; 2004)

2.2.5 Consumer awareness of product

Awareness of a certain product is a crucial facet for consumers in order to create the sort of attitudes which will consequentially lead to the evaluation of a product and purchasing decision. To reach a good understanding of consumer awareness of a product, which is also purpose of this paper, this concept will be broken down on sub-concepts: product knowledge and product involvement. Lastly, young consumers will be mentioned and their learning of consumption and products.

a) Product knowledge

Consumers have or can acquire certain attitudes toward products while they are evaluating product's attributes and using their experience. In order to understand the concept of product knowledge, it is necessary to extend this finding.

Product knowledge can be defined as stored information about a particular product. (Long-Yi & Chun-Shuo; 2006) Based on this premise, consumer attitudes are influenced by the knowledge these consumers have. Moreover, Long-Yi & Chun-Shuo (2006) proved in their study that there is a strong positive link between product knowledge and purchasing decision. Consumer attitudes have an effect on purchasing behavior; therefore what consumers know about products can create positive or negative attitudes toward these products.

Product knowledge is also examined by Brucks (1985), who maintains that consumers rely on two kinds of knowledge, subjective and objective, which they use to make a purchase decision. Subjective knowledge is defined as the confidence of the consumer in his/her knowledge, and objective knowledge is defined as the actual knowledge consumers have. (Brucks, 1985). As Brucks (1985) maintains, objective knowledge is used by consumers to evaluate attributes of products. The more knowledgeable the consumers are, the more they try to get information about the products. Coming back to Long-Yi & Chun-Shuo (2006), they also proved in their study that the more knowledgeable consumers got more information about the product.

One can see that consumers have certain knowledge about certain products. Baker et al. (2002) reach the conclusion that consumers' knowledge about a new product is based on knowledge about already existing products. This finding is based on two preconditions: products have to be within the same product class, and application of existing knowledge on the new product is based on the consumer level of knowledge (low or high). What Baker et al. (2002) proved is that high knowledgeable consumers are less affected by specifics of a new product and tend to evaluate this product with using the knowledge they already have. Low knowledgeable consumers are more easily affected by information about the new product and are more easily convinced. (Baker et al., 2002)

b) Product involvement

Another characteristic of consumers' awareness, worth mentioning, is product involvement. It is defined as the reflection of the individual's lifestyle, identity and, in this case, attitudes. In other words, consumers tend to lean toward sorts of products because they identify themselves with them. (Traylor; 1981) In the literature about consumer behavior, it is possible to find two kinds of involvement: cognitive and affective. Cognitive involvement is recognition of potential usefulness of the product. Affective involvement is mostly connected with the evaluation of the products by individuals. It also can express high emotional responses towards products. Depending also on intensity of consumers' involvement with products, these consumers express higher interest for getting more knowledge about products; and it positively affects their purchasing decision. (Peter & Olson; 1999, Long-Yi & Chun-Shuo; 2006)

The consumers also express high or low involvement with products. The level of involvement is decided by consumers based on their evaluation for one product's ability to positively correspond to consumers' values, beliefs and norms. (Peter & Olson; 1999) Traylor (1981) is using the term 'ego-involvement' in his study to address why consumers tend to spend more time on choosing a product. He used example of automobiles, which is, according to him, a highly ego-centered product because consumers who are purchasing a car are matching this product with their personalities. (Traylor; 1981)

c) Young consumers

The choice of this social group is not random because young consumers acquire knowledge about products, they learn how to consume, and they evaluate what products are worthy to purchase. This knowledge is being acquired, according to theory, in age from 15 to 20. (Martin & Bush; 2000)

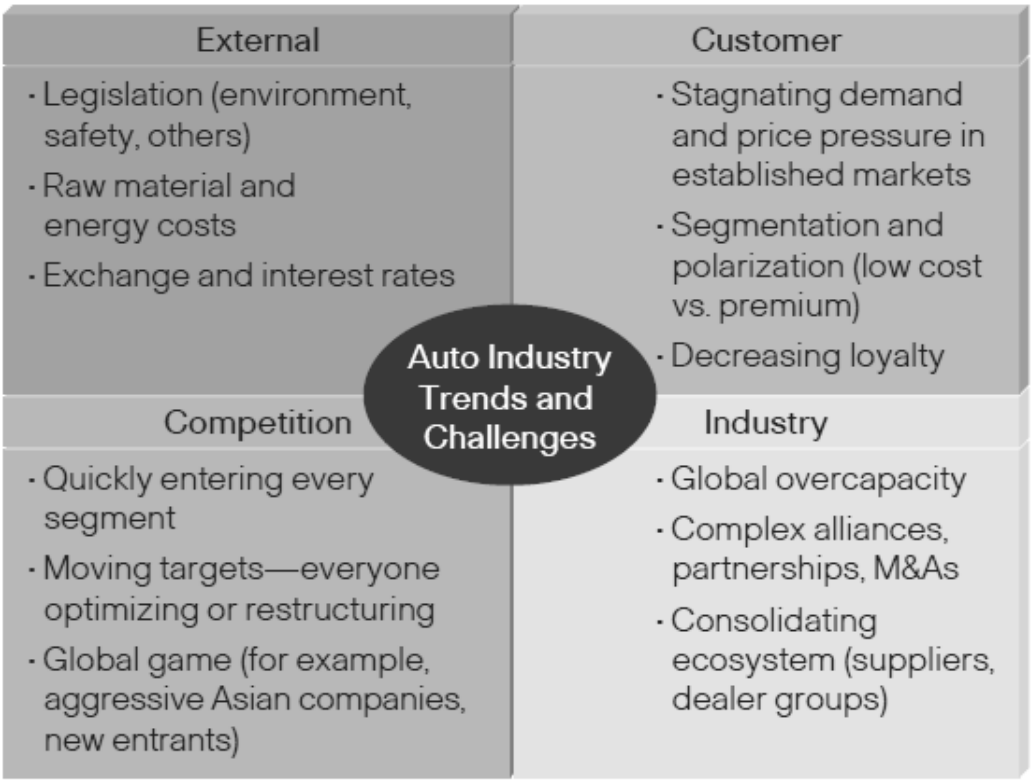
The reason why young consumers are mentioned is that at this age they go through a learning process of how to purchase. They are influenced by several factors. As Martin & Bush (2000) stated, younger consumers learn from their environment through observation. First factor influencing their learning are parents or other relatives. Other factors are peers, professors or media. Martin & Bush (2000) call these factors role models. By observation of these factors, young consumers create their attitudes and beliefs.

Keillor et al. (1996) call this process socialization. In their research, young consumers are proved to be firstly influenced by parents. The authors also maintain that as young consumers grow, they start to rely more on their peers or on their own judgments. Nevertheless, they are still influenced by external factors (media etc.). This argument is partly supported by Te'eni-Harari & Hornik (2010) who are discussing product involvement of young consumers. They prove that with growing age, young consumers' product involvement decreases.

2.3 Changes in the automotive industry

Due to the complexity of consumer characteristics and the fast changes in consumer demands, automotive industry is facing various challenges with same intensity of change. Schwarz (2008) developed a framework with global trends that the automotive industry is going through. According to Schwarz's framework, the automotive industry will face and is already facing challenges from fast growing automobile companies, especially from China. More important, consumer attitudes toward cars, as a product, are shifting. The main reason behind this is the growth of oil prices and environmental pressure. These factors caused dramatic shift in consumers' demand and forced car manufacturers to become more adaptable, flexible and invest more in product development.

Figure 6: Global trends and challenges in the automotive industry (Schwarz, 2008)



Winterhoff et al. (2009) in their study named other global trends like 'individualization', which basically means shift from conservative and strongly mass kind of demand to more fragmented demand based on different lifestyles consumers have. What is more, Winterhoff et al. (2009) pay attention also on 'social trends' which can be considered as determinant of consumers' attitudes. One of the things they noticed is ageing population which is not necessarily a problem because, as they maintained, new old generation has its specifics like living active life and high purchase power. Consumers are also less oriented on luxurious cars and they are searching for products which would reflect their daily needs and requirements. Moreover, they are switching their purchasing habits as they are not anymore oriented only on one class of products but looking for variety of products depending on their actual needs. Consumers also tend to be more interested in new technology but with appreciation of simplicity. What is considered to be a biggest trend affecting consumers' attitude, is environmental responsibility. This factor, which is becoming more to be a moral obligation, forced consumers to think in so called 'green' way. They tend to fit environmental responsibility to their lifestyles and that affects their attitudes and consequently products requirements. (Winterhoff et al., 2009)

As consumers are becoming more diversified in their needs, this distinction cannot be made from general point of view. One has to take into account also circumstances of particular country or world region. While consumers in developed country are diversified based on their lifestyle specifics, consumers in emerging markets (example China) are more practical

regards cars. Their condition of living does not allow for most them to avoid new/used car and if so they pay precise attention on factors like price. Even in big urban areas, where a precondition of high purchasing power could appear, people adapt the purchasing of a car to practical requirements like price, gas consumption, impact on the environment. Consumers in urban areas also incline more to environmentally friendly cars, as the pollution in big Asian cities crossed bearable levels. (Winterhoff et al., 2009)

In the following chapter, in this paper the Electric Vehicle (the EV) concept will be discussed. The presentation of EV definition and its strong and weak sides will serve an informative function. It will provide reader with good understanding about the EV and linking point to the essence of this paper.

3. EV CONCEPT

3.1 Introduction

The EV concept is receiving increasing interest, and many stakeholders are shedding light on this subject. In the context of long-term emission targets, Electric Vehicles are becoming a topical concept. (European Parliament, 2010)

In March 2011, the International Geneva Motor Show has organized an automobile event that presented what was new and what the future will hold for this industry. The event had a "Green Vision" section that promoted the segment of eco-cars and the section had 12 brands that displayed a total of 13 different Electric Vehicles.[12] The event stressed the importance of the EV concept and the fact that it is a phenomena happening right now.

As some investigations (Green Car Institute, 2010; Anderson & Anderson, 2010) show, the interest for the Electric Vehicle has been present for more than a century now and there is a real consumer market and car fleet.

Because of the huge benefits that Electric Vehicles (EVs) bring in terms of environmental protection and energy consumption, they are undoubtedly the motorized road vehicles of the future.[13] This statement belongs to the Association of Electric Vehicles in Europe, and shows why the concept is gaining acceptance. To add, the considerable interest in Electric Vehicle is due to climate change concerns and environment, tougher efficiency standards and increasing oil dependency. (Deal, 2010)

3.2 Definition of EV

The Electric Vehicle can be defined as a vehicle where an electric motor powers the wheels.[14] It is an "*innovative"* vehicle (Ewing& Sarigöllu, 2000, p. 114) "*and has the highest engine efficiency of existing propulsion systems and zero tailpipe emissions."* (European Parliament, 2010, p. 7) The characteristics that set a border between the EV and regular fuel cars is that it does not have any tailpipe emissions, it pollutes less and conserves energy. Also EVs are cheaper to run, averaging twice the distance of a normal car. (Anderson & Anderson, 2010, p. 12)

A more comprehensive manner of defining the EV, is the definition of Anglin (2008) whom states that "a*n Electric vehicle can be described as a ground vehicle propelled by a motor*

[12] http://www.salon-auto.ch/en/pavillon_vert/ - accessed March 7, 2011
[13] http://www.going-electric.org/who/mission.htm - accessed March 7, 2011
[14] http://www.electricauto.org/?page=EVGlossary – accessed March 8, 2011

that is powered by electrical energy from rechargeable batteries or other source onboard the vehicle, or from an external source in, on, or above the roadway. […] The EV refers to an automotive vehicle in which the propulsion system converts electrical energy stored chemically in a battery into mechanical energy to move the vehicle. This is classed as a battery-only-powered electric vehicle." (p. 1)

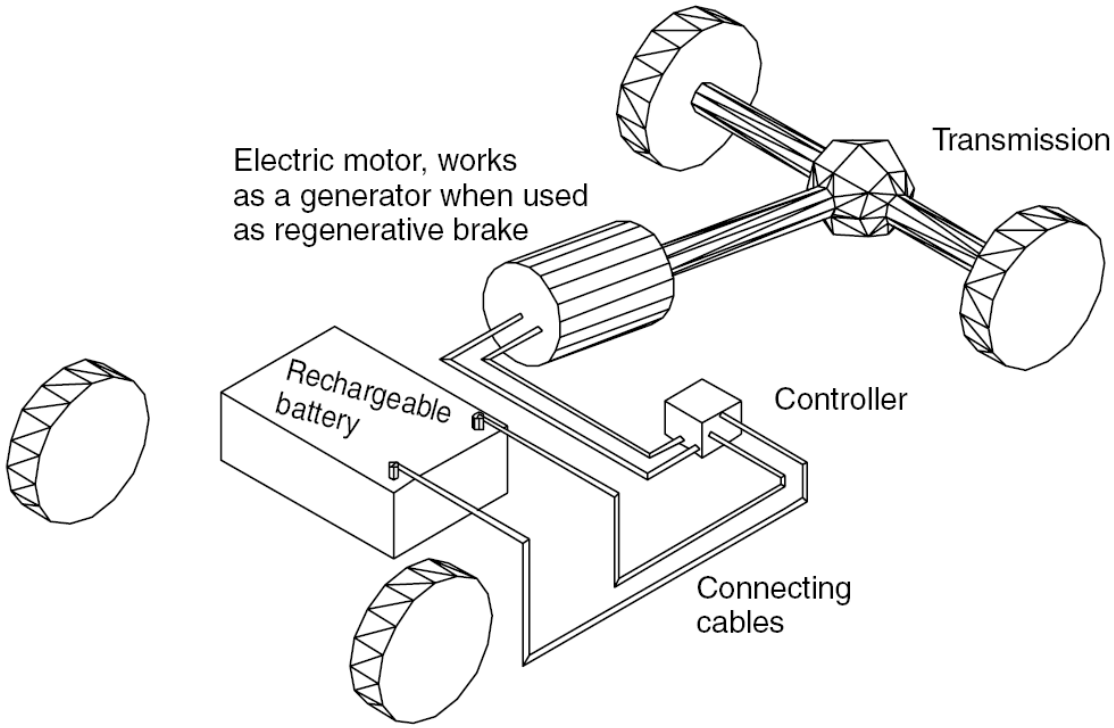
Larminie & Lowry (2003) researched the Electric Vehicle technology and managed very well to convey the essentials of this concept. While many people usually relate the EV term to the traditional battery electric vehicle, the existing knowledge distinguishes between six categories of Electric Vehicles. (Larminie & Lowry, 2003, pp. 7-9):

a. Battery Electric Vehicle (BEV)
b. Hybrid Electric Vehicle – combines a battery and an internal combustion engine
c. Vehicles that use replaceable fuel – either fuel cells or metal air batteries
d. Vehicles supplied by power lines
e. Vehicles that use solar energy from radiation
f. Vehicles that store energy by alternative means such as flywheels or super capacitors

While there are several types of Electric Vehicles, the paper will be strictly focusing on the Battery Electric Vehicles. Because the body of knowledge has undertaken so many terminlogies for the Electric Vehicle, such as Zero-Emission vehicles (ZEVs) (Ewing & Sarigollu, 2000) or Battery-only-powered vehicle (Anglin, 2008), and others may go to concepts such as Pure Electric Vehicle (PEV). It is in the interest of the paper and for the better understanding of the readers, that we will use the terminology of EV.

The characteristics of the Electric Vehicle, as Larminie & Lowry (2003) put it, "*are that it consists of an electric battery for energy storage, an electric motor, and a controller. The battery is normally recharged from main electricity via a plug and a battery charging unit that can either be carried onboard or fitted at the charging point. The controller will normally control the power supplied to the motor, and hence the vehicle speed, in forward and reverse. This is normally known as a 2 quadrant controller, forwards and backwards. It is usually desirable to use regenerative braking both to recoup energy and as a convenient form of frictionless braking. When in addition the controller allows regenerative braking in forward and reverse directions it is known as a 4 quadrant controller."* (p. 8)

Figure 7: Concept of the Electric Vehicle (Larminie & Lowry, 2003)



Larminie & Lowry (2003) show in the above figure the simplicity behind the EV concept, and it is valuable for anyone to have a inside look on how the main parts of the car are actually positioned and how they work in powering the Electric Vehicle.

3.3 Strengths & Weaknesses of the Electric Vehicle

3.3.1 Strengths

The Association of Electric Vehicles in Europe (AEVE) has devised a number of factors that can be translated into the real benefits if the concept will be more globally accepted:

a. Positive effects on environment and pollution

It has been many times stated and it has become a fact that EVs are having a positive impact on the environment as they produce no exhaust emissions (Larminie & Lowry, 2003) and thus substantial air quality benefits. (Ewing & Sarigollu, 2000) They are cleaner and more fuel efficient compared to internal combustion vehicles. (Association of Electric Vehicles Europe)

Other significant advantages, listed by the AEVE (2010):

- *"Electric vehicles consume less energy than fossil fuel vehicles;*
- *Electric vehicles generate significantly less CO2 than fossil fuel vehicles;*
- *The electric cars in production or in the pipeline consume less energy and generate significantly less CO2 emissions than the cleanest fossil fuel cars;*

- *Electric vehicles will have a positive impact overall on electricity production."*

b. They are extremely quiet, and it is expected that they will eliminate almost all traffic noize (Larminie & Lowry, 2003 & AEVE)

c. The Association of Electric Vehicles in Europe found that if Electric Vehicles would be use on a global scale, the benefits will be that they would: (p. 1)

- *"To save around 20% of oil production and thus reduce oil dependency;*
- *To significantly reduce urban pollution;*
- *To eliminate almost all traffic noise;*
- *To reduce traffic and parking congestion."*

3.3.2 Weaknesses

a. Limited range due to their battery capacity, and thus their use will be restricted to commuting. (EABV, 2010)

b. Not easy to refuel – as compared to internal combustion (IC) cars. (Larminie & Lowry, 2003, Ewing & Sarigollu, 2000)
A major drawback for the EV is the time it takes to recharge. Because it takes too much time, it becomes a great inconvenience for the consumer.

c. Price of car
Electric Vehicles have been known as being expensive when compared to IC cars. In the last years, the price gap between the two different car classes has been strongly diminishing, but still, today consumers have to pay a premium price for an Electric Vehicle. The main reason for the price is relaetd to the fact that batteries are very expensive, as Larminie & Lowry (2003) state.

d. Poor acceleration and speed
A considerable disadvantage that seems to follow the EV concept ever since its birth in 1900 is that they lack the speed of regular cars. Thus in 1910, Victor Appleton wrote that "*while they were very nice cars*, [they] *didn't seem to go very fast or very far."* (Anderson & Anderson, 2010, p. 166) Unfortunately not much has changed since then, this still remaining today an issue of consideration for potential buyers. Another reason tied to speed is also the poor acceleration of the Electric Vehicle.

3.4 EV – Past, Present and Future

The history of the EV is of importance to the paper because one can see the developments and how this car has managed to continue its existence until today. Anderson & Anderson (2010) divide the history of the Electric Vehicle into three parts:

a. The Early Years (1890–1929)
While the initial Electric vehicle is dated back to 1830's, it is only in the 1890's that the concept became commercialized, and the first automobile to be put into production is thought to be a German Benz in 1885. Interestingly enough, *"in the 1900 in France there were 5,600 automobiles in France and 265 electric charging stations"*, which can be seen as an amazing fact dating back in history. Another extremely fact is that in 1905 some researchers made a car that ran 130 miles on a single battery charge. (Anderson & Anderson, 2010) Then, the EV was a real success as it had so much more benefits than an internal combustion (IC) car. *"It was clean, silent, free of vibrations, thoroughly reliable, easy to start and control (no shifting required) and produced no dirt or odor. The disadvantages were short range and high initial cost. Interestingly enough, Electric vehicles outsold all other types of cars in America in the years 1899 and 1900."* (Anderson & Anderson, 2010, p. 22) Nevertheless, with the advances of the IC engine and with the low price on oil, things were prone to dramatically change and so they did. (Larminie & Lowry, 2003)

b. The Middle Years (1930–1989)
The middle years saw a brief peak of interest in EVs brought on by the gasoline shortages during World War II, the environmental concerns of the 1960s and oil shortages of the 1970s.

c. The current years (1990–present).
The current years brought renewed interest in air quality and the impact on the environment of pollution from the internal combustion engine. Since 2002, statutes have encouraged research in EVs and re-energized the development of environmentally friendly vehicles through tax incentives, grants and government-industry collaborative projects. From 2008, when the number of EVs was somewhat limited and small - 13 models and over the following years the EV will get to reach in 2012 a total of 119 models. (Deutsche Bank, 2009) Other studies confirm that EV will experience rapid growth in the years to come. (Brown, 2010) Larminie (2003) adds uncertainty by saying that *"the future of electric vehicles [...] remains to be written."* (p. 20)

As a sum up of the history of the EV, Anderson & Anderson (2010) notice that the interest in the EV was in general for short periods and mainly during periods of crisis (e.g. fuel shortage, environmental crisis, etc.) Making a parallel one surely sees a resemblance to present days. Today the society is constantly raising environmental issues because of the

increasing pollution globally. Coincidently, it is a time of crisis where prices for gas are extremely high, never reached until now.

The EV concept is still under question as research shows. Authors like Anderson & Anderson (2010) are not afraid to show their mere skepticism because of the general oscillation of the acceptance of consumers toward the EV over the last century. While the solution seems to be clear and generally accepted, "*the reality is that most consumers want internal combustion engines and are not willing to change this conviction as long as they have the money to pay for the car and the oil and gasoline to run them."* (p. 13) Ewing & Sarigollu (2000) are in the same sentiment, as they also believe that the future of the EV is in consumer's hands. Larminie & Lowry (2003) agree as well to the above, stating that the technology requisites are present and there should be no barrier.

Surprisingly, the solution was offered to mankind exactly one century ago, when in Electrical World (1911) it was said that "*if charging stations could readily be found in every town where there is electric service, the use of electric pleasure cars on fairly long runs would become much more common than it is now."* (Anderson & Anderson, 2010, p. 225, originally in Electrical World, 1911)

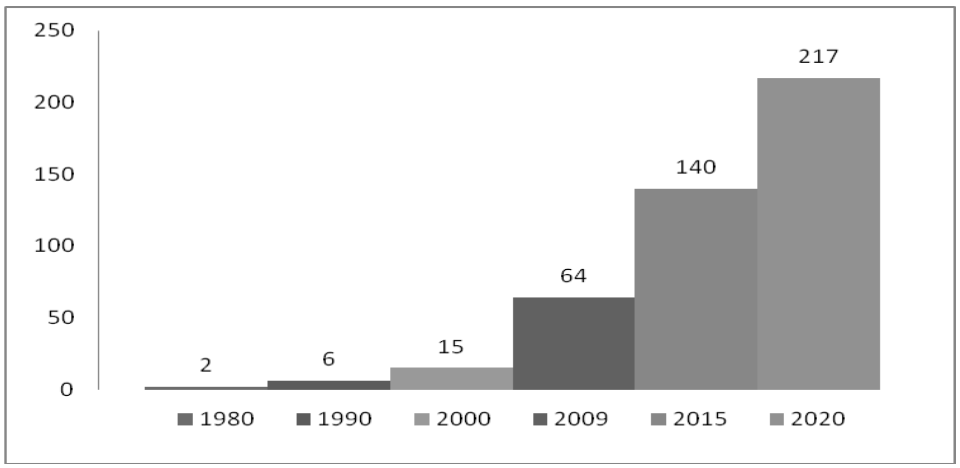
In their writings about the EV history, Anderson & Anderson (2010) speak about the countries that have shown increased interest in this concept over the years. Countries such as France or US are the most often mentioned in connection to the EV concept, while Asian countries such as China are not present on the EV map. But that has changed, as of recently, with the introduction of the EV on the automotive market. Thus, to the paper it is of critical importance to understand the concept in the Asian continent and see its directions, reasons for introduction, but also implications for future. The next chapter is focused on seeing the EV concept within the borders of China.

4. THE ELECTRIC VEHICLE IN CHINA: DETERMINANTS AND CHALLENGES

The automotive industry is currently at a turning point in development of their products. Constant environmental pressure but also decreasing oil resources is forcing automotive industry to look for new, innovative technology which will make cars independent from present energetic inputs. This need of shift was recognized in developed countries first, where was and still are being invested billions of dollars. Usage of cleaner energy is also considered as a future competitive advantage and besides car manufacturers from developed countries; a car manufacturers from China have appeared in this segment. Chinese car manufacturers entered this segment in the automotive industry really late, especially in comparison with its competitors from developed countries. Nevertheless, due to their fast development and growth, so called 'five-year-plans' developed by Chinese government, and growing investments into R&D (research & development), both by companies and government, China and car manufacturers are catching up quickly. (Zhou et al., 2004)

The reason for China to invest in development of the electric vehicle (EV) is not only to increase competitiveness. Chinese car fleet is growing tremendously year by year. According to Gao et al. (2008), the Chinese car fleet is growing 12 % annually and in the next 20-30 years the estimated number of cars in China can reach more than 250 million units (See Figure 8). These data is also reflecting the growth of Chinese automotive industry, although it means negative effects in sense of threats for environment and growing oil consumption. (Gao et al., 2008)

Figure 8: Number of vehicles on Chinese roads (in million units)[15] (Booz & Company, 2010)



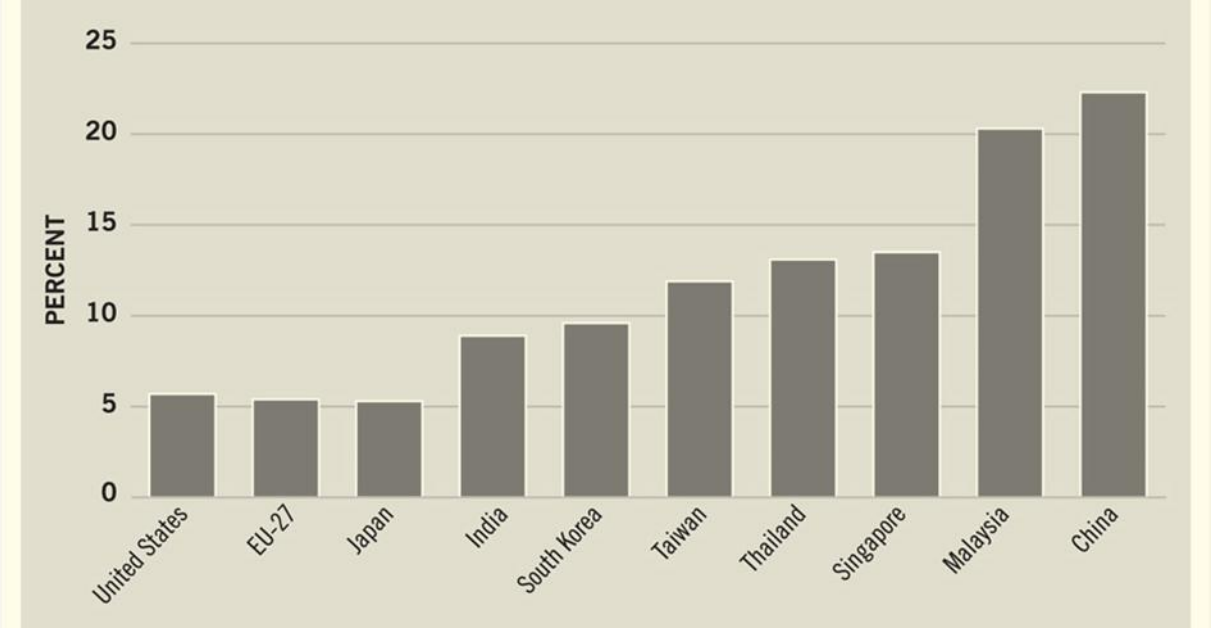
[15] Note: Years 2015 and 2020 are forecasting data; therefore they have to be considered as only estimation

The need of new technology, which can answer not only issue of competitiveness but also issue of pollution and growing oil consumption in China, is going to be discussed. In this context, the introduction of EV to the Chinese market might be part of the solution, but this product is facing several challenges. In the following lines the paper will discuss factors that are related to concept of the EV, like technology, pollution, Chinese oil dependency, standards and governmental influence will be presented. Furthermore, crucial challenges the EV faces will be presented.

4.1 Technology

An investment into technology is a key aim to achieve for Chinese automotive industry, but for China itself as well, in order to reach sustainability and energy security. Due to the growing Chinese oil dependency and environmental pressure, the need of a new alternative energy source is inevitable. For majority of industries in China, and whole economy, having such technology will enable China to make significant cuts in oil imports and assure its future growth. (Stark et al., 2011)

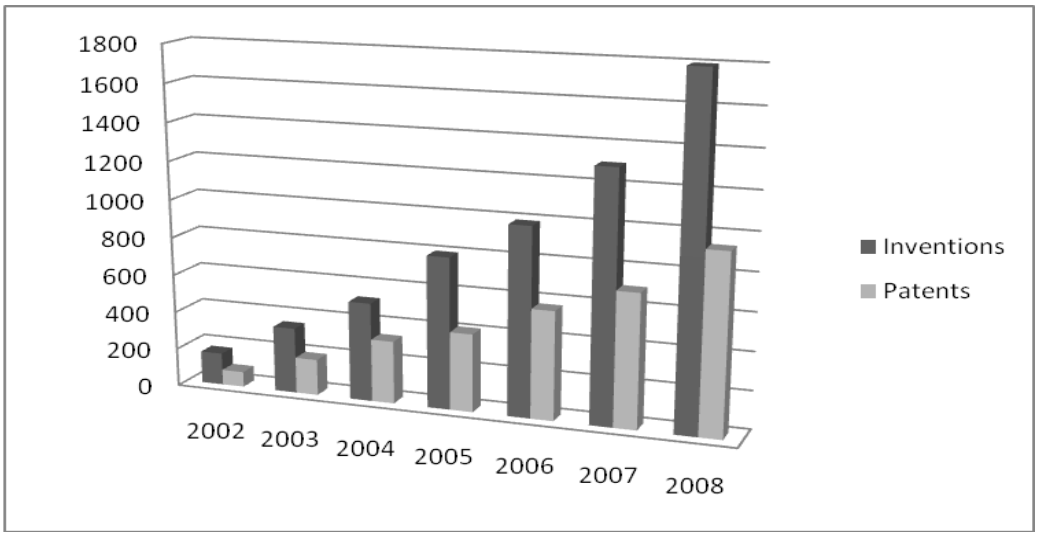
Figure 9: Average annual growth of R&D expenditures for US, EU27 and Asia-8 economies in period: 1996-2007 (National Science Board. 2010)



It is therefore in China's interest to invest into new technologies. As one can see in figure 9, China's investment grew rapidly in the last years. This growth even overcame US R&D investment growth and it is expected that China will be the world leader in innovation in the next decade. China claims desire of becoming independent from foreign technologies, and by increasing the amount of its investments into R&D to 2.5% of GDP by 2020 China seems to achieve the goal of becoming an innovation-oriented society. (Hout & Ghemawat, 2010)

China also increased number of acquired patents regarding renewable energy technologies. These patents are part of the so called "Energy-saving and New Energy Vehicle Program" and as figure 10 shows, the number of patents reached 1796 in 2008 with number of inventions reaching almost 1000, as compared to 2002, when China was lagging behind with 170 patents and even more less inventions. (Ouyang, 2009) Thus one can see the progress that China has made in the past couple of years.

Figure 10: Number of patents and inventions in years 2002-2008 (Ouyang, 2009)



Based on big investments in R&D and constantly growing number of patents, one can see two of the reasons why China became the world leader in the manufacturing of rechargeable batteries. This is one of the key predispositions for China to dominate technologically in EV segment. Local car manufacturers in China are not lagging behind and investing as well into development of EVs. (Stark et al., 2011) According to Stark et al. (2011) in an Accenture report, car companies in China are investing hundred millions of dollars into R&D of EV. Namely BYD company already invested US$300 million, SAIC invested US$900 million and DFAC company is planning to invest US$4.9 billion in the next decade.

Local car manufacturers are also trying to avoid foreign technologies and to develop their own technological capabilities. The example is, already mentioned, BYD which successfully introduced first EV concept in the 2006. BYD was founded in 1996 and it was mainly focused on development and distribution of rechargeable batteries. It entered automotive industry in 2003, so it can be considered quite new to the industry. However, it quickly started to use its knowledge from batteries development. (Zang & Wu, 2009) Currently, BYD offers two models of cars with pure electric drive, F3DM and E6. Really interesting is specification especially for E6. According to BYD website, this family car has driving range

300 km and top speed 140 km/h which proves technological progress made in the EVs technological development.[16]

4.2 Pollution and Chinese oil dependency

Pollution is one of the reasons China is trying to develop the new energy technology in the automotive industry. As it was mentioned, Chinese car fleet is growing rapidly, especially passenger cars. Chinese consumers, due to their higher purchasing power and low prices of cars with traditional drive system, are buying more cars than ever before. This causes serious threat to environment, and this problem is visible mainly in big Chinese cities, where passenger cars are considered as main reason for high production of greenhouse gas emissions. (Jimin, 2006)

Figure 11: Vehicles participation on pollution in chosen Chinese cities (Jimin, 2006)[17]

	Vehicle Emission Rate (%)		
City	CO	HC	NO_x
Beijing	63.4	73.5	46
Shanghai	87	97	74
Chongqing	85.8	36.6	86.3
Wulumuqi	88.7	–	48.5
Tianjin	83	81	55
Chengdu	62	70	45
Guangzhou	84.1	–	25.7

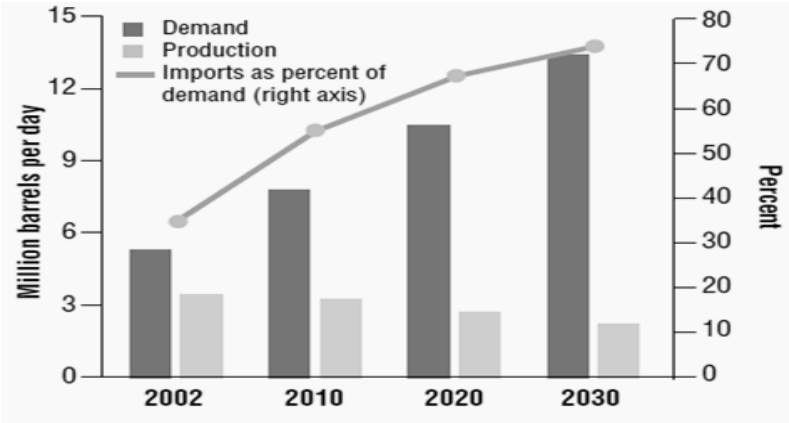
Beijing, Shanghai, Guangzhou, and Shenyang, which is not in the table above, were listed among the 10 most polluted cities around the world. (Booz & Company, 2010) China is aware of this problem and strives to achieve new, alternative energy sources; not only for automotive industry but also whole energy security is in its interest. China energy sources are mostly dependant on coal resources this country has, which are responsible for heavy pollution. Developing new technologies in every industry of China's economy can mitigate effects of pollution, mainly on society. (Gao et al., 2008) It is predicted, by Gao et al. (2008), that in 2030 passenger cars in China could produce 1.2 billion tons of greenhouse gas emissions, unless new energy alternative like EV is not adopted. EV, with other alternative drive systems potentially available in the automotive industry, seems to be solution to this particular problem, as they have the potential to reduce emissions by 45%, as stated by Gao et al. (2008).

[16] www.byd.com
[17] CO- carbon monoxide; HC- hydrocarbon; NOx- nitrogen oxide

Growth of passenger car fleet in China, which was mentioned earlier, is heading consequently to increased oil consumption. The automotive industry is witnessing global challenge in form of developing sophisticated engines which will reduce oil consumption. Chinese automotive industry is not the exception, apart from other industries in the country. Demanding Chinese economy needs for its growth huge amount of natural resources, namely oil. This fact resulted into high amounts of imported oil (nearly 2/3 of all Chinese oil is imported). (Booz & Company, 2010)

Growing oil consumption and dependency on foreign sources (See Figure 12) drives attention to EVs,- as the part of solution. This technology has potential to contribute on lowering the oil consumption with almost 100% efficiency. Gao et al. (2008) estimated that if at least 30% of Chinese passenger car fleet were EVs by 2030, China could save up 10% out of 6.2 billion barrels, which is projected need of oil by that year.

Figure 12: Production, consumption and imports of petroleum in China (Ban et al., 2005)



High oil consumption and growing prices affects consumers. EVs could be helpful for household budget of consumers. However, consumers tend to think rather in short-term and usually do not see long-term positive outcome of purchasing EV. This product, as a new technology, is being sold with higher initial price than cars with traditional engines. (Zang & Wu, 2009) Fuel savings, reachable with purchasing EVs, are not seen by consumers and the fact that gas prices are regulated in China is not supportive factor. Nevertheless, the situation will force government officials to deregulate these prices, which is happening. In July 2008 gas prices jumped by 17% on 6.6 RMB (renminbi). As Gao et al. (2008) estimated, if the price for gas jumps on 10 RMB ownership of the EV will pay off his/her owner within 5 years. In other words, the premium price for the EV will be returned, in form of fuel savings, in relatively short time. However, this is just one precondition and development of gas prices and regulation in China is rather unclear. (Gao et al., 2008)

4.3 Role of standards

Success of EVs, and even survival, is highly dependent on coordination and cooperation of different parties involved. These are Government officials, technicians, scientists, car manufacturers or marketers and many more. The necessity of proper and well-established communication between these parties is underlined by the still prevailing public skepticism regarding EVs. Necessary standards for this class of products would help. The importance and role most of the standards have, is to create a sort of consensus between experts or jurisdiction with private sector, represented by manufacturers, on technical attributes of the particular product and procedures which will serve to the public good. (Brown et al., 2010)

As Brown et al. (2010) argue, standardization for the EV is relevant and important not only for transportation itself but also for other industries interrelated with development and functioning of this product. There should be standards for the electricity sourcing and storage, infrastructure vehicle-to-grid technologies, design or education. These standards' development has to be executed with keeping in mind the consumers' requirements.

China adopted the first standard regarding emissions in 1987 and amended in 1995 and 2000. In 1999 Chinese government implemented the European emission standards. The Euro II, III and IV emission standards were enforced with following Chinese strong ambition to catch up with foreign competitors. Chinese government even supported local car manufacturers with incentives in order to force them to incorporate these standards into their product development process. For instance, in the end of 2001 0.13 billion dollars were paid to the three largest car manufacturers (FAW, SAIC and Dongfeng) on taxes. (Jimin, 2006) Car manufacturers needed this form of incentives because only then they were willing to invest more into technology development, so they could meet upping standards for emissions and technology. Jimin (2006) conducted the interview with one of the managers who said the following: "*we will meet whatever standards China imposes but we have no interest in moving further than government requirements if there is no economic benefit. Our main objective is to provide affordable and better quality vehicles to Chinese consumers. There are no consumer preferences for cleaner vehicle technology, and we will be disadvantaged in the market if we provide cleaner and more expensive vehicles."* (p. 128)

Some of the incentive programs remained, some not. Nevertheless, standards are still valid and in China they can be divided on technological and non-technological standards. Technological standards are serving purpose of regulating the fuel economy of passenger cars (See Figure 13). Limitations are applied on passenger cars based on their weight and there is no difference whether a particular car is with diesel or gasoline drive. What they vary in though is type of gear box. As it can be seen in the figure below, there are different limitations if the car is with manual or automatic gear box. What is also possible to notice, are different phases. The phase I was introduced in 2005 and was related to 'in-production

cars'. The phase II was introduced in 2008 and was related to 'newly registered cars'[18]. These regulations are mandatory and if some car product does not follow these regulations it is not allowed to be produced, not mentioning introduction to the market. These regulations, however, are not valid for imported cars. (Mingde & Yixiang, 2010)

Figure 13: Maximum limits for fuel consumption for passenger cars in China (Mingde & Yixiang, 2010)

Weights (lbs)	Maximum fuel consumption limits, based on NEDC cycle (L/100 km)				Minimum fuel economy limits, based on US CAFE-equivalent (mpg)			
	Phase I (2005)		Phase II (2008)		Phase I (2005)		Phase II (2008)	
	Manual (with manual transmission)	Auto/SUV	Manual	Auto/SUV	Manual	Auto/SUV	Manual	Auto/SUV
⩽1,667	7.2	7.6	6.2	6.6	36.9	35.0	42.9	40.3
⩽1,992	7.2	7.6	6.5	6.9	36.9	35.0	40.9	38.5
⩽2,178	7.7	8.2	7.0	7.4	34.5	32.4	38.0	35.9
⩽2,422	8.3	8.8	7.5	8.0	32.0	30.2	35.4	33.2
⩽2,678	8.9	9.4	8.1	8.6	29.9	28.3	32.8	30.9
⩽2,933	9.5	10.1	8.6	9.1	28.0	26.3	30.9	29.2
⩽3,178	10.1	10.7	9.2	9.8	26.3	24.8	28.9	27.1
⩽3,422	10.7	11.3	9.7	10.3	24.8	23.5	27.4	25.8
⩽3,689	11.3	12.0	10.2	10.8	23.5	22.2	26.1	24.6
⩽3,933	11.9	12.6	10.7	11.3	22.3	21.1	24.8	23.5
⩽4,178	12.4	13.1	11.1	11.8	21.4	20.3	23.9	22.5
⩽4,444	12.8	13.6	11.5	12.2	20.8	19.5	23.1	21.8

Non-technological standards are based on goal to promote purchasing of smaller cars producing lower emissions or to initiate often shifts in ways of transportation. In other words, China uses different taxes and fees. General, value added, tax is 17% for all passenger cars in China. Difference is visible in excise taxes where is rule that the car with the smallest engine size require less tax to pay (See Figure 14). As it is in table below this tax was revisited several times. Another tax, which changed, was acquisition tax. This tax is on 10% right now for all vehicles, even EVs. However, there are examples like cars with 1.6 engine size which are not necessary to be purchased with 10% tax. This tax was reduced to 5% in 2009 and to 7.5% at the end of 2010. There are also fees necessary to pay. One of the examples is tax for fuel where the price for gasoline jumped from 0.03 dollars to 0.15 dollars per liter, and prices for diesel jumped from 0.015 to 0.12 dollars per liter in 2009. (Mingde & Yixiang, 2010)

Figure 14: Excise tax for light-duty passenger vehicles in China (Mingde & Yixiang, 2010)

Engine volume litre	Before 1 April 2006	After 1 April 2006	After 1 September 2008
<1.0	3%	3%	1%
1.0–1.5	5%	3%	3%
1.5–2.0	5%	5%	5%
2.0–2.2	5%	9%	9%
2.2–2.5	8%	9%	9%
2.5–3.0	8%	12%	12%
3.0–4.0	8%	15%	25%
>4.0	8%	20%	40%

[18] Phase III is planned to be introduced in 2012.

Even though, there is significant effort from side of Chinese government to enforce standards in transportation area, there are some challenges. Coming back to Jimin (2006) who argued that, for instance the emission measurement system is still lacking. Inspections and emission regulations' enforcing is different from province to province and these controls are not sufficient. There is also poor quality of fuel.

Nevertheless, Chinese government officials are, with using those tools, trying to support low emission cars with better fuel economy. Indeed, the improvement is necessary and there are more taxes and fees, also expected in the future, but the regulations mentioned above are proof that such taxes are positive precondition for the EV.

4.4 Governmental influence

Government plays crucial and main role in Chinese economy. It ensures standards, regulations, incentives, tax policy, investments and, moreover, strategic plans for industries across Chinese economical spectrum. The automotive industry is not exclusion. Already mentioned investments into R&D and introduced standards are some of the actions the Chinese government is responsible for.
Development of EV technology is the important agenda for Chinese government, yet it faces several challenges. In the following lines, ongoing and expected programs and strategy plans of Chinese government regarding EVs will be presented.

As it was mentioned above, Chinese government has strong motivations for developing green technology in its automotive industry. First of all, there is high amount of oil imported which is not expected to stop growing due to the high production and purchasing of new cars. Second of all, there is high pollution in major Chinese cities caused by urbanization and also caused by mentioned growth of distribution of new cars.

China is well-known for its five years plans and many programs. It is hard to find out how these programs and plans are being fulfilled because there are no published data or access to them is really limited. China, however, is informing the public with what it is going to achieve in the next years.

One of the well known programs is the National 863 program which only priorities are promoting automotive products with alternative technology, the EV included. This plan has its horizontal and vertical sub-plans. Horizontal ones are developing the EVs, HEVs (hybrid electric vehicles) and FCVs (fuel-cell vehicles). Vertical sub-plans are aligning this development of these new technologies with functional perspective like policies, standards, infrastructure and development of assemblies. What is more, the Ministry of Industry and Information Technology in China announced that till 2020 more than 15 billion dollars will be invested into development of battery technology and whole concept of the cars with

alternative drive system. Another program is offering incentives for car manufacturers, announced in 1 June 2010, which will provide these manufacturers with amount of 8800 dollars per electric vehicle. This initiative is being run in five Chinese cities (Changchun, Hangzhou, Hefei, Shanghai and Shenzhen). The program of 1000 electric vehicles per 10 cities is also interesting in sense of promoting the EVs in 10 chosen cities each year and showing their usefulness to the public. The main goal of this program is to achieve 30000 units sold by 2012. (FinPro, 2010)

The purpose of this chapter was to present what lies behind the EVs presence in Chinese market and to describe places for the improvement. Even this does not have to be enough to acquire better picture about this particular product, since the success of the EV is highly dependent on how consumers will perceive this product. Understanding of consumers is thus more than crucial and, without doubts, first appropriate step in making strategies for this particular product. In the next chapter, the consumers' perspective will be presented, their general perceptions and attitudes as related to the Chinese automotive industry. In addition, China as a perspective and growing market, the Chinese automotive industry and finally facets of Chinese consumers will be discussed This knowledge will serve as basis for following analysis of Chinese 'green' attitudes and attitudes towards the EV.

5. CONSUMER ATTITUDES IN CHINESE AUTOMOTIVE

5.1 Introduction

"Consumer attitudes are changing at faster pace, probably never seen until now. Signs of consumers' changing attitudes are everywhere, and they provide a warning to managers about the seismic changes ahead." (Hagel & Rayport, 1997)

While there is consistent research made towards consumer behavior and attitudes in developed countries, the body of knowledge is missing data from the Asian continent and of importance for this paper – from China. Studies (Li & Xiao, 1999) have shown that the availability of research regarding Chinese attitudes is to a great extent limited, and further research needs to be undertaken. The reasons are related to the shift that China has gone through in the last decades, one of them being the major development in the domain of consumer understanding. "*We are not only witnessing the dawn of a new millennium in China but a new era in which the emotions, attitudes, and perceptions of the man and woman on the street increasingly matter."* (McEwen et. al, 2006, p. 75) As a consequence, the attitudes of Chinese consumers have been fluctuating, and for that matter, it is hard to keep pace with the shifting attitudes of Chinese consumers, and more trying to understand that they are still changing. (Dixit et. al, 2008)

The importance of understanding these attitudes stems from the fact that China is now the world's second largest consumer economy, with a population of over 1.3 billion, which is almost five times bigger than US and twice bigger as Europe. This undoubtedly makes it important for both scholars and practitioners. (Xin-an et. al, 2008) Also, Clifford et. al (2005) show that the new passenger vehicle sales in China has been constantly growing in the last years. This leads to the importance of having a better knowledge of the attitude of the prospect customers.

5.2 China - Emerging Market

The plainest definition of this concept comes from the World Bank that sees emerging markets as countries where the GDP per capita is below $8,000 per year.

But a comprehensive definition of an emerging market is entailed by Luo (2002), whom states that "*an emerging market can be defined as a country in which its national economy grows rapidly, its industry is structurally changing, its market is promising but volatile, its regulatory framework favors economic liberalization and the adoption of a free-market*

system, and its government is reducing bureaucratic and administrative control over business activities.[...] Emerging markets are those developing economies characterized by rapidly growing and structurally changing economies." (p. 5)

In defining an emerging market, Mody (2004) begins by laying down some of the main characteristics of this concept. The main attributes are that emerging countries are having a high level of risk and also that they are very volatile as compared to developed countries. Another important aspect is their transitional character in various domains such as economic, political, social and demographic. This transition is referred to as a state that will lead a country to "a *greater [...] maturity in the global market economy."* (p. 4)

5.3 Chinese automotive

"Today the Chinese automotive industry is the fourth largest in the world behind the European Union, USA and Japan, boasting an annual output of circa 8–9 million units." (p. 290) Trying to see an international development, China needs to do a lot of changes and to go through a lot of challenges, but according to Donnelly et al. (2010), two are the most important. First are the structural problems that will help create a more viable and sustainable auto industry, and second China has to catch up with the more advanced global competitors, especially in areas such as design, technology and brand equity. In the context of international competition, China must address these issues, if they desire to achieve the targets they have set until 2020-2030, which is to hold a 10% share of the global car market outside their domestic borders. (Donnelly et al., 2010)

Recently authors have been discussing intensely regarding the future of the Chinese automobile industry. This is happening because of the rapid developments that China has been going through, but also due to the major struggles that it has – structurally, technical or organizational. Another reason is because the automotive has been referred to as a 'Pillar Industry', and China has constantly attempted in upgrading and modernizing this industry, bringing it closer to Western standards and models. It has been recently shown that in China, 25 out of 31 provinces state automotive industry is a local pillar industry, with an approximate number of 120 car producers in China, as of 2004. (Donnelly et al., 2010, p. 292[19])

Furthermore, in the context of emerging countries, it has been said by researchers that because of a strong automotive industry (as a pillar industry), the country has a series of benefits, such as it generates "*employment, skills and advanced forms of work organization*

[19] Originally in Thun (2004)

and wealth creation, [and it] *can stimulate local industry through the development of components and related services"* (Donnelly et al., 2010, p. 292[20])

5.4 Chinese consumer attitudes in automotive industry

"Consumption behaviors are not necessarily the same as those in advanced markets, nor necessarily similar for cross-regional consumers within an emerging market. [...] In some large emerging markets, product or service markets are highly segmented and differentiated along consumption behaviors, income levels, social norms, and cultural traits." (Luo, 2002, p. 6)

McEwan et. al, (2006) in their study, discuss that Chinese attitudes have been gradually changing and this has been happening due to the shift that China has been going through over the last years. China is evolving, and so are the Chinese consumers and their attitudes, as they move to a more Western type of attitudes. (Clifford et. al, 2005; Atsmon et. al, 2010) Below we can see some meaningful changes in respect to some general attitudes, but measured at a 10 year interval. The table manages to show a glance of the ongoing shift of Chinese consumer attitudes:

Figure 15: Closest to own attitudes (McEwan et al., 2006)

Closest to own attitude	**1994**	**2004**
"Work hard and get rich"	68%	53%
"Don't think of money/fame; live a life that suits my own tastes."	10%	26%
"Never think of self; give in service to society."	4%	2%

The noticeable shift is that the individuals are more concerned about <living their life>, and implicitly increasing their buying power and enjoying life. As the author mentions, the consumer is having an increased desire concerning his/her individuality. This is congruent with the fact that the other variables are decreasing; the Chinese consumers are less worried about society and about getting rich and more interested in their own development and investing in them more than in the past.

As it has been said and shown, China is rapidly changing. And this has affected the income distribution, as the household income is fast growing (Li et. al, 2009) and leading to a greater middle class. This offers the chances to the automobile market in becoming a more viable consumer market. (Clifford et. al, 2005) It can be assumed that this will automatically translate in more Chinese consumers showing their interest in this market, and making their

[20] Originally in Harwit (1995)

attitudes of importance in this context. While "*Chinese consumers were not in the driver's seat"* (Clifford et. al, 2005) until recent, this is due to change.

5.4.1 Importance of advice and recommendation

Recommendations play an important role for the Chinese consumers. They often rely on the opinions and attitude of friends or other people. As a fact, the most common way of acquiring knowledge about products is by word of mouth. (Li & Xiao, 1999; Atsmon et. al, 2010)

In the automotive sector this also is automatically implied, as more and more consumers rely on advice and recommendations. This is strongly related to the fact that Chinese consumers have so little car experience. (Paur, 2008) Chinese automotive market is still a young market as consumers purchase an automobile for the first time, and for this matter they rely on other's opinions. And as a proof, when Chinese consumers were asked on what they relied when purchasing a car, recommendations was the most influential factor in their decision, in the three Tiers that the research was undertaken.

Figure 16: Main reason for car purchase at a dealership (Paur, 2008)

Attributes	**Tier 1**	**Tier 2**	**Tier 3**
Recommendations from friends/acquaintances	22%	32%	22%
Availability of preferred brands	15%	12%	31%
Good service quality	16%	17%	17%
Convenient location	18%	15%	10%
Low prices	11%	11%	12%
Good advice	95	5%	3%
Wide range	6%	2%	2%
Close customer relations	3%	3%	3%

5.4.2 Importance of product information/knowledge

Due to the relatively low knowledge about cars, Chinese consumers gather the maximum possible information to eventually decide on a car brand and model.

It has been said that car dealers in China are still lacking behind with the relation they have with their customers. This translates in the fact that consumers do not get enough information regarding an automobile, when they approach a dealer. This is why it is proposed that the consumer be offered a better experience with the car (e.g. show interior, test drive) so that his/her view on the car becomes more knowledgeable (Paur, 2008), and also to decrease this gap, by creating a closer relationship between car sellers and consumers. (Clifford et.al, 2005) The lack of information decreases the chances of purchase/overt behavior toward a

product, because as shown in Chapter 1, the framework of attitude formation or behavior is dependent on the information that leads to the formation of beliefs. The Chinese customer does not create beliefs about a given vehicle, and thus there is no basis for him/her to even consider a purchase. Consistent with the importance of recommendations, this shows a general deficit in the way car sellers deal with the consumer. More importance is put on this aspect by Guo & Meng (2008), stating that the level of the consumer's knowledge will allow companies and researchers better understand their behavior.

Paur (2008) states, in his research, that product attributes play a very important role in the process of buying a car. This is consistent with general attitude theory that affirms that attitudes are formed as evaluations of certain object attributes. Extrapolating this statement one can assume that attributes play a crucial role in the consideration of any given product, even more when the product is having a big price (in comparison to day to day commodities) and is bought for many years of use.

Another facet of the information aspect is that because in general Chinese consumers are not so knowledgeable about cars, this leaves place for them to have vulnerable attitudes, which are subject to often changes. (Paur, 2008)

While this is a current challenge for the Chinese auto market, it seems that this will very likely change in the years to come, as the Chinese auto market will more and more resemble with other automotive markets as regards to consumer behavior and preferences. (Clifford et. al, 2005; Atsmon et. al, 2010)

In a study in 2005, it has been acknowledged some of the attributes that matter to the Chinese consumer, when considering a purchasing behavior toward an automobile. Interestingly enough, the Chinese consumers appreciate to a great extent attributes such as safety and reliability, while the environmental factors or brand are not the most important. They do put price just above environment, but as a general overview, Chinese generally consider the utility and practicality of a car. This result does offer credibility to the study of Li & Xiao (1999), whom found that the most predominant Chinese consumer type is pragmatic and focuses on practicality, value and functional attributes.

Chinese consumers have specific characteristics, which also applies in the automotive industry. One can see that the Chinese consumer is gradually evolving and becoming more and more similar to Western consumers' attitudes, and this is due to the big number of changes that China has been going through. One significant change in the Chinese automotive industry is the introduction of the Electric Vehicle. Thus it is of real interest to see consumers' attitudes and the acceptance of this concept in the Chinese background.

6. Consumer attitudes towards the Electric Vehicle

6.1 Introduction to the attitudes towards the EV

In this chapter consumers' attitudes towards the EV and issue of consumer acceptance of this particular product will be analyzed. The purpose is to define what the typical consumers' perceptions towards EVs are, ergo what obstacles this product could face. Main factors the authors are interested in are consumers' attitudes towards the EV from technological perspective and from symbolic perspective (environmental attitudes and perception of environmental issues; moral obligation; values and beliefs etc.), factors influencing acceptance of this product and understanding of this knowledge in Chinese context.

Due to the energy security and high levels of CO2 emissions, a discussion about facing these challenges in the automotive industry appeared. In 1997, when Kyoto Protocol was accepted, first standards regarding reduction of emissions were applied and these countries, which applied these standards, started to put pressure on the industry by using various kinds of regulations. The automotive industry was not exclusion and two major challenges were defined there- how to increase fuel savings and reduce emissions. Even though technology exists and one can witness car products with low or zero emissions and, to some extent, almost none fuel consumption (HEVs, EVs), the consumers' acceptance is still a challenge. (PricewaterhouseCoopers; 2007)

According to the survey presented in a report by PricewaterhouseCoopers (2007), consumers still express inclination to such features of cars like engine power and speed, comfort, safety or luxury. Moreover, this study found out that they evaluate 'green' cars by these criteria since environmental issues are on second place to them. In the mentioned survey, chosen consumers were asked about their awareness of environmental issues and most of them responded positively, but expressed more concern about such factors like fuel prices, infrastructure etc. Another prevailing characteristic among asked consumers was that they did not choose to change their driving behavior because of the environmental concern. Rather they changed their behavior because of more economical factors, like fuel prices. Nearly ⅓ of respondents also claimed that they would consider buying the car with alternative drive system, but ⅓ out of it would change their minds if they should pay premium price. The survey also revealed that 3 out of 10 participants would never change their driving behavior; ergo they would not buy any other car than a conventional one. Interesting findings in this survey were consumers' awareness of technology. In other words, respondents were asked about their knowledge of alternative drive systems in cars. Most of them heard about such inventions but their knowledge was more or less superficial. EVs, for instance, were

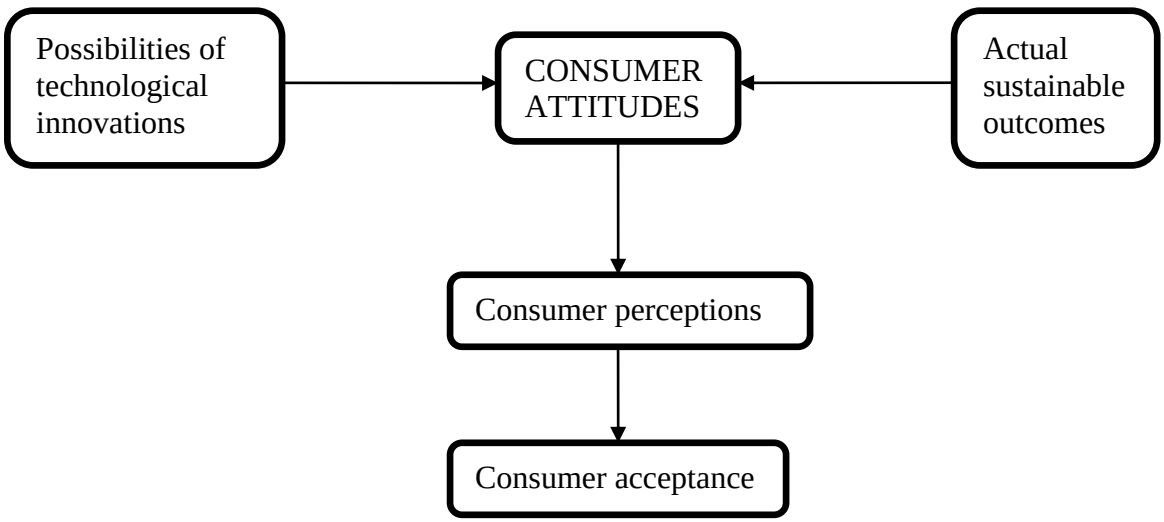
evaluated as an ambivalent product since near half of respondents considered the EV as useful for the future and nearly same amount of respondents expressed more of skeptical attitude toward it. Thus, there is reasonable doubt whether the EV would be accepted by consumers, and moreover the question, how to increase possibility that the EV would be accepted by consumers.

6.2 Consumer acceptance of EV

In an analysis to understand the motivations for consumers to purchase green cars, Ozaki & Sevastyanova (2010) frame the consumer attitudes in the context of new car technologies. The authors talk about the "need" to understand what determines consumers to consider a purchase decision. Furthermore, the authors put consumer attitudes at the core of the relationship between the possibilities produced by technological innovations and the actual sustainable outcomes. But because their attitudes are not always aligned to the concept, because they are not educated (Zpryme Report, 2010) and their perceptions are altered, thus it is a critical matter that consumer perceptions are cleared and informed. If one would take this premise in mind, a real connection between the perceptions of the consumer and his/her acceptance is made. The perception directly affects a favorable or unfavorable attitude towards the EV concept and more to a purchase decision.

Below, a general consumer acceptance framework is developed according to the readings of Ozaki & Sevastyanova (2010):

Figure 17: What determines consumer buying decision (Ozaki & Sevastyanova, 2010)[21]



The above figure manages to show a clear relation between consumer attitudes and his/her acceptance of a technological innovation. Thus, the attitudes are being influenced by two

[21] The figure is developed by the authors according to the article of Ozaki & Sevastyanova (2010).

factors that can be easily translated in the characteristics of the product as well as in the benefits it brings to the consumer. These create a set of attitudes that in turn develop the perception of the product and finally that lead to acceptance. While overly simplistic in nature, the model does help in the understanding of how to connect attitudes and acceptance. Unfortunately, the authors only consider consumer acceptance, but they fail to add the possibility that the individual might not accept the product.

Consistent with the above framework, Ozaki & Sevastyanova (2010) found that some of the respondents "*were intrinsically attracted to technology and hold a positive attitude toward it."* (p. 8) More, this favorable attitude is to a great extent owed to the experience of the consumer or of someone that they know. Thus, one can assume that an important aspect that car manufacturers need to pursue is the trial of Electric Vehicles by the possible consumers, and this factor must not under any situation be overlooked.

In 2000, it has been proved in a survey that consumers have a positive attitude toward CFVs (Clean-Fuel Vehicles[22]), but at the day of the survey, drivers were not willing to exchange their current vehicle for a CFV. (Ewing & Sarigollu, 2000) The research was made on 1500 commuters, and it also admitted that consumers that hold favorable environment beliefs should have a higher preference toward the CFVs. It does not make a direct connection to a purchasing behavior, and it is consistent with the general theory on attitudes – that favorable attitudes do mean a higher preference for a product, but it does not translate into a buying decision.

Relating to the above finding, today, while many variables have changed, we can see that customers are still rather reluctant to seeing the EV as a replacement for their regular fuel car. Their skepticism comes from the price, range and other aspects of an EV, aspects that are not really aligned to their acceptance – be it budget, range needs, etc.

6.2.1 Application of 'Technology acceptance model' on the EV

Consumers' understanding of a product is important because only good knowledge, coming from either (past) experience or searching the informations about the product, can create positive/negative attitude towards product, and consequently the potential intention to buy the product. In the theory of consumer behavior, consumer perception and beliefs about products were being analyzed and from that knowledge some of the authors developed the 'Technology Acceptance Model' (TAM) to address the issues around acceptance of technology by consumers. (Davis, 1989; Adams et al., 1992; Venkatesh, 1999)
The concept of TAM was mostly applied in information technologies, but the purpose of use of this concept in this study is adaptation to the EVs, since it is new technology and as was

[22] To be acknowledged that the Clean Fuel Vehicles encompass the EV. Another example of a CFV is the hybrid vehicle.

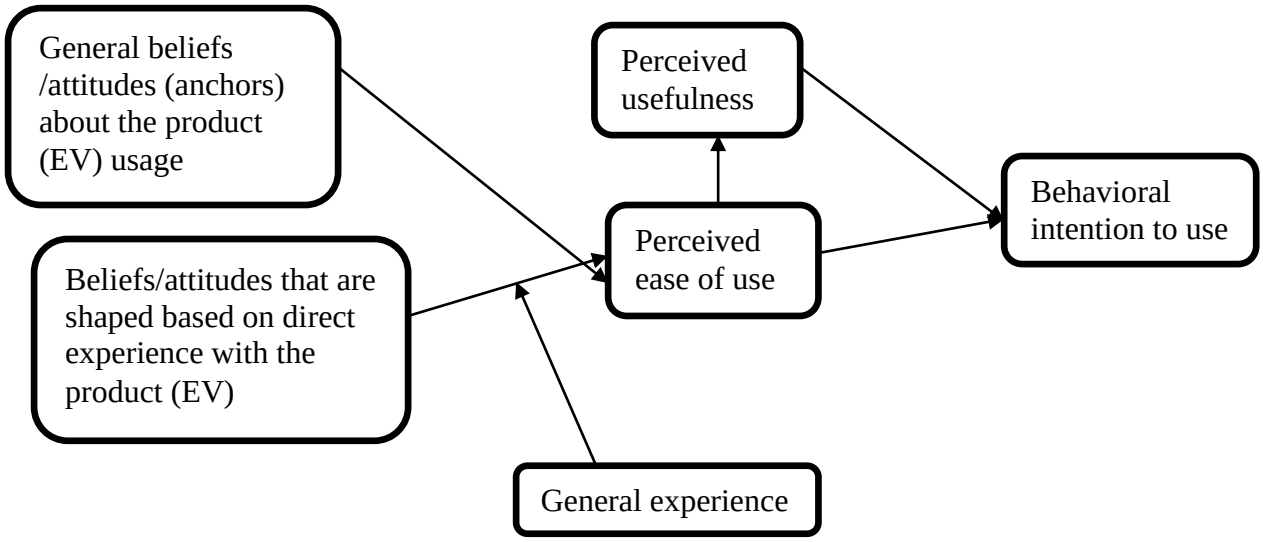
mentioned earlier, there is limitation of knowledge from side of consumers about this product.

TAM is consisted of two determinants, perceived usefulness (PU) and perceived ease of use (PEU). As Venkatesh (2000) argues, these two are closely related and it can be said that PEU determines PU. PU is defined as individual's behavioral action expressing the intention to use technology. If the individual perceive some technology as useful for his/her future, no matter what kind of attitude he/she has towards it, he/she would be willing to purchase and use the technology. PEU is one's perception that some particular technology will insist from individual less effort to handle it. Since PEU is affecting PU of the individual it would be appropriate to explain what determines PEU, and thus how TAM can be applied on the EV.

Venkatesh (2000) defines two determinants of PEU. First determinant is 'anchors' which he defines as general beliefs about products' usage. Second determinant is 'adjustments' which are defined as a linkage between perceived ease of use and actual interaction of the individual with the product. Here, the individual considers also his/her own experience.

If the PEU concept is applied on the EV one can assume analogy that individuals are evaluating this product with certain beliefs already acquired in the past, and are using experience (their own, but could be another) and interaction to adjust themselves with product. Thus, the individuals can perceive the EV as useful for the future. (See Figure 19)

Figure 18: Revised TAM for the EV product (Venkatesh, 2000)



In other words, consumers can evaluate the EV with using same or similar criteria like in evaluation process of conventional car. Some of the consumers can have previous experience with EVs, or with another kind of cars with engine using alternative sources and they can have positive/negative perception based on this experience. The secondary experience, in sense of experience from others, has also significant effect on PEU of EVs.

Consumers can evaluate PU separately, not only with previous affect by PEU. They could be able to see if the EV has positive contribution to their lives, while judging mostly its economic efficiency or any kind of characteristic making the consumers' lives easier.

From this assumption, the consumers can be divided on those who are willing to adopt innovative technology, such as EVs, and those who are not. Jansson (2011), proved in his study regarding consumers' eco-innovation adoption, that adopters (individuals with higher eco-involvement) tend to seek for novelties and express higher motivation for using such innovations than non-adopters. He also defines adopters as individuals who perceive innovations as highly advantageous for their lives, and a high interrelation can be seen between adopters' values and beliefs and innovation there. Adopters have better understanding of innovative technology than non-adopters, as they see it less complex and also are willing to take a risk, which can be caused by uncertainty, of purchasing this innovative technology.

Nevertheless, technology acceptance theory has its limitations. For example Bagozzi (2007) maintains that TAM is weak mainly in the linkages between stages and that this concept is more simplified when the consumers' evaluation is a rather complex process. Bagozzi (2007) argues that TAM does not explain process of individuals' evaluation and rather names steps and outcomes. These processes could be though decisive and significantly affect individuals' final decision. Another limitation, considered by Bagozzi is that TAM analyzes individuals and ignores the fact that humans are social creatures; thus their attitudes, beliefs and intentions are affected by group. Therefore it is necessary to consider social aspects of individuals' decision-making process, which can have immense impact.

Geng et al. (2009) add that with introduction of new technologies the consumers can have dilemma whether to adopt or not adopt particular technology. This brings uncertainty into their decision making and can acquire negative attitude towards new technologies. Consumers are concerned by more effort they need to put into learning about new technology. New technology can also disrupt previous routines the consumers had. Suddenly they tend to compare new technology with this they already purchased, and this can lead to resistance.

Despite the fact that TAM can be applied also to the EV and offer better understanding of determinants of consumers' acceptance form technological perspective, it lacks social premise. Therefore, the following subchapters will discuss, so called, 'green' attitudes which could represent additional necessary dimension, contributing to the understanding of consumers' attitudes towards the EV.

6.3 Determinants of consumers' 'green' attitude

Influential factors which are not simply oriented on technology acceptance but rather have psychological influence on consumers' attitudes deserve significant attention. In the case of, so called, 'green' attitude these factors can determine what actions the individuals will take in matter of purchasing/not purchasing eco-innovative products. These factors can be divided on contextual factors, habits and routines, attitudinal factors and personal capabilities. (Jansson et al., 2010)

a) Attitudinal factors

Jansson et al. (2010) define contextual factors as forces indirectly affecting consumers' eco-behavior through attitudinal factors. Thus attitudinal factors are defined as values, norms and beliefs. Moreover, his study maintains that, values are usually aligned with eco-behavior of consumers and he presents three types of such values: altruistic (considering common good in society); biospheric (same as altruistic but also considering impact on ecosystem); and egoistic. Beliefs are defined as individuals' awareness of consequences their actions brings to the environment, and thus they feel responsibility. Norms are more related to some moral obligation to act responsibly in environmental manner. Habits and routines are defined by Jansson et al. (2010), in context of eco-behavior, as replacing old ones with new ones. The author also maintains that habits and routines could be decisive factor in matter, whether consumers would purchase eco-friendly products or not. As regards to personal capabilities, this factor will be analyzed later in this paper since it represents demographic characteristics of consumers.

Coming back to determinants of 'green' behavior, Pickett-Baker and Ozaki (2008) also discussed values and beliefs as preconditions to eco-behavior. However, their argument is supplemented by need of individuals so that eco-innovation is aligned with their personal needs (safety; fuel economy etc.). The authors also add more determinants of 'green' behavior, as they maintain that trust of consumers in a particular brand is also important, because this could mean for consumers sort of assurance that product will have performance which they expected. Consumers will also have positive attitude towards particular eco-products of particular car manufacturer if they are influenced by car manufacturer's image. In other words consumers will be willing to purchase eco-products from companies which are labeled as environmentally friendly.

Consumers who are willing to adopt cars with alternative fuel system tend to have positive environmental attitudes. These attitudes can have even higher importance for consumers than financial aspect of eco-product, which price is usually higher than the price of a conventional alternative. However, this does not mean that the effect of price factor on consumers' attitudes, and consequently purchasing decision, is with low importance. On contrary, the

price factor can form or change attitude towards eco-products to negative one, and thus this should be also considered as important factor. (Jansson et al., 2010)

b) Personal values

As it was mentioned before, new technology, or eco-innovation, needs to be aligned with personal values/needs of consumers in order to be successfully adopted by them.

Gunagping et al. (2008, p.241) discussed in their study consumption attitudes, which they define them as "*consumption attitudes are consumer context-specific dispositions that link personal values to actual consumption behaviors*". They touched upon, apart from other factors, personal values of consumers which defines new product adoption. *Conformity* is the first factor and it is defined as an ability of individuals to satisfy their close social environment. Those consumers with high sense of conformity tend to rely more on advices from their social groups they belong to, and usually do not trust advertisement. *Security* factor is typical for these consumers who prefer stability and are trying to avoid uncertainty. Thus the new, innovative product might cause resistance from their side. Another personal value defined by Guangping et al. (2008) is *tradition*. Consumers being influenced by this value, tend to stay faithful toward product they already purchased and are not willing to replace it with something new. Last personal value is *self-direction*. Consumers characterized as self-directed usually rely on individual judgments, do their own decisions and adopt innovative ideas without others' intervention.

c) Personal capabilities

Social factors like personal values, attitudinal facets, habits and routines are still not enough in order to analyze consumer 'green' attitude or behavior. Researchers have agreed that personal capabilities are needed as well. Personal capabilities are widely defined as demographics factors contained by age, gender, social class etc. This class of factors has, however, the lowest value among other, mentioned factors. This is because they are hardly accurate and varies under different circumstances. (Jansson et al., 2010; Jansson, 2011; Cottrell, 2003; Midgley, 1987) Thus consumers attitudes cannot be called 'green' only because of analysis of demographic characteristic indicating such finding. Earlier in this study was found that, for instance, it is hard to segment consumers attitudes based on age or social class. Gender is also inaccurate predictor of consumers' attitudes since consumers can have different inclination to some products than their gender (men-female traits and women-male traits in product preferences). Nevertheless, personal capabilities can outline to some extent consumers 'green' attitudes. Different demographic facets can be distinctive in the influence on consumers' attitudes.

Of the mentioned three demographic characteristics only two will be analyzed in the following lines. 'Age' facet will be analyzed in relation to young consumers, as they represent target group in the survey conducted for this paper.

As it was discussed in chapter regarding consumer attitudes in the automotive industry where these attitudes were analyzed in context of differential demographic characteristics like gender, environmental attitudes are following same pattern. In other words, environmental attitudes are different depending on gender. According to Kaman (2009), women differ from men not only in environmental attitude but also in environmental concern, which is predisposition for such attitude. Women tend to be more compassionate and nurturing, and feel more responsibility for their surrounding not only in local context but also in global one. The happenings like global warming, for instance, are thus more in their interest. Environmental issues are causing sort of moral obligation among people concerned about environment and usually this obligation is spread by peer influence and, as Kaman (2009) argues, women tend to conform more to these influences.

Defining and presenting social class, as one of the influencing factors, was realized in previous chapter regarding consumer attitudes determinants. It was maintained that human beings are naturally divided into the social groups or classes. These classes have their specific characteristics and individuals tend to express common attitudes and behavior within particular class. This attitude and behavior can be changed with moving to another class. There was also mentioning of determinants of social classes, and one of the determinants was *education*. This facet is, as social class factor, serving purpose of this purpose because target group of the research conducted in this paper are master students from China. Thus, discussion around environmental attitudes can be based on premise which is maintaining influence of social groups and education on formation of environmental attitudes.

According to Iyer and Kashyap (2007), who analyzed 'green' attitudes and intentions regarding recycling which is another subject but with the same context, maintained that in order for consumers to have positive attitudes and intentions towards environmentally friendly actions they are dependant on good informations about this issue, incentives and influence of the social class they belong to. They maintain that analysis of the social class can provide researchers and marketers with better understanding of individuals' actions, and provide them with a fairly good predictive tool as well. As Iyer and Kashyap (2007) argued in their research, the impact of social class on individual's 'green' attitudes is significant because the same individual is affected by other members of the social class. In other words, the particular individual is copying or considering his/her actions as he/she is observing others' attitudes and intentions towards environmentally friendly acting.

6.4 Moral consciousness and collectivity

Belonging to the particular social class is closely connected to acquiring some moral grounds and directly leads to acting morally/immorally also in purchasing behavior. Morality can affect our attitudes towards everything. Moral consciousness creates certain moral obligation to act responsibly, for the good of the society and the environment. This is an essential

premise which is needed for the development of responsible consumerism of today. However, people's consumption attitude and behavior does not reflect the quickly changing world. (McGregor, 2006)

As McGregor (2006) maintains in his work, consumption is still very much affected by previous habits. Consumption is not perceived responsibly and the negative impact on the environment is not viewed, as consumers tend to consume in order to serve their own good and reach personal satisfaction. McGregor (2006) argues that consumers nowadays are immature. This immaturity might be solved with forgetting to follow the personal satisfaction by participating in 'consuming communities'. Consumers can be thus affected positively by moral influence of a group learning how to perceive common good; ergo their consumption will become more ethical.

Ethics in the consumption can be forced or suddenly discovered by the consumer, but as Cherrier (2007) argues, supporting McGregor (2006), ethical consumption is the outcome of social interaction of individual and community. As Cherrier (2007) continues, consumers are becoming more autonomous in their decisions and attitudes. Nevertheless, they tend to create communities where, as McGregor (2006) wrote, they are being influenced by the others. Moreover, these networks do not serve only impacting purpose but they are also place to share. In other words, individuals within a network are becoming ethically conscious and share this consciousness among the others members of networks.

This creation of certain moral consciousness in the consumption can be considered as solid predisposition for 'green' attitudes as well. Following moral obligation to save and protect the environment has influence on existence of new, environmentally concerned, consumer. It would be false to claim that behavior of consumer is not changing entirely. The focus is turned on young generation which is starting to realize their responsibility towards their surroundings. Nevertheless, they are still being influenced by the society, more specifically consumerism.

Companies thus play an important role in the formation of 'green' attitudes and behavior. Eco attitudes and behavior cannot be viewed as ideology but rather more as the phenomenon highly related to consumerism and commercial world. The consumers' awareness of environmental problems and responsible (eco) consumption, as a potential solution, is not suddenly triggered by consumers themselves. Companies, whose label is presented as 'green' and environmentally friendly, are spreading edification among consumers by providing them with 'green' products. Consumers, on the other hand, build stronger involvement not only with particular company, but more importantly with 'green' consumerism. Moreover, they believe more in those companies, and in their products, which have well-known eco-label. (Rahbar & Wahid, 2011)

6.5 Green attitudes in the context of developed countries and China

Consumer acceptance of the EV technology is highly dependent on the consumer behavior and consequently on the consumer attitudes. Consumer attitudes toward the EV are different, and for this matter it has been mentioned that consumers will differ in their attitudes to alternative types of innovative vehicles. (Ewing & Sarigollu, 2000) One can also assume that consumer attitudes will differ from continent to continent or when comparing developed with emerging countries. Interestingly enough there are studies to confirm the above assumption. The Zpyrme Report recently written by a consulting group has had some insightful findings in regards to consumer attitudes to the EV concept in developed countries.

In December, 2010, a Zpryme Company Report, when looking to understand the consumer attitudes in the US, shows that results seem to be extremely positive. A total of 37.2% of respondents said that they are very or somewhat likely that they will make an EV purchase in the following 2 next years. Nevertheless this percentage does not make a real case scenario since 28.7% of them said that they are "somewhat likely" to buy such a car. That puts a sign of incertitude on the matter. Still, researchers believe that US consumers are constantly building more their acceptance to the concept and its utilization. (Zpryme Report, 2010)

On the European continent the situation seems to be of a different nature. Delft Company (2010) has stated that the EV concept seems to be lagging behind, because of the shortcomings of the EV. However the consumer attitudes can be driven to a better acceptance level, and as the study puts it, the general confidence of Europe consumers still has to be gained. (Delft, 2010)

The consumer acceptance of the EV has not been very different in the last century. The attention of consumers is still drawn to the EV, and *"if the electric meets their expectation of convenience, performance and cost, many will buy it by choice."* (Anderson & Anderson, 2010, p. 232) It has been argued that at the heart of EV adoption stands the issue of consumer education, and that it is related to the amount of knowledge the consumer has in regards to the EV. No matter how truthfully this is, it has been also discovered in the US that the consumers would consider the purchase of an EV with the main precondition that the price would be considerably close or comparable to a regular gasoline car. (Zpryme Report, 2010)

6.5.1 Types of consumers

In the context of the EV, research has put consistent stress on several types of consumers, types that can define a certain acceptance or buying pattern. Even though the study was made in 2000, one would agree it is perfectly valid and applicable today. Ewing & Sarigollu (2000)

state that these types differ in many perspectives, such as preference for vehicles, their attitudes toward the environment, and also demographic characteristics. These types are:

a) Actively concerned

The actively concerned persons are 3-6 times more likely to choose the EV, and 2.7 times more likely to choose an alternative fuel vehicle. This consumer type has the higgest likelihood of buying an EV, and manufacturers should consider this segment as the most relevant.customer target.

b) Passively concerned

This type of consumer is also holding higher chances of choosing an Electric Vehicle, but less than the actively concerned. However, the passively concerned would be more inclined to buying an EV, if it has similar or close performance to the regular cars with IC. *Positioning the EV as similar to gasoline vehicles, rather than differentiating it as a brand-new product category, would be more appropriate for this segment.* (Ewing & Sarigollu, 2000, p. 114)

c) Unconcerned

This category has the highest likelihood of buying a vehicle in the next five years. However, they will consider the EV as one of the alternatives only if they are more convenient from a price perspective.

While these types seem to be different, all consumers in the study have had a positive attitude toward CFV's. However this does not have a major effect on them when they are in the position of considering a purchase. Actually they are unwilling to do so because of performance levels of range, acceleration and refueling time; also regulations alone are not enough to convince a consumer to buy such a vehicle. The examples used by Ewing & Sarigollu (2000) are extremely relevant – in the situation of increasing gasoline price or offering reduced commuting time by the use of special lanes – the consumer remain totally unconvinced. Surprisingly, the study shows performance and price subsidy as being critical to the acceptance of consumers and also the most effective. (Ewing & Sarigollu, 2000)

The authors have conclude that these 3 segments are relevant from a managerial perspective, and that "*the CFVs, particularly the EV, should be positioned and targeted differently for each"* of the consumer types. (Ewing & Sarigollu, 2000, p. 117)

In a study put together by Green Car Institute (200-), the beliefs of consumers were that EVs are practical, clean and inexpensive to operate. Relating this finding to the general theory of consumer attitudes, one can say that these beliefs are extremely important if connected to a purchase decision. On these beliefs EV car manufacturers need to insist and work with so that the number of buyers will increase.

6.5.2 Chinese green attitudes and predispositions for accepting the concept of EV in China

As it was mention before, Chinese economy is growing fast and this development asks its price. Particularly, growing number of passenger cars on Chinese roads are causing higher level of pollution and higher level of Chinese dependency on foreign oil year by year. Issue of acting 'green' has also growing importance. Purchasing of green cars, such as the EV, is not a matter of lifestyle but rather can be considered as a necessity. Nevertheless, the EV existence can face constraints in form of consumer awareness of this products or lacks in environmental concerns, and in form of more practical ones as price, insufficient infrastructure and legislation.

There is growing interest in the environment and negative effects the human activity has on it, mainly due to the news spread in public by media or researchers. However, so called 'propagation' does not necessarily result into the consumers' awareness of the environmental problems. There is a little involvement in this area by consumers and this involvement varies depending on the area people live in. In other words, distribution of 'green' knowledge is not distributed equally among regions, thus consumers are not aware of this issue at the same level. Consumers' awareness about environmental issue seems to not be affected by age, ergo young and elder consumers have similar awareness and knowledge. (Joshi & Mishra, 2011)

This argument is also proved by Gupta & Popli (year unknown), who discussed 'green' attitudes across scope of consumers with different age. They maintain that there is no difference between *cognitive* 'green' attitude among young and elder consumers, which means both groups have certain level of knowledge about environment issues. However, there is a difference between young and elder consumers as regards to perception of the ownership of conventional car having negative effects to the environment. Younger consumers are concerned more about effects of conventional cars on the environment and they see in them the main reason of pollution. Moreover, due to the rising environmental problems they actively perceive them and seek for solutions, which they find in the 'green' products such as the EV.

In more specific matters, Chinese consumers are usually considered as unconcerned people about environmental issues. One should discover their culture and values among their society, which will provide him/her with different conclusion. Chinese culture is based on premise which is alignment with nature; ergo there is strong cultural precondition for protecting the environment. This implies that Chinese consumers' 'green' attitudes are not based mainly on knowledge about the environmental problems but rather they are based on more symbolic aspects. (Chan, 2001)

According to Chan (2001), even though Chinese consumers have positive attitude towards ‘green’ products, a resulting purchase of such products face constraint of insufficient variety. This might explain the finding that Chinese ‘green’ attitudes are more based on symbolic affects than knowledge. Another factor influencing such behavior, Chan (2001) noticed, is high level of reliance on Chinese government. Chinese consumers tend to move responsibility for eco-edification on government, as they believe it has to educate and propagate ‘green’ products.

The issues around Chinese ‘green’ attitudes, their ‘eco’ awareness, and attitudes toward the EV are going to be analyzed more specifically with developed, for this purpose, survey in the following chapter.

7. Empirical study – Chinese attitudes towards the Electric Vehicle

7.1 Methodology

7.1.1 Overview

As there is no previous research made on this specific topic and in the context of China (Li & Xiao, 1999), this gives the paper the possibility to decrease the gap in the body of knowledge. 'Conducting consumer research in a specific setting can contribute greatly to the knowledge of 'global consumer behavior'. (Yau, 1994) However, the literature review will suffer as there are little if no previous writings on this matter.

7.1.2 Research Design

The purpose of the research is to determine attitudes of Chinese consumers towards EV. Apart of defining the target group, choosing the appropriate method is in the place.

a. Quantitative research

Approach of the conducted research, the authors chose, is of quantitative kind. Quantitative approach is based on collection and usage of statistical/numerical data gathered from population. These data are consequently measured, compared, and used as source for creation of predictions. (Harkness et al., 2010)

In the case of assessing the consumers' attitudes, the choice of quantitative approach can be discussed. Discussion can be focused on appropriateness of the method and comparing its usability with opposing qualitative approach. Quantitative approach is widely used for assessing attitudes toward particular issue, as it can project commonality in the population. It also can allow assessing attitudes in the future. In other words, quantitative approaching of attitudes can be used as monitoring device of attitude change over time. On the other side there are limitations of such approach, as it does not analyze attitudes in depth. Participants can also provide misleading answers because of emotional attachment with discussed topic in the quantitative research. (Jowel, 2005)

The development of questionnaire represents the quantitative method, and it is widely used by researchers because it can provide them with understanding of relations of discussed issues within survey. Thus they can make generalization of gathered information, prove their hypothesizes and provide general implications. (Limpanitgul, 2009)

To serve the purpose in the best way, the descriptive method is used as basis for the research. Two main parts of descriptive method are chosen, the mean and standard deviation. The mean serves the purpose of finding the statistical average. In other words, it defines the average answer from respondents provided in the survey. Standard deviation function is closely related to the mean, as it defines uncertainty/certainty of conducted statistical average. This means, in the case the study is provided with hypothesizes, standard deviation can help to define whether these hypothesizes have homogeneous or heterogeneous indications.

b. Descriptive statistics

Descriptive statistics is the most common statistical, survey, method used. It is basically first step researchers take in order to explain their findings. Descriptive statistics can be defined as "*statistical procedures that describe, organize, and summarize the main characteristics of sample data."* (p. 16) There is also high necessity of conducting such method, since the surveys usually are consisted of many responses, numbers or any other data. Researchers, thus, need to transform this information into manageable and understandable way. Usage of descriptive statistics provides readers with simple kind of observing huge amount of data about respondents, like demographics or answers on crucial, to particular survey, issues. (Dunn, 2001)

After collecting the data from the target group it is necessary to provide reader(s) with implications collected data have. Therefore, it is necessary is to include extension to the descriptive method, and that is inferential statistics. The inferential statistics will serve to purpose of provision the explanation and conclusion of collected data.

c. Inferential statistics

As it was mentioned above, the inferential statistics is extension to the descriptive statistics. This method is used in order to create inferences from collected data, thus it is not simple presentation of data. The inferential statistics can be defined as permission of "*generalizations to be made about the populations based on sample data drawn for them.*" (p. 17) In order to make use of the inferential statistics, hypothesizes are developed. These hypothesizes are closely related to the discussed theory and issues in the survey, which were found by authors as crucial as regards to finding out the participants' attitudes towards the EV. Collected data is furthermore managed in way which gives opportunity to the authors to define the hypothesizes as true/false. (Dunn, 2001)

The analysis of data is done with usage of the inductive reasoning, as the research is trying to confirm developed hypothesizes. Even though theory of consumers' attitudes is used, one may assume deductive method would be appropriate. Research on Chinese consumers' attitudes towards the Electric Vehicle has not been researched yet. Therefore, inductive reasoning will provide better understanding of discussed fairly new issues. Inductive reasoning is defined as "*generalizing from one or more observations in the course of developing a more general explanation."* (p. 10). There is limitation with this method as well,

and the research in this paper can suffer from it respectively. Using the inductive approach does not include other influential factors which might have impact in the process of acquiring the assumption and proving hypothesizes. More specifically, the explanation of responses from the participants in the research can consist of more than one motive. (Dunn, 2001)

d. Pearson correlation

- Definition

"Correlation analysis is one of the most widely used and reported statistical methods in summarizing medical and scientific research data." Correlation, as a concept of universal significance, is defined as a process by which it is determined *"if a relationship exists between two different variables* [and its] *purpose is to measure the closeness of the linear relationship between the defined variables"*. Another purpose of this method is to offer researchers the so-called 'correlation coefficient'. (Taylor, 1990, pp. 36-39)

- The correlation coefficient (r)

The correlation coefficient is often found in statistical literature as Pearson's product-moment r or r coefficient. The correlation coefficient represents the summary value of a data set, which determines the degree of association between two measured variables. (Taylor, 1990; Berkson, 1993) In research, this tools is highly recommended, as it offers objectivity to the investigation, being independent from a personal human factor and also because it correctly and rigidly position the data. (Reed, 1917)

- Procedure

The data must be introduced accordingly in groups in a table or arranged as a dotted chart. If the data appears to have a straight line setting, this means that there is an association between the variables in the table, *"that is, whether there is a tendency for a high value of one variable to be associated with high values of the other variable and proportionately higher or lower values of the one to be associated with similar values of the other."* This situation shows there is a linear correlation between the variables. (Reed, 1917, p. 671)

But due to the advances in statistical tools, the above procedure is easier interpreted with statistical software (e.g. SPSS), and if the correlation coefficient is found to be less than 0.05, then the correlation is significant and the variables are linearly related.[23] After this step has been realized, then it is a matter of analyzing the correlation coefficient and interpreting it.

- Interpretation

The correlation 'r' value may take on a range of values from -1 to 0 to +1. If the value is 0, then it can be stated that there is no association between the given variables. On the other hand, the closer the correlation coefficient approaches ± 1, regardless of the direction, the stronger and more linear is the relationship. "*A positive correlation coefficient indicates that*

[23] SPSS Statistics Base 17.0 User's Guide

an increase in the first variable would correspond to an increase in the second variable, thus implying a direct relationship between the variables. A negative correlation indicates an inverse relationship whereas one variable increases the second variable decreases." (Taylor, 1990, p.36)

The most important aspect and for which the correlation coefficient has received so much consideration is because it is a tool that shows a pattern not only for the cases analyzed, but it can be applied to a bigger number of cases. "*Its size* (r) *is a measure of how closely the results from an infinite number of cases would correspond with those obtained from the observed cases."* (Reed, 1917, p. 681)

Because values of (r) can be very different and express degrees of strength for the relationship between two variables, in the following table an analysis of what the values mean is detailed:

Figure 19: Correlation coefficient description (Popa, 2006)[24]

Correlation coefficient	**Description**
0.0-0.1	Very small, negligible, unsubstantial
0.1-0.3	Small, minor
0.3-0.5	Moderate, medium
0.5-0.7	Big, high, major
0.7-0.9	Very big, very high
0.9-1	Almost perfect, describes the relationship between two indistinct variables

7.1.3 Participants

Master students form chosen Chinese universities are the target group in this study. According to Kaman (2009), young people are more likely to support environmental friendly policy, products or even philosophy. It is also argued that young people are promising group of individuals, especially for marketers in long-run, since it is easier to inspire and develop their awareness of environmental issues. Besides open-mind, young people are having better prospects to get higher salary, so their (future) purchasing power will be stronger. Their live-span is longer and they have also, to some extent, impact on their family members. (Kaman, 2009)

With using argument by Creusen, the dimension of gender will be added as facet for realize differences in attitudes between males and females. Creusen is emphasizing the importance

[24] The table is an excerpt from a handout given to students.

of demographics, gender included, as an important aspect in analyzing consumer attitudes towards products. (Creusen, 2010) This argument is also supported by Kaman in his study, where he argues the necessity of distinction between male and female attitudes in relation to environmental issues. His study revealed that, for instance, females are more responsible and approachable to environment protection, and that they have also significant influence on their male peers. (Kaman, 2009)

Summing up, the choice of Master students, as the target group for a research, is based on the following premises:

- Highly educated
- Open-minded with positive relation to new ideas
- Potentially well-paid future workforce
- Higher environmental awareness

Statistical approach will be realized by distinguishing participants in the survey by gender, and age since this is not prescribed predisposition for studying Master program.

7.1.4 Survey

The survey consists of several questions that are meant to cover the subject of attitudes in the specific design direction which is the attitudes of Chinese Master Students as regards to the EV. On 1st of April the survey has been posted off the Web, which meant that data analysis was in progress. The survey strictly chose to concentrate on respondents that are Chinese Master Students. The target group was reached by contacting directly the students by e-mail. A total of 105 students have been contacted by e-mail, a total of 50 students answered, but only 40 responses were valid for the purposes of this survey. In order to avoid any language issue, the survey has been developed in Chinese, with the help of two Chinese colleagues.

7.1.5 Piloting and testing

For the certainty that the survey would be released without any problems, a pilot has been released on 15 March, and stopped on the 18 March. After all questions were developed and they were agreed upon, the link of an English version was given to a number of Master Students at Linköping University, and after two days the results were collected. This opportunity made room for seeing several improvements that needed to be done and also insightful reviews were given by the chosen respondents.

7.1.6 Instruments

The questionnaire has been used as the main tool for this paper. The survey consists of a section where the profile of the respondent is determined, including socio-demographic characteristics such as ‘Age’, ‘Gender’, and of a section where specific questions regarding

the consumers' attitudes are put. The survey gives some conception on what are the attitudes of Chinese Master Students toward the EV. It consists of closed-ended questions, questions with multiple choice and scales, but also one open question, which have been developed with Google docs and that provided extensive tools for analysis and information management. Further, the data has been processed more thoroughly by the use of SPSS, for better interpretation purposes. (The detailed version of the survey can be found in the Appendix)

7.1.7 Ethical Considerations

Because the survey is working with human respondents, upon considering this aspect, we decided that not to ask for any personal information and thus we would not have to work with information that is personal and confidential. Also, we will inform the respondents as regards to the aim of the study and what it will follow.

7.1.8 Limitations

One of the main limitations is that respondents may not respond with their utmost sincerity to the questions in the survey, and unfortunately there is no method to avoid this aspect. This is owed to the fact that respondents are aware they are being questioned. Fishbein & Ajzen (1975) speak about disguised and non-disguised methods of measuring attitudes, and the paper has a non-disguised approach, in that the respondents know that their attitudes are being measured, as opposed to disguised approach, where respondents are not aware of the measurement. This is consistent with the fact that attitude measurement approach will generally consist of a real score, which shows the attitude of the respondent, but also consist of a measurement error. (Fishbein & Ajzen, 1975) Fazio et al.. (1986) add to the above considerations by affirming that individual will not always be sincere when asking an attitude survey.

A second limitation, that Fishbein & Ajzen (1975) mention, is that the survey itself might influence one's attitudes upon a given object. This happens because the individual is given a question that might affect his/her perception and possibly change his/her beliefs and attitudes at the moment when taking the survey. "*While reading a question and listed characteristics, the person may change his salient beliefs by recalling information or by making a new inference on the basis of existing beliefs. It can be concluded that because of the nature of beliefs is easily changeable and thus it is extremely hard to have an efficient and precise measurement."* (pp. 218-219) In terms of this paper, these considerations can be applied. Thus for the EV concept, some participants will only now meet this subject, which will possibly translate into a person doing some research upon answering all questions in the questionnaire. Also, according to Fishbein and Ajzen (1975), people might change their beliefs about this concept only by going through the survey.

Another limitation is regarding the Pearson correlation. Even though the concept is very much used in research, Taylor (1990) says the correlation coefficient does not validly measure nonlinear relationships or spurious and accidental associations. One of the most significant limitations for researchers using this statistical method is the issue raised in the paper of Aldrich (1995), but originally in Elderton (1907). He admits that two variables can have a significant value of the coefficient of correlation, but when in fact in reality these are totally unrelated.

7.2 Sample questions[25]

The purpose of the survey the authors conducted is to find out what is the attitude of Chinese consumers towards new products, particularly electric vehicles (EVs). In order to proceed with this research authors had to consider several variables which can have significant impact on answering the general contextual question. Among these variables are some of the demographics characteristics, out of which the age and gender of participants playing crucial role, and consumer awareness of EVs, which can be perceived by consumers based on its functional (technology, usefulness etc.) and symbolic facets (environmental responsibility and awareness, moral obligation etc.). The detailed version of the survey can be found in the Appendix.

Gender
Gender is another demographics facet considered in this research. As authors examined, consumer attitudes can be different depending if consumer is male or female. It is proved that males and females have different attitudes towards products, whether they are new or already placed on the market.

According to literature, males and females have different ways of evaluation of a product. Females tend to examine and analyze product in details before they make purchasing decision. Males tend to think in simpler way and evaluate overall characteristics of a product. Males are also more open-minded to trends, while females tend to be more skeptical to new products and even scared. Females respond to product differently as they appreciate more symbolic facets of it. In their mind the beauty, prestige or any other emotional aspect is of high importance for them. Men, on the other hand, evaluate products from their functional perspective and practicality. (Hoyer & MacInnis; 2007)

This distinction has its limitation since it seems, according to literature, that masculine and feminine traits have to be taken into account. In other words some females and some males consumer attitudes can be positive, more or less, to features of product that are perceived to

[25] Note: Questions are put in logical and structured order, so there can be meaningful connection between them.

be attractive for other gender (example: females can incline to male products). (Hoyer & MacInnis; 2007)

That is why the results of the survey can be highly dependable on the demographical characteristics of participants. However, to base the research only on demographics cannot be considered as sufficient. It is rather to implement other facet important for examining attitudes towards EVs.

Consumer awareness of product is thus viewed as a proper support for a research. The questions examining this issue are made in two contexts of the EV as a product, which is environmental and technological context.

Age

The question about the age was put into the survey based on findings from various literature sources. According to literature, consumer attitudes can vary in different stages of human life. In other words, consumer attitudes can be different, to some extent, in youth age in comparison with those in senior age.

Authors are focused on one particular group and that is students studying master programs. The general perception of one master student's age is that he/she is in age group 22-25, even though this cannot be considered as rule. This age group falls in definition, regarding theory of demographics, of so called 'generation X'. 'Generation X' consumers are characterized as highly potential group of consumers for marketers in long-term perspective. These consumers are creating their own attitudes towards particular products mostly in this stage of life. Consumers in this age category usually have free spirit and are open-minded. Usually they do not prefer materialistic attitude and do not respond to brand names in whatsoever way. They respond positively if marketers communicate in language understandable for them, usually reflecting their lifestyle. These consumers treat products in the same way too. (Schiffman & Kanuk; 2000) Therefore, the emphasis on this particular group is put by authors in their survey.

Are you a Master Degree student?

The purpose of this question is mainly to be sure that the sample will be consistent of people that are currently studying their Master Degree. Thus, the persons that will not answer in an affirmative manner to the question, they will be withdrawn from the sample that we will consider in the analysis. It is therefore crucial to examine this likelihood on master students, who are considered open-minded and future solvent purchasing class. The reasons for choosing Master students have been discussed in detail in the Methodology part of the paper.

How important do you consider environmental issues?

The purpose of this question is to examine the participants' awareness of environmental issues. Especially in China, which is suffering by rapid growth of pollution, this concern is of

high importance. This fact can influence consumer awareness of environmental threats and can be considered as factor having positive influence on attitudes towards EVs. The context of this question is also connected to sort of moral obligation and responsibility the participants can feel towards their surroundings.

Do you own a car?
The general purpose of this question is to see how many people have a car. Generally, people that have a car have developed some past experience that would help them to a great extent to creating some strong attitudes. As the paper has found out, the Chinese consumers do not have so much experience with cars, and even less with an Electric car. So, the paper hopes to make a connection between experience (by owning a car) and how this may affect in a positive or negative way their attitudes to a future EV buying decision.

What is your attitude towards new technologies/innovations?
As it was mentioned earlier, the EV has its functional characteristics. It is a fairly new technology, especially on the Chinese market. We believe that consumers who are concerned about the environment and are not intimidated by technology should display a higher preference for CFVs than consumers who are not concemed and are intimidated. Our belief is consistent with the long and compelling evidence in the literature that relates attitudes to preference and behavior (e.g., Ajzen and Fishbein 1977; Borgida and Campbell 1982; Snyder and Kendzierski 1982).

What is your attitude toward the Electric Vehicle?
This question is very straightforward, and it is believed that it offers the paper a good picture of what is the real attitude of Chinese Master Students regarding the EV. Also in a more wide understanding, conclusions can be drawn to what the acceptance of the Electric Vehicle might be.

Would you buy an Electric Vehicle?
This question serves the administrative function. The purpose is to select and separate those participants, who are already decided not to purchase the EV, from those, who at least consider purchasing the EV in near or far future. Even though the authors expect negative answers, participant answering in this way will not be excluded from the survey because of two reasons. First, having participants with negative attitudes towards EVs has important implications for this product in future. Second, the participants answering no are asked to write their reasoning behind their attitude.

In what time would you consider buying an EV?
While it might be hard for respondents to give a sincere or a definite answer that could be taken for granted, this is not the case, as the students will only give possible predictions on the approximate time they think they will consider buying an EV. Nevertheless, this question

serves the purpose of seeing a pattern of Master students and in what time they project themselves in having an EV.

Would you pay a premium price for an EV?
Development and introduction of the EV was and is costly, thus the price of this product is fairly higher than price for cars with traditional drive system. The price as a factor is mostly considered as one of the most decisive for consumers' purchasing decision. It can even outweigh symbolic aspects of the EV and its importance for future sustainability for Chinese environment and economy. Either positive or negative response on this question will have immense implications for companies' officials.

What EV range would serve your daily driving needs?
With this question the survey proposes to find out what potential range would suit one's necessities, and more trying to see how much Chinese Master Students value the importance of mileage done with one charge. Consequently it will be also found out whether there is a need for long or short distances in this sample.

In your opinion, how important is the contribution of the Electric Vehicle to the Environment?
It is predicted, by Gao et al. (2008), that in 2030 passenger cars in China could produce 1.2 billion tons of greenhouse gas emissions, unless new energy alternative like EV is not adopted. EV, with other alternative drive systems potentially available in the automotive industry, seems to be solution to this particular problem, as it/they has/have potential to reduce emissions by 45%, Gao et al. maintained. Although it may seem the EV is partly a solution on the environmental problems, consumers' view can be different and dependant on their values and beliefs. They might see the EV more from practical point of view; in other words, they might judge its usefulness and positive/negative contribution to their life. By tasking this question, the authors want to "relational triangle" between consumers, environment and the EV.

Ranking the following factors' importance as regards to the defining Electric Vehicle.
In this particular section, the participants are asked to rank factors which are determining the EV as a product. These factors are: "contribution to the environment, price of the electric vehicle, electric vehicle infrastructure (refers to recharge stations for instance), support from government and distance range of the electric vehicle". The intentions of authors are to find out of what the consumers are really concerned at the most, as regards to the EV.

Contribution to the environment and price of the EV was discussed earlier, thus attention will be put on the other factors.

The EVs infrastructure is essential factor for this product. For China this issue is still a challenge. Gao et al. (2008) maintain that China will need to invest till 10 billion renmimbi

by 2020 only on recharging stations. That does not mean official are not having this in mind because State Grid Corporation had already installed charging stations for buses and passenger cars in Beijing, Shanghai and Tianjin. Recharging stations are just part of solution to this challenge. Time of recharging the EV or battery charging is another one. In comparison to traditional gas stations, where filling up the gas tank takes few minutes, recharging stations for the EV could cost consumers few hours of their time.

Government plays crucial role in the case of the EV. It has it responsibility share in the R&D of the EV and also contributes to market positioning of the EV by supporting it with (de)regulations and incentives. China claims increasing the amount of investments into R&D on 2.5% of GDP by 2020 and it adopted several five year plans so far, which also include certain amount of investments. In the next five year plan, which will be announced this year (2011), Chinese government is expected to maintain its support to R&D of the EV and development of batteries. However, one could find certain amount of doubtfulness since Chinese government is resistant to publish any data. What is more clarified is the amount of incentives, in form of financial support of purchasing the EV, by government. On June 1, 2010, Chinese government proclaimed the trial financial incentive program where it offers up to 8800 USD per vehicle for chosen cities of Shanghai, Changchun, Hangzhou, Hefei and Shenzhen. (FinPro China, 2010)

Distance range of the EVs is another characteristics proving unworthy purchasing of this product, since this range is considerably smaller than this on side of the traditional cars. It is understandable due to the fact that this technology is still in early stage, especially in China. However, China is moving forward with development of battery technology and it can be considered as the leader in this segment nowadays. Besides, car manufacturers are progressing in this issue as well. Example is BYD car company which, as the authors presented in their paper, was mainly focused on development and distribution of rechargeable batteries. It entered automotive industry in 2003, so it can be considered quiet new to the industry. However, it quickly started to use its knowledge from batteries development. (Zang & Wu, 2009) Currently, BYD offers two models of cars with pure electric drive, F3DM and E6. Really interesting is specification especially for E6. According to BYD website, this family car has driving range 300 km and top speed 140 km/h

Rank car specific attributes that will make you buy an EV.
Trying to see outside the considerable benefits the EV has, this question is intended to see how important car attributes are for Chinese Master Students, when choosing to purchase a vehicle, and what degree of importance they give to this car specific attributes.

In order to understand consumer attitudes in the automotive industry it is necessary to define an object the consumer addresses his/her attitude to. In this case the object is a car. Car, as the most of products, is not evaluated only as a complete package, but rather as a complex

product consisted by different attributes which can affect, positively or negatively, consumer attitudes.

These different attributes cannot all be known by each consumer, thus consumer knowledge about car attributes is limited or varies due to the consumers involvement in particular car company [or product]. (Peter & Olson, 1999)

What are the reasons why you would not buy an EV?
While it is assumed respondents will have a positive attitude toward the EV, many people will decide not to buy this car because of its main disadvantages. The questionnaire intends to find out what are the probable reasons of people that would not buy an EV. This can also serve for a better understanding to what are the main aspects that need to be considered by manufacturers of EV.

7.3 Empirical analysis

The purpose of the empirical analysis is to find out what are Chinese consumers' attitudes toward the EV (Electric Vehicle). For this reason, the survey was developed and sent out to 104 persons in Chinese language. First targeted were all the Chinese universities in Beijing, Shanghai and Guangzhou. By using e-mails and phone calls in some cases, these universities were approached, but unsuccessfully. What is more, the Chinese master students in China were approached with using social networks and various channels. Because of the intention to be more efficient in collecting data, the authors turned their focus on Chinese master students studying abroad on universities in Linköping and Kalmar.

These persons were chosen with respect to two specific criteria. A first criterion was nationality which had to be necessarily Chinese. Second criterion was that participants had to be, either first or second year, master students. The motivation behind these two criteria was the growing importance of the EV for Chinese automotive industry and Chinese economy as the whole. Master students were chosen for their relatively high education and because they are considered as a new buying class. Samli (1995) who, in his book regarding "International Consumer Behavior", discussed the adoption of innovations within four cultures (Japanese, Korean, US and Chinese) claimed that there are big differences between these cultures in the process of the adoption of innovation. For the purpose of this survey and motivation for choosing to analyze Chinese master students' attitudes, his finding about China will be used. The most notable facet of Chinese consumers Samli discovered was their open-minded nature. He defines this characteristic as important precondition to the adoption of innovation. To prove this statement he also found out that Chinese consumers tend to be less cautious than other studied cultures, which could imply their highly positive attitudes toward innovative products whatsoever. Furthermore, Samli (1995) analyzed their pre-purchase behavior, where he proved that Chinese consumers' pre-purchase decision is closely related

and dependable on their social networks. In other words, Chinese consumers tend to be less autonomous in their purchase decision making and rely to high extent on other opinions (colleagues at work, family, peer mates etc.).

Coming back to the reasoning for choosing the master students, from mentioned above one can assume that they will be open-minded in their nature and, so to say, with eager attitude towards innovative products, such as the EV. They might be influenced to some extent by other factors like family or friends, but the purpose of analyzing their attitudes is to find out their general perspective on the EV, no matter influences. Therefore, they will be put in front of questions not only regarding their attitudes toward the environment and the EV but also they will be asked about their perception of more practical determinants of this product (government, infrastructure, price of this product etc.). And what is more important, in this stage of life they are shaping their attitudes and beliefs, thus their answers will provide a valuable source of information not only for the research community but also for marketers.

Because of the small number of respondents, it has been raised to the author's attention that this number of respondents or sent surveys is not enough, but what needs to be kept in mind is that the target group for this research has its specific characteristics. It is common that the number of sent surveys usually to exceed 100,[26] but in these cases one has to notice that there is no such specified target group, as compared to this survey. The common group of respondents is usually picked base on their location, but if comes to specific characteristics like gender, age group, educational background, those are not taken into account so much. Although they are analyzed, the methodology of the survey is not based on specific criteria for selecting the target group. Therefore the number of sent surveys and actual number of responses can be considered as sufficient for the purpose of this research.

Out of these 104 sent out surveys 50 persons decided to participate. Participants were mainly Chinese master students at Linköping University and studying variety of master programs. Just a few participants were directly from China.

No matter the effort to contact only Chinese master students, some of the participants had to be excluded due to the unmet requirements. Out of these 50 responses 10 had to be excluded because the participants were not master students or even they did not have Chinese nationality.

The questions were written in multiple choice formats and one open question. Participants have either choice to choose between simple 'yes' or 'no' options, or they were offered with five scale multiple choice questions to better express their opinion regarding a particular issue. These kind of questions also served purpose of giving a better understanding to authors about key issues such as awareness and attitudes toward environmental issues, relation to the

[26] To the authors' knowledge from read articles in consumer attitude research.

new technologies/innovations, relation to the 'green' products, and finally relation/attitudes toward the EV and beliefs regarding its contribution to the environment.

In order to analyze recent issue of consumers' attitudes toward the EV in China, and moreover its acceptance, hypothesizes are developed. These hypothesizes are based on assumptions referring to consumers' attitude toward practical and symbolic facets of the EV.

7.3.1 Hypothesizes

H01a: Consumers considering the environmental issues with high/highest importance will have positive attitude toward the EV.
H01b: Students will consider the environmental issues highly important.

H02a: Consumers with good relationship toward new technologies/innovations will have positive attitude toward the EV.
H02b: Students will have positive relationship toward new technologies/innovations.

H03: Students will tend to have better relationship toward "green" products, such as the EV.

H04a: Consumers with higher awareness about the environmental issues/problems will be willing to pay price premium for "green" products, such as the EV.

H04b: Consumers with higher awareness about the environmental issues/problems would consider the contribution of the EV to these issues/problems as high.

H04c: Students would consider the EV as contributory factor to solving of the environmental issues/problems.

a. Descriptive analysis

With number of 40 respondents, the survey aims to get basic demographic information about the participants in its beginning. Apart from questions, where participants were asked if they are master students and with Chinese nationality, which they answered on 100% positively, this survey tries to find out participants' gender, age and place of permanent living.

Out of the respondents, 70 % claimed they are females and respectively 30 % claimed they are men. The result regarding age was not extraordinary or unexpected at all. Within 7 age groups given to participants to choose, majority of them felt into the age scale of 22-25 (63%). The group of 26-30 year old included 14 participants (35%) and only 1 participant claimed the age within 36-40 age scale (2%). As regards to question about permanent address, the majority of participants (82.5%) responded to have permanent address in the other cities than Tier 1 (Beijing, Shanghai, Guangzhou). 12.5% of the respondents claimed to have the permanent address in the city of Shanghai and 5 % of respondents live in Beijing.

Hypothesis 01

The first key question, which was of interest for this survey, was to find out what are the attitudes of participants regarding environmental issues. In other words, participants were asked about their perception of environmental issues, and what is their stand. They were presented with a five option scale where they could choose from 'extremely unimportant' to 'extremely important'. The majority of participants expressed either high or higher concern about the environmental issues/problems; in other words 22 out of 40 participants (55%) considered environmental issues as important, and 18 out of 40 participants (45%) considered them as extremely important. Based on statistical average (MEAN), all of the participants had average answer with value of 4.4500. Moreover, there were no finding showing that the importance of environmental issues is perceived differently by males and females (MEAN for males- 4.4167; MEAN for females- 4.4643). In other words, for males and females the environmental issues are almost equally important.

Figure 20: Consideration of environmental issues

	Extremely unimportant	**Unimportant**	**Neither unimportant, nor important**	**Important**	**Extremely important**	**Mean**
How important do you consider environmental issues?	0%	0%	0%	55% (22)	45% (18)	4.4500

Interesting findings can be considered the responses to the question whether the participants would buy the EV. Results have shown that 25 out of 40 would purchase this product. In relation with previous finding, one can observe connection between awareness of environmental issues and willingness to purchase the EV.

This finding aligns with written theory which says that awareness of environmental issues could create sort of moral consciousness and trigger the 'green' acting. (McGregor 2006) Moreover, such people's actions would result into the purchasing of 'green' products such as the EV. What is more, one cannot forget the target group of this survey, which is 'master students'. This also stresses the findings in theory which maintains that young generation has started to be, more or less environmentally concerned. (Autio et al., 2009) Thus hypothesizes *H01a* and *H01b* can be adopted.

Hypothesis 02

The second key question was conceived in the sense of defining the participants' relationship towards new technologies and innovations. 'Green' products, such as the EV, are

characterized as innovations with intensive technologically developing background. Thus these products cannot be viewed only from symbolic perspective, represented by 'green' consciousness, but also from technological one, and moreover from consumers' ability to adopt particular new technology.

Therefore, participants were asked to express their attitude towards new technologies/innovations, and were offered to choose from five option scale: from extremely unfavorable to extremely favorable. According to the survey, the majority of participants expressed highly positive relationship towards new technologies. In more specific numbers, 19 out of 40 expressed favorable, and 18 out of 40 expressed extremely favorable relationship towards new technologies/innovations. The rest of participants (3 out of 40) had neutral attitude. Based on distinction of the answers on males and females, males expressed slightly more favorable attitude toward new technologies/innovation (MEAN- 4.5833) than females (MEAN- 4.2857). In summary, the participants averagely expressed favorable attitude toward new technologies/innovations.

This finding means important precondition for purchasing the EV, as it was mentioned before that 25 out 40 would buy the EV. Therefore one can assume that high interest in new technologies leads to inclination to new technologies and potential purchase of the EV. This finding is aligning with presented theory earlier (Ozaki & Sevastyanova, 2010), however does not offer full understanding about consumers' 'green' attitudes and consequently purchasing behavior (Cui et al., 2009; Bagozzi, 2007). Nevertheless, it proves that technological perspective of any product can attract consumers' interest, and thus it is factor worthy to consider. From this perspective, *H02a,b* are proved respectfully.

Figure 21: Expressed favorability towards new technologies/innovations

	Extremely unfavorable	**Unfavorable**	**Neither unfavorable, nor favorable**	**Favorable**	**Extremely favorable**	**Mean**
What is your attitude towards new technologies/innovations?	0%	0%	8% (3)	48% (19)	45% (18)	4.3750

Hypothesis 03

The next issue this survey tried to address is simple attitudes of consumers (students) towards the EV. For that reason they were offered to provide their opinion regarding their experience with cars whatsoever and to express their attitude to such product.

As regards to the experience with cars, the majority of participants claimed they do not own the car (33 out of 40; 83%). On the other side, however, 57% (23 out of 40) claimed that they had experience[27] with cars in the last 2 years. The reason, why the questions regarding ownership of a car and experience with cars were asked, was to find out if there are some factors which can make participants to acquire certain perception, belief or salient attitude toward cars in general. This important facet could affect perceiving and attitudinally evaluate the EV as well. From collected responses on mentioned two questions, one can assume that there is a little 'first-hand' experience with cars whatsoever. Moreover, while asking participants about their attitude towards EV, those who claimed to have car experience in the last 2 years expressed less favorable attitude towards the EV (MEAN- 3.9565) than opposite group (MEAN- 4.0588). This could imply that the participants might be more influenced in their opinions from other, external factors. The peer-experience, observation taken from environment and so forth could be potential reason behind this. (Iyer and Kashyap 2007; McGregor, 2006)

Coming back to the defining the participants' attitudes towards the EV, their expression was positive towards such product as they claimed their attitude to be favorable as regards to the EV. The 31 out of 40 participants expressed favorable or extremely favorable attitude toward the EV (22- favorable; 9- extremely favorable). The rest of the participants expressed neutral attitude towards the EV. These results maintained the average answer saying that their attitude is favorable (MEAN- 4.0000). This finding corresponds with the argument of Chan (2001). He/she argued that, Chinese people have really positive relationship to the nature graven into their culture.

Therefore, and because of influential factors from the society and communities they live in, Chinese master students will have better relation toward the 'green' products, such as the EV. Thus, based on findings, *H03* can be maintained as true.

Figure 22: Expressed attitudes toward the EV

	Extremely unfavorable	**Unfavorable**	**Neither unfavorable, nor favorable**	**Favorable**	**Extremely favorable**	**Mean**
What is your attitude toward the Electric Vehicle?	0%	0%	23% (9)	55% (22)	23% (9)	4.0000

[27] By experience, the authors mean driving the car, being passenger, visiting car shows etc.

Hypothesis 04

Furthermore, the survey analyzed responses from those participants who expressed their willingness to purchase the EV. They represented a number of 25 persons out of 40, as it was mentioned before. The question regarding willingness to purchase the EV is the crucial one for the survey. It served the purpose of distinguishing those participants whose attitudes were more 'pro-EV' oriented from those whose were not. It also gave the authors the option to narrow down the participants to the group of individuals whom they could ask specific question about this particular product. Thus the questions that followed were answered only by those who answered 'Yes' to whether they would buy an EV or not.

The first issue raised was regarding willingness of participants to pay a premium price for the EV. The results in this case were almost even. 13 participants out of 25 claimed that they would pay premium price, the 12 would not. Male participants had smaller intention to pay premium price for the EV than female participants. Average answer of males was more inclining to negative attitude as regards to this issue (MEAN- 1.6667), while females expressed less resistant attitude (MEAN- 1.4211). Nevertheless, this finding leads to assumption that price still plays an important role in decision making of consumers whether to purchase 'green' products. To partly support this argument, participants were also asked in what time they would consider to buy the EV. Majority of them maintained that they would buy it in 5-10 years (13 out of 25), while another expressed willingness to purchase this product in shorter period of time (1 out of 25 in 18-24 months; 8 out of 25 in 2-3 years; 3out of 25 in 3-5 years). This finding might be interpreted as participants do not see them purchasing the EV in the short period of time due to the price factor, even though the reasons could be of another kind than price (infrastructure; not enough support from the government). (Chan, 2001) Thus the hypothesis *H04a* can be, by observing, respectively disapproved.

Despite the fact that price can significantly affect the pro-environmental attitude, all the participants who claimed that they would not pay premium price, they expressed strong consideration of the environmental issues and highly positive relation towards technology and innovations. Furthermore, they expressed highly positive attitude towards the EV (See Figure 23).

Figure 23: Perceiving the EVs contribution to the environment by participants who were not willing to purchase the EV

	Mean
How important do you consider environmental issues?	4.2500
What is your attitude towards new technologies/innovations?	4.5000
What is your attitude toward the Electric Vehicle?	4.1667
In your opinion, how important is the contribution of the EV to the Environment?	4.1667

Moreover, in the context of purchasing such products, the most of participants in the survey expressed their belief about high contribution of the EV to the environment issues. 19 out of 25 responses showed that, participants consider this contribution as important, and 8 out of 25 as extremely important. The written above is showing two perspectives how the participants looked at the EV: a) they perceive this product through practical point of view, as they put emphasis on price of this product while evaluating it; b) they also perceive it from symbolic perspective, as they believe in the EVs contribution to the environment. It also seems that there is no connection between practical and symbolic perceiving of the EV by participants, thus they are not dependable on each other. This implies that hypothesizes *H04b,c* can be considered as proved.

Figure 24: Expressed opinion about the EVs contribution to the environmental issues

	Extremely unimportant	**Unimportant**	**Neither unimportant, nor important**	**Important**	**Extremely important**	**Mean**
In your opinion, how important is the contribution of the Electric Vehicle to the Environment?	0%	0%	0%	76% (19)	24% (6)	4.2400

All hypothesizes were analyzed not only by purely dividing the participants' responses, defining the statistical average (Mean) answer they gave on the each question. What is not presented in the figures above is the standard deviation. It has to be noted that standard deviation is the most common statistical tool for defining the distribution of variability. As Dunn (2001, p.158) argues, the standard deviation can be defined "*as the average deviation between an observed score and the mean of a distribution"*. Dunn continues saying that, if the standard deviation reaches small numbers the observations (hypothesizes) are close to the statistical average. In other case, when these numbers are big, observations (hypothesizes) are not dispersed from the statistical average, thus do not have to be reconsidered. Based on the findings from the survey, all collected responses showed to be with low standard deviation as being correlated to the statistical average at the same time. Thus all hypothesizes did not infer any need to be reconsidered as they did not express any dispersion or heterogeneity.

The rest of the questions in the survey were more concentrated on defining participants' subjective requirements as regards to the EV, as well as defining the importance of objective factors impacting relevance of the EV to participants.

To acquire better understanding of the EV, authors had to take into account in this thesis external factors defining and affecting the EV. Therefore, factors like government, infrastructure, driving range of the EV, price and contribution of the EV to the environment had to be considered.

Price and contribution to the environment was discussed partly earlier. There was also touching upon driving range issue in the survey where participants were asked to estimate what kind of driving range would serve their working days driving range the best. The results showed that the majority of respondents required more than 70 km driving range from the EV (1 out of 25/4%- 30-50km; 3 out of 25/12%- 50-70km; 4 out of 25/16%- 70-90km; 7 out of 25/28%- 90-110km; 5 out of 25/20%- 110-130km; 2 out of 25/8%- 130-150km; 3 out of 25/12%- more than 150km).

Nevertheless, participants were asked to rank these, already discussed, three issues and additional factors (government and infrastructure) on a scale from 1-5, as 5 being extremely important. As regards to contribution of the EV to the environment, the results were not surprising as the majority (22 out of 25) ranked as important or extremely important, which aligns with finding about the positive belief expressed by the participants regarding the EVs contribution to the environment, earlier asked in the survey. Similar result appeared in ranking the price where 19 out of 25 ranked it also as important or extremely important.

The infrastructure (recharging stations; battery swap services), which was considered as one of the weakest sides of the EV according to the theory (Larminie & Lowry, 2003), was ranked more as extremely important (19 out of 25).

Interesting finding appeared while ranking the government support as influential factor as regards to the EV. While 15 out of 25 participants considered government as more as important/extremely important (10- important; 5- extremely important), 9 out of 25 respondents considered its role neither unimportant nor important. According to the written theory which claimed government as really important and decisive factor for the EV (Chan, 2001), one can assume that from perspective of consumers (in this case students) government position here is not so crucially important.

Ranking the driving range (distance range) also did not bring surprising results as the participants ranked it mostly as important or extremely important (13 out of 25- important; 11 out of 25- extremely important).

The reason why those factors were analyzed in relation to the EV is that they define it and can be crucial to its existence. The importance of these factors is even more notable in Chinese environment since the automotive industry is highly regulated, and especially the development of the EV is under strict supervision of the government because of its importance to the Chinese economy (Gao et al., 2008; Stark et al., 2011; Brown et al., 2010; Cao & Xu, 2010). Moreover, from the presented above, there can be assumption acquired that as much as participants see the contribution of the EV to the environment they perceive and evaluate it as any other product. In other words, they are evaluating this product by matching it to their personal needs, while price, infrastructure, driving needs and role of the government seem to be facets put into the correlation of personal needs by the participants.

In the case of subjective requirements, the participants were asked to rank following chosen car attributes: color, interior, the cost of maintenance, comfort, speed/acceleration, design, size, trunk space, technology and customization. As in the previous case, the participants could rank these attributes' importance on scale 1-5, as 5 was being the extremely important. The reason to analyze participants' evaluation of particular attributes is to find out their preferences if comes to the cars. One might argue that because the participants are students they do not have to have necessarily developed 'taste' for cars. Let's not forget that the purpose is to find out what attributes, so to say, trigger participants' interest into the EV and this does not need to be immensely related to their direct (if they have) experience with cars.

In very general view, the color was ranked as the least important among the other attributes. Only 11 out of 25 (44%) considered it as important (8- important; 3- extremely important). The majority of responses were more in category of having a little or no meaning to the participants (3- extremely unimportant; 1- unimportant; 10- neutral).

As regards to the comfort, interior and design, the factors which can symbolically provide consumers with attributes like beauty and pleasantness, they were ranked with relatively high importance. For instance, 24 out of 25 (96%) ranked comfort attribute as important (15-

important; 9- extremely important). Results from ranking the design were not so much different (16- important; 4- extremely important).

If comes to the practical attributes like cost of maintenance, size of car and trunk space, one can notice ranking these attributes as highly important. The participants expressed the high importance particularly to cost of maintenance where 23 out of 25 (92%) ranked it as important (12- important; 11- extremely important). Size of a car was also considered as important facet for participants when 20 out of 25 (80%) ranked it as important. Similar results appeared also in the case of trunk space attribute were 17 out of 25 (68%) considered it as important (14- important; 3- extremely important).

More technical attributes like speed/acceleration, technology and customization were also ranked with relatively high importance. Speed and acceleration were important for 19 out of 25 (76%) respondents (12- important; 7- extremely important). Technology, in the context of the car, means gadgets incorporated into the car and also technological advancement. This attribute, in alignment with highly positive relationship of participants towards new technologies/innovations, was ranked as highly important (10- important; 12- extremely important). Customization, as attribute, was implemented into the survey because there can be witnessed growing individualization in the car industry nowadays. (Schwarz, 2008) This is proved by results of this survey where more than a half of the participants expressed consideration of customization as important (12- important; 5- extremely important).

From the written above, there can be concluded two implications. First, participants were evaluating the EVs attributes as any other conventional car ones. The environmental context of this product seems to not be taken into account while ranking these attributes, thus the EV is not treated any differently from this perspective. Second, all of the attributes, except color, were ranked with considerably high importance. The most important for the participants seem to be practical attributes which imply what kind of requirements they prefer to be fulfilled.

The last question in the survey answered only by the respondents who would not buy an EV, was concerning their reasons for which they would not buy an EV. The main reasons why people would not consider buying an EV had to do with the chargeability. The lack of charging facilities, the short battery life and the charging time are important facets of the EV which make consumers not even to consider the purchase idea of this vehicle. Another important reason was that technology is not yet fully developed and they are not ready to accept it. Beside these reasons, some respondents would rather go for a hybrid or a car with lower emissions, instead of an Electric Vehicle.

The respondents have expressed a real need of availability of the car at any given moment, so Electric Cars that will go on longer ranges are the solution for the consumer. Another extremely important finding is that because all respondents have shown positive environmental attitudes, this shows that consumers are willing to consider the EV as a viable

option to their transportation needs as long as the EV comes without battery limitations. In the meanwhile, they will choose other environmentally friendly vehicles.

b. Pearson correlation

While there are authors that show the concepts of correlation and correlation coefficient to have a series of setbacks and weaknesses, it is still very much in use. As it has been shown in Methodology, the correlation tool has been one of the most preeminent concepts in statistics. For this reason, it is believed in regards to the paper, that correlation has an added value to the original findings, as some of the questions raised in the survey are to a great extent interrelated and the strength of these associations (of the questions) could not be understood by the means of the descriptive analysis. SPSS proved extremely helpful in seeing the correlations that existed between the questions in the survey. While all the questions were probed to see whether ties of correlation could be created, only a few were significant and relevant for the purposes of the study.

In the following rows, the correlations that were found to be significant from a statistical perspective are presented:

What is your attitude toward new technologies/innovations? - What is your attitude toward the Electric Vehicle?

Figure 25: Pearson Correlation 1

		What is your attitude toward the Electric Vehicle?
What is your attitude towards new technologies/ innovations?	Pearson Correlation (r)	.481
	Significance	.002
	N*	40

* Number of respondents

One of the most important findings of the survey is the correlation created between the respondents' attitude toward new technologies/innovations and the attitude toward the Electric Vehicle. Consistently with the SPSS tool, the correlation of these variables is significant at a level lower than 0.05, which turns one's attention to the strength of this relationship. With a .488 degree correlation (r) the variables are in moderate/medium relation, which means that the more favorable is the attitude toward technology, the higher is the attitude toward EVs. This is an interesting finding for the body of knowledge, as well as for marketers, in the context of consumer research (e.g. segmentation). Furthermore, this piece of

information can be applied to the entire world population[28], and it can be clearly affirmed that people with a strong knowledge and a positive attitude regarding new technologies will consequently show a very strong attitude toward the concept of the Electric Vehicle.

This finding is also confirming Hypothesis 2 a and b, showing that there is a connection between the attitude toward new technologies and the attitude toward the EV and they are very much causal variables, so if the first one is high, the second will also be high, and if the first is low, the second will also be low.

What is your attitude toward the Electric Vehicle? – In your opinion, how important is the contribution of the EV to the Environment?

Figure 26: Pearson Correlation 2

		In your opinion, how important is the contribution of the EV to the Environment?
What is your attitude toward the Electric Vehicle?	Pearson Correlation (r)	.614**
	Significance	.001
	N*	25

* Number of respondents

Another important finding of the survey is the correlation created between the attitude towards the EV and the importance of the EV in regards to the Environment. Being a significant correlation with a .614 degree, it shows that a very positive attitude toward the EV, will consequently translate into an understanding that the EV contributes greatly to the Environment. Or that people, who do not have positive attitudes toward the EV, will believe its contribution to the environment is very low. The (r) value being high, the two variables are in a very strong correlation.

Beside these two main findings, the respondents of the survey have shown that the EV specific car attributes are important and more very much correlated one with the other. The results show that while respondents give car attributes independent appreciation, these characteristics are very much closely related. For example, people will tend to appreciate comfort and design as co-dependant on one another. This means that individuals will see design as a great part in the comfort factor. Another strong correlation is between the size of the car and the size of the trunk. The respondents give to this relationship causality, in the sense that they expect the bigger the car, the bigger the trunk.

[28] According to Reed (1917)

8. Conclusions

8.1 Chapter conclusions

8.1.1 Chapter 1

Chapter 1 was intended at providing a general knowledge base regarding consumer attitudes, as well as, to provide consistent understanding of the main concepts under the attitude umbrella.

Attitudes are a favorable or unfavorable evaluation of a given product, situation, etc. It has been discovered that attitudes are a complex process, which forms from a number of other processes (e.g. beliefs, information acquisition). Attitudes can be measured by several methods (e.g. opinions, behaviors) and they are most easily interpreted by the use of measurement scales (e.g. Likert, Guttman).

When speaking about behavior it is important to mention that attitudes are one of several steps that lead to the formation of a given behavior, but having a positive attitude towards a product, will not always translate into a positive behavior towards it. The relation between attitudes and behavior can be one of causality, but it can also have no connection whatsoever; the consistent debate between researchers alternates constantly, as some are firm believers that behavior can be predicted from attitudes, while others think this is not always true and that other variables may intervene between attitudes and behavior. The current research has raised authors' attention at the fact that the truth is somewhere in the middle, and that taking a stand for Yes or No, is not the best way to answer whether attitudes have a relationship with behavior. One of the best and easiest ways of understanding attitudes and behavior concepts is by visualizing the graphic model created by Fishbein & Ajzen (1975). (See Figures 4 & 5)

8.1.2 Chapter 2

It appeared that determinants like demographics (age, gender and social class) have significant impact on attitudes. This impact is even more visible due to their ambiguous characteristics. In other words, consumers tend to change their attitudes according to their age when they have different expectations and requirements in life. However, it can affect only attitudes which are not salient.

There is also certain connection between attitudes and social class. According to findings, a particular social class has its characteristics like behavior, values and attitudes. Moreover, there is significant influence of these common characteristics on individual's behavior and

attitudes. In the ‘age’ case, attitudes can be changed depending on whether individual is moving from one social class to another.

Males/females also evaluate certain products differently. Although their attitudes cannot be simply divided on male and female but it is a rather complex issue. Some males can have interest in feminine products and the same is valid for female consumers. Significant effect on male/female attitudes has also gender of products. Products can have masculine or feminine traits and this affects male/female consumers in their attitudes toward products.

Awareness of products plays crucial role in shaping attitudes too. Consumers’ knowledge or involvement with particular product defines consumers’ positive inclination to this product. We are witnessing changing automotive industry. There is mutual affection between this speed of changes and consumers’ attitudes and behavior. Consideration of demographics is crucially important, even though the issue is complicated due to the high level of variability of mentioned demographics.

8.1.3 Chapter 3

The EV is an innovative vehicle that uses electricity as propulsion. The EV has a series of benefits (e.g. positive effects on environment, quietness) and disadvantages (e.g. limited range, price) that impact the consumer and his/her acceptance.

Even though the EV appeared in the beginning of the 1800’s its existence has been fluctuant and not always being consistent. This is showed by the fact that the concept is still to be embraced. However in the last decade, the EV has had considerable focus and the concept attracted and still attracts attention, consistent with a relative growth of its acceptance by the consumers.

8.1.4 Chapter 4

One can see that in order to make a success out of the EV there are several factors which have to be considered and challenges which have to be faced. Chinese automotive industry is nowadays on the verge of choosing right strategies to face these challenges in the context of the EV.

There are several incentives and strategies launched by Chinese government but they seem to be insufficient. Low taxes and price cutting for the EV have certain effect but they are rather short-term support. From the long-term perspective, there is necessity to involve more actions in this field, such as implementing clear standards for the EVs, infrastructure development and investing heavily into R&D.

8.1.5 Chapter 5

China is an emerging market where consumer attitudes are becoming more and more of interest. There is a general shift in the Chinese attitudes, as they move from more traditional to Western attitudes; Chinese consumers are becoming more than ever individualistic in their attitudes.

The Chinese automotive industry is one of the 'Pillar industries' and plays a crucial role in China's economy. Chinese consumers have specific characteristics in the automotive industry, and as such they are very much counting on recommendations and opinions from others, as they are not knowledgeable and informed – and this translates into a general need for the Chinese consumers to be provided with more information about products.

8.1.6 Chapter 6

Based on findings one can conclude that there is evidence of positive attitudes of Chinese consumers toward environmental protection. This was explained by their natural respect to nature and willingness to care about and improve their surroundings. Chinese consumers are also knowledgeable about climate changes and threats resulting from them. However, they can be classified into several consumer types based on their awareness and interest of such issues.

The other side of the coin is their willingness to incorporate 'green' products, which happens to be part of the solution to the environmental issues, into their lives. As in the case of each product, consumers need to see that they can align a product with their personal values, beliefs and their needs. One cannot underestimate consumers' capabilities (age, gender and social class). As it was mentioned before, these capabilities affect consumers' attitudes and so does attitude towards 'green' products.

All in all, there is no problem of not being agreeable to behave eco friendly, because there is also moral obligation and peer influence created. The challenges for the EV come from a more practical perspective rather than a symbolic one.

8.1.7 Chapter 7

In the research conducted in this paper, the findings proved high level of eco-consciousness of Chinese respondents (students). Participants expressed prevailing awareness of environmental problems as much as the positive attitude toward 'green' products, such as the EV. The novelty of the EV was also appreciated by participants as this issue was put into the correlation with attitude towards new technologies. Moreover, there was no sign of resistance

to such product and participants ranked its role and contribution to the environment really positively.
Although, what was noticed in this research, is evaluation of 'green' products as any other products. The practical perception of the EV was more important than the symbolic aspects of this product. The EV was treated as such due to the high importance of infrastructure, price factor and perceived ease of use (battery swap, cost of maintenance, recharging stations etc.), which was meted to this product by participants. What is more, participants inclined to evaluate the EVs attributes more from a practical and a technical perspective when attributes like trunk space, size of a car or technological innovativeness were given higher rankings.

One of the most important findings of the survey is the correlation created between the respondents' attitude toward new technologies/innovations and the attitude toward the Electric Vehicle. With a .488 degree correlation (r) the variables have a moderate/medium relationship. This means that the more favorable is the attitude of an individual toward technology, the stronger is his/her attitude toward EVs. This is a relevant finding for both the body of knowledge, but also for marketers, as this shows that people who are into technology, the likely they will be interested in the EV concept.

Another significant finding of the survey is the correlation created between the attitude towards the EV and the importance of the EV in regards to the Environment. Being a significant correlation with a .614 degree, it shows that a very positive attitude toward the EV, will consequently translate into an understanding that the EV contributes greatly to the Environment. Or that people, who do not have positive attitudes toward the EV, will believe its contribution to the environment is very low. The (r) value being high, the two variables are in a very strong correlation.

Important to mention, in the context of the Pearson correlation, is that all correlations that are found as significant by SPSS are applicable to an infinite number of respondents. This only shows that the two correlations are extremely significant from a statistical perspective, but also extremely relevant from a scientific point of view.

8.2 General conclusions

"Electro-mobility might change mobility behavior of our society far beyond those scenarios underlying the recent discussions. Limitations of battery performance could lead to a rethinking of established car concepts and mobility patterns. New vehicle concepts and mobility services could be established matching to individual mobility needs and transform mobility significantly […]" (European Parliament, 2010, p. 19)

The EV concept is still under question as research shows. Authors like Anderson & Anderson (2010) are not afraid to show their mere skepticism because of the general oscillation of the

acceptance of consumers toward the EV over the last century. While the solution seems to be clear and generally accepted, *"the reality is that most consumers want internal combustion engines and are not willing to change this conviction as long as they have the money to pay for the car and the oil and gasoline to run them."* (p. 13) Ewing & Sarigollu (2000) are in the same sentiment, as they also believe that the future of the EV is in consumer's hands. Larminie & Lowry (2003) agree as well to the above, stating that the technology requisites are present and there should be no barrier.

Surprisingly, the solution was offered to mankind exactly one century ago, when in Electrical World (1911) it was said that *"if charging stations could readily be found in every town where there is electric service, the use of electric pleasure cars on fairly long runs would become much more common than it is now."* (Anderson & Anderson, 2010, p. 225, originally in Electrical World, 1911)

EV is a real solution for reducing the emissions in the transport sector, but its limited acceptance makes it hard to see it as an applicable solution. In order for China to create a sustainable market for EVs, the strong collaboration of all entities involved (e.g. Government, customers) is needed. Furthermore, technological developments of EV attributes need to be undertaken. The issue of battery technologies has to be considered as essential. Consistent with the paper findings, the consumers still have problems with accepting the limitations of battery technology (e.g. EV range, charging time). Also the EV lacks in such facets like standards, infrastructure and price. These practical sides of the EV are main constraints to successful acceptance. However, strong eco-behavior can be sometimes enough for consumers to purchase such products, but in majority of cases it is not. Consumers (students as well) are sufficiently aware of environmental problems. One can say that they are willing to consume responsibly with respect to the environment. And this is shown in the survey, as some respondents would rather go for other types of eco-friendly vehicles. They prefer them because they are more environmentally friendly than regular IC cars, and have no limitations as compared to EVs. Thus, till EV technologies are more developed, consumers will be inclined to other environmentally friendly choices.

One specific characteristic for China is that people rely strongly on government and companies. They are not so skeptical like in the West. This is an important finding because it gives officials support from public. If they develop infrastructure, technology and standards (government), and educate people about such products (also companies) purchasing of the EVs would not be a challenge. And, of course, attitudes will be more positive or they can become saliently positive toward the EV;

Because Chinese consumers are rapidly changing their attitudes, as they gradually move toward Western attitudes and thinking, proper strategies are called for. The Chinese customers have individual mobility needs and manufacturers need to address them. One of the main ideas, raised also in the research is the general need for Chinese consumers to be

more informed about the real benefits the EV has. They need to be provided with real information, which can better help them and convince them in the decision process.

"The EV has universal benefits, but individual disadvantages" – The authors

8.3 Future implications for research

- Addressing particular issues regarding EV. For example, the paper does not go in depth with factors such as Government that are highly important in the context of China;
- The context of Battery development is also of real interest, as the development of new technologies in this domain will positively affect the situation of EV in China, but not only;
- More, the disadvantages of the EV could be better understood with their limitations, and having particular studies discussing those issues;
- As the study has shown, attitude theory has not changed very much, and has remained the same over the past decades. But consistent with our findings, consumers change continuously over time, and for that reason new theories in consumer attitude context would be of interest.

9. Appendix

Questionnaire in both languages:

1. Gender • Male • Female	性别 • 男 • 女
Age Group • 22-25 • 26-30 • 31-35 • 36-40 • 41-45 • 46-50 • Over 50	年龄 • 22-25 • 26-30 • 31-35 • 36-40 • 41-45 • 46-50 • 50岁以上
Nationality • Chinese • Other	国籍 • 中国 • 其他
What is the city where you have your permanent address? • Beijing • Shanghai • Guangzhou • Other	您的永久居住地址为下列哪个城市? • 北京 • 上海 • 广州 • 其他
Are you a Master Degree student? • Yes • No	您是否是在读研究生 • 是 • 否
How important do you consider environmental issues? • Extremely Unimportant • Unimportant • Neither unimportant nor important (neutral) • Important	您认为环境问题对于您的重要程度 • 毫不重要 • 不重要 • 无所谓 • 重要 • 非常重要

• Extremely Important	
Do you own a car? • Yes • No	您有私人汽车吗? • 是 • 否
What is your attitude towards new technologies/innovations? • Extremely Unfavorable • Unfavorable • Neither unfavorable nor favorable (neutral) • Favorable • Extremely Favorable	您对新科技发明的态度? • 非常反对 • 反对 • 无所谓 • 支持 • 非常支持
Have you had any experience with cars in the last 2 years? By experience the study means driving a car, being a passenger, going to auto shows etc. • Yes • No	您在过去两年中是否有过汽车体验? 例如驾乘汽车,参加车展等. • 是 • 否
What is your attitude toward the Electric Vehicle? • Extremely Unfavorable • Unfavorable • Neither unfavorable nor favorable (neutral) • Favorable • Extremely Favorable	您对电动汽车的态度? • 非常反对 • 反对 • 无所谓 • 支持 • 非常支持
Would you buy an Electric Vehicle? • Yes • No	您认为您是否会购买电动汽车 • 是 • 否
In what time would you consider buying an EV? • Less than 3 months • 3-6 months • 6-12 months • 12-18 months • 18-24 months • 2-3 years • 3-5 years • 5-10 years	您认为何时您会购买电动汽车? 3个月以内 3至6个月 6至12个月 12至18个月 18至24个月 2至3年 3至5年

• more than 10 years	5至10年 10年以后
Would you pay a premium price for an EV? • Yes • No	您愿意支付比传统汽车更高的价格去购买电动汽车吗? • 是 • 否
What EV range would serve your working days driving needs? • 30-50 km • 50-70 km • 70-90 km • 90-110 km • 110-130 km • 130-150 km • more than 150 km	您认为电动汽车需要满足您的日常行驶里程为? • 30-50 km • 50-70 km • 70-90 km • 90-110 km • 110-130 km • 130-150 km • 多于150 km
In your opinion, how important is the contribution of the Electric Vehicle to the Environment? • Extremely Unimportant • Unimportant • Neither unimportant nor important (neutral) • Important • Extremely Important	您认为电动汽车对环境保护的重要性 • 毫不重要 • 不重要 • 无所谓 • 重要 • 非常重要

Rank the following factors' importance for you as regards to the Electric Vehicle. *1 - Extremely Unimportant, 2 - Unimportant, 3 - Neither unimportant, nor important, 4 - Important, 5 - Extremely Important

	1	2	3	4	5
Contribution to Environment	○	○	○	○	○
Price of Electric Vehicle	○	○	○	○	○
Electric Vehicle Infrastructure (e.g.Recharge stations, Battery swap)	○	○	○	○	○
Government support (incentives) towards	○	○	○	○	○

	1	2	3	4	5
the Electric Vehicle					
Electric Vehicle distance range					

影响您购买电动汽车的决策重要性 *1-毫不重要 2- 不重要 3-无所谓 4-重要 5- 极为重要

	1	2	3	4	5
利用环保					
电动汽车的价格					
电动汽车的配套设施（例如：充电站，电池更换）					
政府对电动汽车的补贴					
电动车一次充电最大驾驶里程					

Rank car specific attributes that will make you buy an Electric Vehicle *1 - Extremely Unimportant, 2 - Unimportant, 3 - Neither unimportant, nor important, 4 - Important, 5 - Extremely Important

	1	2	3	4	5
Colour					
Interior					
Cost of maintenance					
Comfort					
Speed/Acceleration					
Design					
Size					
Trunk space					
Technology					
Customization					

影响您购买电动汽车的其他因素的重要性*1-毫不重要 2- 不重要 3无所谓 4-重要 5- 极为重要

	1	2	3	4	5
颜色	○	○	○	○	○
内饰	○	○	○	○	○
保养和维修费用	○	○	○	○	○
驾乘舒适度	○	○	○	○	○
速度/加速	○	○	○	○	○
外观设计	○	○	○	○	○
车型大小	○	○	○	○	○
后备空间	○	○	○	○	○
技术	○	○	○	○	○
个性化自选配置	○	○	○	○	○

What are the reasons why you would not buy an EV?

您不购买电动汽车的原因是什么?

Thank you for your answers!
非常感谢您的回答!

We expect your sincerity when answering this survey.

我们期待通过此问卷调查了解到您的真实想法

Thank you,
Alexander & Catalin

非常感谢您的支持
Alexander & Catalin

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