Green Race!
A Conjoint Analysis in High Involvement Purchase Decision Process
- In Context of Green Cars in Sweden

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Summary

Environment and its conservation is one of the key issues across the globe these days. It is even more important in the Scandinavian region. Sweden is one of the leading pro-environment nations in the world when it comes to environment-friendly or green automobiles. Introducing emissions tax, green car rebate, and congestion tax exemption for green cars on large cities have resulted in a surge of green car sales in Sweden over the past few years. The preferences of the Swedish green car consumers are examined in this study.

Consumer decision process and preferences related theories have been used for the theoretical understanding of this study and based on these understandings, the Adaptive Choice Based Conjoint Analysis has been selected to measure and understand the consumer preferences towards green cars. The Swedish green car market has been explained and understood as a prerequisite to conduct this study. Examinations of previous related studies, a small scale pre-screening survey, and expert interviews were carried out prior to formulating the conjoint experiment to ensure the inclusion of significant components into the study. The collected data were analyzed using advanced analysis software such as, SSI Web, SMRT, and SPSS, to understand and measure consumer preferences. The findings provide answers to the importance of different attributes in the purchase decision-making for green cars, the effect of each attribute to the decision-making process, the effect of prior purchase experience on the formation of preference, and the relationship between consumer’s green consciousness level and green decision-making process.

This study contributes to the theoretical field of green consumer behavior and to the practical field of marketing of green cars. The study also identifies and recommends key areas of interest that warrant further research.

Key Words: High Involvement Purchase, Green Consumer Behavior, Conjoint Analysis, Adaptive Choice Based Conjoint Analysis (ACBC), Green Preference, Green Car.
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1. INTRODUCTION
There was a time when humans hardly cared for the environment around them; they rather saw the environment as a sphere to simply dominate (Merchant, 1989, p.7-9). Human society as a whole has moved miles away from that viewpoint since then. Now, chances are high that even an everyday person takes a look at the labels of the products he wants to purchase to make sure they are not harmful to the environment.

1.1 Green Trends
Customers nowadays not only look for an environmentally safe product but also look into the depths of the production process of the said product as well. Factors such as animal testing, child-labor etc. are strong determinants in many consumer purchase decisions (De Pelsmacker, Driesen, & Rayp, 2005, p. 363; Unruh & Ettenson, 2010a, p.96, 98). It is very common today that a regular coffee drinker makes sure that his/her coffee has UTZ Certified\(^1\) logo, Rainforest Alliance Certified\(^2\) logo, Fairtrade Certified\(^3\) logo, and Eco-friendly labels on the coffee pack or at the restaurant menu prior to purchase (Gurskis, 2009). Continuation of this behavior can be seen when consumers pay extra for their airfare to off-set their carbon footprint, purchase a low-energy motion sensitive bulb for home usage, or purchase organic or ecological food products (GGAS, 2011; Soil Association, 2010, p.4-9).

Needless to say, these shifts in customer trends have created quiet big impacts for the businesses and their policies around the globe. The emergence of the ‘green’ consumer has made it absolutely essential for a business enterprise to obtain somewhat detailed information about its potential and/or existing customers (D'Souza, Taghian, Lamb, & Peretiatkos, 2006, p.144; Ryan, 2006 p.1). With more and more consumers paying attention to the environmental features of the products and willing to pay more for such sustainable products, marketing (in the sense of transparent communication) of sustainable products to the potential and existing consumers has become more important than ever.

Sustainable or eco-friendly product offerings can accelerate business growths, enable innovations, and build, rebuild, or establish brands (Ottman, 2006). From 2007 to 2009, the launch of eco-friendly products has increased by more than 500% across the globe (Unruh & Ettenson, 2010a, p.94). Such an influx did not go unnoticed by the executives. Top businesses around the world now understand that being environmentally responsible can pave the way to both business growth as well as differentiation (Unruh & Ettenson, 2010a, p.96). And sustainability for the business enterprise can be achieved by striking a balance between social, environmental, and commercial goals (Unruh & Ettenson, 2010b, p.113).

The green trend has made its ground in virtually all product and service categories such as water filters to cleaning products to electronics. Today web hosting service providers such as iPage, fatcow, hostgator etc. have gone green\(^4\). The trend is so strong that even cable service providers are trying to come up with ways to become green (Unruh & Ettenson, 2010b, p.114).

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\(^1\) UTZ Certified is a global coffee certification program for ethically grown coffee. \url{http://utzcertified.org/}
\(^2\) Rainforest Alliance Certified denotes that no rainforest was destroyed in the agricultural process of the certified item. \url{http://rainforest-alliance.org/}
\(^3\) Fairtrade Certified denotes that sustainability and better working conditions were ensured. \url{http://www.fairtrade.org.uk/}
\(^4\) A list of the green web hosting companies may be accessed at: \url{http://b2evolution.net/web-hosting/green-hosting-renewable-energy-power.php}
The 'Green House Effect' or global warming has become household phenomena these days. Either way, a change in global climate could result in severe consequences for planet earth's vegetation, life forms (including human beings), habitable lands – in short, the entire planet would be in danger (Held & Soden, 2000, p.441-443). This danger warning was the reason behind the formation of the United Nations Framework Convention for Climate Change and devising a global treaty with the aim of “stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system” (UNFCCC, 2005, p.5).

1.2 The Emergence of Green Cars

According to reports by Federation Belge De l’Industrie De Automobile Et Du Cycle or FEBIAC (2008, cited in De Craecker & De Wulf, 2009, p.1), annually about 28 billion tons of CO\textsubscript{2} is deposited to the atmosphere of which 37% comes from production of energy and 25% from transportation sector. The report also states that 10% of the annual global Carbon Dioxide or CO\textsubscript{2} emissions are caused by private automobiles. So, it is no wonder that the automobile sector is one of the prime concerns for the environmental protection activities.

The automobile industry formally stepped into this 'Green' or environment-friendly product category with Toyota's development and mass-marketing of 'Prius' in 1997 (Lake, 2001). Since then Honda and many other leading automakers have followed suit. The list of auto-makers that already have developed and marketed hybrid (green) automobiles or those who are planning to introduce green automobiles is growing rapidly and even includes sports car giants Porsche (Unruh & Ettenson, 2010a, p.98).

As we have discussed above, the need for green products is growing day by day. About 75% of the European Union citizens are willing to purchase environment-friendly products (European Commission, 2008). Cars are no exception. This European attitude can be justified by the Belgian example, where, between 2003-2008, the sales of environment-friendly cars\textsuperscript{5} (with CO\textsubscript{2} emissions of less than 140 g/km) has doubled while sales of more polluting cars (with CO\textsubscript{2} emissions of 210-250 g/km) has decreased by 50% (FEBIAC, 2008, cited in De Craecker & De Wulf, 2009, p.6). About 75% of the European citizens are willing to purchase environment-friendly products (European Commission, 2008, p.27).

The governments and regulatory agencies have also put new regulations to curtail emissions from the automobiles as transportation sector remains a major contributor of environmental pollution. The EU has implemented a policy of reducing CO\textsubscript{2} emissions by 20% by the year 2020 (Lindfors & Roxland, 2010, p.1). So, the member countries are applying various tactics and regulations to meet this goal. For example, Sweden's automobile tax is now calculated based on the amount of carbon emissions by the automobile (Lindfors & Roxland, 2010, p.1) and therefore creating an indirect push on the sales and development of the greener vehicles. The US government, among others, provides income tax credit of up to $7,500 for purchase of an electric car in or after 2010 (US Department of Energy, 2010). UK, China, and France have government programs that provide incentives to motorists who are buying green cars as well (Vaughan, 2011). Many cities (such as Stockholm, London) are exempting green car owners from paying congestion tax, driving tax etc (Lindfors & Roxland, 2010, p.2).

\textsuperscript{5} The terms 'Green Car', 'Green Automobile', 'Environment-friendly Car', 'Environment-friendly Vehicle’ and 'Environment-friendly Automobile' are used interchangeably in this study.
Automobile Industry Initiative

As Unruh and Ettensohn (2010b, p.110) points out, a race is on in virtually all business industries to produce green products. The automobile industry is no exception. To illustrate the importance of the emergence of the need for green or eco-friendly cars, Ford's Chairman William C. Ford said in 2003, “The automobile business is about to experience the most profound and revolutionary changes it’s seen since the Model T first hit the streets.” (Cited in Office of Technology Policy, 2003, p.27). Of course, the Model T was the first ever vehicle to be produced. So, according to the chairman of the largest automobile company in the world, the importance of the eco-friendly innovations for the automobile industry has the same magnitude as the invention of the automobile itself.

Association des Constructeurs Européens d’Automobiles (ACEA) states that sustainability is now the key concern of European automobile industry and in the process manufacturers delivered 50 new CO₂ reducing technologies (ACEA, 2009, p.10). The automakers are requesting for a €40 billion loan fund to develop new technologies to improve the green cars (ACEA, 2009, p.11). ACEA entered into a voluntary agreement with the European Commission in 1998 to cut down emissions. As a result, in 2008, the total CO₂ emissions of the new cars have been reduced by 20% compared to that of 1998 (ACEA, 2009, p.15). The most significant aspect of this agreement is that the ACEA initiated this even before any legislative restrictions on emissions were put in place. The willingness of the automakers towards developing eco-friendly cars can be clearly understood by this.

Moreover, an ongoing initiative by the leading automobile manufacturers to produce even greener vehicles is gaining steady footing. Using bio-plastics for various engine and other components by Ford, Toyota, and Mazda yields proof to this (Guzman, 2010, p.20). Ford is currently fitting its fleet (both green and non-green vehicles) with materials that are bio-degradable and environment-friendly (such as plastics made from wheat straw, seat covers made from soy based foam etc.) and is developing new Eco-friendly materials with its plastic research facility (Vasilash, 2010a, p.23). BMW is working on building a 100% reusable vehicle and succeeded in making about 40% body parts of its 3 series automobiles can be stripped down and reused (Dibb, Simkin, Pride, & Ferrell, 2001, p.47). Automobile manufacturers such as Mitsubishi is planning to incorporate the hybrid fuel (Diesel and Electricity) technology into all of its automobile models and making the entire Mitsubishi fleet green (Edberg6, 2011). He also adds that the automobile companies these days set prior goals of at least what percentage of the total car sales should be green cars.

Understanding the consumer preferences is one of the most fundamental activities for the businesses as this understanding leads to understanding the consumer’s needs, and business firms exist to satisfy the consumer needs (Bettman, Luce, & Payne, 1998, p.187; Solomon, 2009, p.35). The automobile industry is no exception and is very keen to understanding consumer’s preferences and answering the needs associated with the resulting needs and demands. For example, a consumer demand for a hybrid car with the plug-in electric option (a switch on option that enables the car to be driven only on electric power to travel a short distance) opted Toyota to develop the Prius PHEV that is due out in 2012 (Vasilash, 2010b, p.28-29). Nissan has moved another step further and introduced the Nissan ‘Leaf’ – an electricity fueled car specifically designed for city traveling (Vaughan, 2011). The Nissan Leaf can be a defining statement on the part of green or Eco-friendly vehicles as it is not only fast but also extremely quiet (Vasilash, 2010c, p.6).

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6 Mr. Erik Edberg is the Sales Manager (Försäljningschef) of Bilinvest, the Mitsubishi and Peugeot dealership in Umeå.
1.3 Problem Discussion
As this study intends to examine the consumer preference of green cars, it falls under the category of consumer behavior or to be more precise green consumer behavior. So, the authors looked into prior works into the fields of green marketing, green consumer behavior, green consumer profiling, and most importantly studies related to green cars.

The field of green marketing is relatively new as it was developed during the late 80's and the early 90's (Polonsky, 1994, p.1). So, the number of studies in this field is relatively fewer than other branches of marketing. The approach of identifying and analyzing environment conscious consumers and formulating appropriate marketing strategies has only started over the last two decades (Moon, Florkowski, Brückner, and Schonhof, 2002).

In case of green consumer profiling, as both the green products and the green consumers are relatively new in this market, the initial studies were not always very conclusive. In studies conducted in the 90's, people were found to be conscious about environment and preferred the green products in general but did not intend to buy green products by themselves (Simmons Market Research Bureau 1991; Roberts 1996). So, the conclusion from these studies suggests that early consumers obtained the green 'attitude' but not the 'behavior'. However, subsequent studies show that the situation is different now. Laroche, Bergeron, & Barbaro-Forleo (2001) conducted a study in North America to develop a profile of the green consumers. This study focused on consumer's attitude, knowledge, values, demographics, and behavior and their influence on consumer's willingness to pay more for environmentally friendly products or services. While the study finds that about 80% consumers are willing to pay more for green products, they would refuse to buy products (even green products) from the companies that are known to be polluters (Laroche et. al., 2001, p.519).

Although the study by Laroche et al. (2001) provides evidence of the transformation of consumer attitudes into behavior and successfully develops a profile of potential green consumers; it does not do so in a specific product or service category. That is, the developed profile may be useful to know the state of the green consumers, but it fails to provide us with information regarding a customer profile for a specific product. So, a need for green product or service (such as green or environment-friendly cars) specific consumer profiling exists in the academic arena.

The studies relating consumers to green cars are even scarcer as the development of first successful green car dates back to only 1997 and, therefore, even fewer studies are conducted concerning green cars. However, the authors have encountered a few green or environment-friendly car related studies. These studies were conducted in Sweden, The Netherlands, and Taiwan.

The first examined environmental-friendly car specific study was conducted in the Netherlands by Rijnsoever, Farla, & Dijst (2009). They investigated the consumer preferences and information channels used for car purchases of about 1500 car owners using cluster analysis. Although green car specific, this study only covered existing car owners and did not investigate potential buyers and their preferences. The study was also more investigative of the information channels used prior to the purchase of the current vehicles.

The next examined green car related study is by Lindfors & Roxland (2010) that looks into the impact of Swedish government's green car rebate program on green cars sales performance. The results of the
study showed that although the green car sales increased due to the rebate program, the program might be costing too much in terms of benefit (Lindfors & Roxland, 2010, p.38). This study was conducted from the regulators point of view and examined the impact of incentives, regulations, and restrictions on the sales performance of the green cars and did not investigate the consumers or their preferences in any way.

Jansson, Marell and Nordlund (2009, p.245-249) used a cluster analytical approach concerning green purchase and curtailment behavior on Swedish car owners as well. The study was conducted on Swedish car owners. There are two major components that have been identified in this research to measure green consumers’ attitude and behavior. The tendency of green purchasing behavior is to obtain green products and green technologies, while; on the other hand, curtailment behavior is to chop down the use of conventional products (Jansson et al. 2009, p.247). Value, Belief and Norm (VBN) theory has been taken into account to profile consumers. However, the researchers merely focused on alternative fuel vehicles (AFVs) and not on other versions of green cars. In addition, the investigation was conducted only on car owners that show the post purchase behavior of car owners. This study did not investigate the potential owners and their preferences.

The last examined green car related literature is an International Association for Management of Technologies (IAMOT) conference paper by Li-Hsing, Yi-Chun, & Kun-Shiang (2006) presented in Beijing. This paper investigated the consumer preference of potential consumers of green cars in Taiwan. Conjoint analysis was used to identify the preferred attribute sets of the consumers. This study was conducted as green cars were about to enter the Taiwanese market, and the results identified only 20% of the respondents as potential buyers (Li-Hsing, et al., 2006. p.6-8). Although this paper works to develop a consumer profile of green cars in Taiwan, it is incomplete as it could not take into account the post-purchase behavior (as green cars were to be introduced to the market and therefore no existing owners were there) of the consumers. The authors also acknowledge the inability of the study to be representative of Taiwanese market due to online data collection process and therefore the lack of reliability of the responses (Li-Hsing et al., 2006. p.7).

From the reviewed studies, the authors can conclude that a study that represents the potential owners of green automobiles may be of great importance from both business and academic perspective. Now, with the emergence of the ‘Green Cars', consumers have different options in selecting their automobile of choice. So, an understanding of what factors or attributes of a green car can make a consumer tick or turn away can be of great academic interest. And, in light of the prior literature review, the authors believe that a green car specific study focusing on consumer preferences (including both existing car owners and potential car owners) is important to gain further knowledge in the field of green consumer behavior. And to the best of the authors’ knowledge, no other previous studies have used conjoint analysis  to examine preferences of both potential and existing consumers on green cars rather they used cluster analysis, cross-sectional surveys, or co-variance models. So the authors believe that a study employing conjoint analysis would enable them to obtain an indirect mapping of the consumer preferences that would be helpful in answering the identified research gap. This study would also measure the green or environmental consciousnes of the respondents and compare them with the preferences obtained from the conjoint process. This comparison will provide an important

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7 Conjoint analysis is a widely used marketing research technique to measure consumer preference (discussed in detail in methodology chapter).
understanding towards developing a meaningful consumer profile of the green automobile purchasers in Sweden.

1.4 Research Question
Specific and precise research questions are essential for a quantitative research as these would guide the designing of the entire research process (Bryman & Bell, 2007, p.304). Understanding this completely, the authors have devised their research questions for this study. Consistent to the primary aim of a conjoint study, the authors are interested in uncovering the key attributes or factors of the environment-friendly automobiles that play the most important parts in the consumers' mind. This aim has lead to the following research question -

‘What are the determining attributes of consumers’ green car choice?’

Identifying the key attributes only is not sufficient to understand the importance of the said attributes towards the actual consumer decision making. So, the authors want to examine the relative importance of each product attribute to the decision making process. Therefore, the next research question is,

‘How the defined attributes influence the consumer decision concerning green cars?’

As this study is conducted in the field of green consumer behavior, the authors would also collect data concerning the environmental consciousness of our respondents to understand how concerned they are about the environment. And upon understanding the importance weights of the attributes (obtained from the previous research question), the authors would want to compare them with the environmental consciousness level of the respondents. Here, the new research question would be,

‘How does the consumer's environmental consciousness affect the choice of the green automobiles?’

1.5 Research purpose
The authors intend to study the consumer preferences concerning green car purchase. The authors would identify the determining factors in the green (car) purchase decision process. The study would examine both the existing and the potential car owners to get the measure of the attitude towards the different attributes of green cars.

The specific purpose or objectives of this study would be -

1. To identify important attributes of the green automobiles.
2. To measure consumer preferences on an individual level towards the identified attributes.
3. To measure the influence of attributes on an aggregate level in consumer decision making process.
4. To evaluate the likelihood of purchase using sensitivity simulations with varying degrees of attribute levels.
5. To compare and contrast the difference of preference (if any) between existing car owners and potential owners.
6. To assess the green attitude of the consumers and develop different consumer profiles according to this measurement.
1.6 Disposition
The thesis consists of six chapters. The thesis layout is shown in figure 01.

**Chapter 1: Introduction**
The scope of the study is presented in this chapter. This includes problem background, problem discussions, research questions and purpose, limitations of the study and the structure of the thesis.

**Chapter 2: Theoretical Framework**
This chapter discusses relevant theories and models and introduces a framework derived from these theories for applying in the high involvement green product purchase scenario. The rationale for selecting conjoint analysis for this study and the theoretical understanding of conjoint analysis is also described.

**Chapter 3: Swedish Green Car Market**
The present condition of the Swedish green car market with a look towards the future is discussed in this chapter.

**Chapter 4: Research Methodology**
Research philosophy, research approach, research strategy, research methods, and research design is explained in this chapter.

**Chapter 5: Empirical Findings and Analysis**
The findings of the study is presented in this chapter. Analysis of the findings in light of discussed theories is also presented.

**Chapter 6: Conclusion and Recommendations**
Answers to the research questions, theoretical and practical contributions of the study, and recommendations for future studies is presented in the conclusion and recommendations chapter.
2. THEORETICAL FRAMEWORK

The selection of theories discussed in this chapter is rooted in the research purposes of the study. Understanding consumer preference is at the core of this study and therefore, relevant consumer preference related models and theories have been included and examined. To relate consumer preference in the green context, green cars to be exact, required definitions, green concepts and green attitude model has been discussed. The concept of consumer preference, attitude, product attributes are all part of the purchase decision making process, so, the inclusion of a detailed discussion concerning the consumer purchase decision process has been automatic. Based on the models and theories, a study specific framework for measuring consumer preference in the high involvement green purchase context has been introduced. The suitability of conjoint analysis as the preferred method for this study has been argued and a theoretical understanding of conjoint analysis has also been discussed.

2.1 Defining Green Car

The exact definition of green cars differs from one country to another. However, a good starting point may be to state the conventional perception of green cars. Any car that pollutes less (in reality, emits less CO$_2$ or other pollutants into the atmosphere) may be considered to be environment friendly or green (Jansson, 2010, p.62). There are many versions of green cars available in the market. These include, Alternative Fuel Vehicle or AFV, Patrol-Electricity Hybrid, Diesel-Electricity Hybrid, Bio-Fuel vehicle, and Electric vehicles (Dagsvik, Wennemo, Wetterwald, & Aaberge, 2002, p.368).

The AFVs run on non-fossil fuel such as Ethanol (alcohol), while the Hybrids use traditional fossil fuel along with an electric motor for reduced emission and increased efficiency. Bio-fuel vehicles use fuels produced from renewable organic sources such as Bio-diesel (Jansson, 2010, p.60-62). These vehicles produce less emission than traditional vehicles. Electric vehicles do not use any fuel at all and run on rechargeable battery-powered engines. These vehicles produce zero or no emissions; however, they have fairly short driving range (Vasilash, 2010c, p.6).

Green Car – in Swedish Context

Sweden is a member of the EU and follows the EU regulations and directives as a member country is expected to do. The EU defines green cars as an automobile emitting less than 140g/km CO$_2$ onto the atmosphere (ACEA, 2009, p.10; Edberg, 2011). However, Sweden has its own definition which is even stricter than the EU when it comes to green cars.

According to Svensk författningssamling (SFS 2007, cited by Lindfors & Roxland, 2010, p.4), the Swedish definition of 'Environment-friendly Vehicles' or 'Green Cars' depends on the amount of carbon emissions and/or fuel consumption by a vehicle. For AFVs, if their consumption lies below the energy equivalent of 9.2 liters of gasoline/100 km, or 8.4 liters of diesel/100 km or 9.7 m$^3$ of gas/100 km, they would be considered as green cars. Electric cars are considered green if the consumption lies below 37 kWh/100 km. For traditional or fossil-fuel powered vehicles, if their carbon dioxide emissions lie below 120 g/km$^8$, they would be considered to be green. Diesel powered cars must also have a particle emission of less than 5 mg/km meaning that they need to have a particle filter fitted to be green.

2.2 Green Consumer Behavior

Green consumer behavior may refer to the consumer's attitude towards environment friendly products

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8 Edberg (2011) informs that the Swedish government may lower this even further to 99g/km in the near future.

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8
(Roozen & De Pelsmacker, 1998, p.23). From this simple definition we can derive that when the consumer attitude towards purchasing (or not) a product is influenced by the green or environment friendly features of the product, we may call that green behavior. Aside from just purchasing, green behavior also includes performing other environmentally responsible activities as well, such as recycling, working in environmental organizations, taking part in environmental-friendly movements etc. (Haanpää, 2007, p.478).

In terms of purchasing green, Young, Hwang, McDonalds, & Oates (2010) state that consumers purchase green products for everyday use fairly easily but search for information extensively when it comes to high-technology products. They also say that in case of high-technology products, consumers are willing to pay extra and buy green product if it has credible environmental labeling, such as European Commission or EC Energy Label (Young et al., 2010, p.23). So, having a reliable certification is an important aspect for green consumers.

As mentioned earlier, green consumer behavior is not only concerned with purchase of product(s), it also involves not purchasing as well. As Laroche et al. (2001, p.514) point out; majority of the consumers would not purchase products of polluting companies. Young et.al. (2010, p.23), and De Pelsmacker et.al. (2005, p.364) find that brand boycotting over environmental concerns has become a regular occurrence as well.

2.2.1 Determinants of Green Consumer Attitude

The determining factors for green attitude tend to be consumer's strong green value, prior purchase experience, available time for information search concerning the product(s), knowledge about product relevant environmental issues, availability of the product, and of course, affordability of the said product (Young et al., 2010, p.29). The relationship of these factors with green attitude can be observed in figure 02.

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Figure 02: Factors of Green Attitude

Source: Adapted from Young et al., 2010, p.29

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9 The terminology green and environmental friendliness has been used interchangeably.
So, an absence or weakened presence of any of these factors may result a weaker formation of green attitude that may in turn adversely affect green consumer behavior (A detailed discussion on the importance of consumer attitude on consumer behavior follows later in this chapter). This can be justified by the finding of De Pelsmacker et al. (2005). In that study, the key causes of not performing green stems from unavailability or limited availability of green products, lack of credibility of green label issuer, and lack of accessibility of green product information (De Pelsmacker et al., 2005, p.383). Wagner (2003, p.3) finds that consumers difficulty in assessing the environmental friendliness of products acts as a cognitive barrier to the adoption of green products.

Green Wash or false claims by business enterprises concerning the environmental attributes of their products contribute to strengthening consumer mistrust of the green nature of products and prevents them from purchasing (Brenkert, 2008, p.141). However reliable source of information such as EC Energy Label (Young et al., 2010, p.23) or the Fuel Economy Label (Dixon & Hill, 2009, p.16) boosts confidence in the consumers and make them behave green.

2.2.2 Consumer Preference towards Green
Consumer preference is the basic groundwork to measure consumer demand and how they act in terms of buying a product. In economic and cognitive psychology traditions, consumer behavior is assumed as rational and consistent. Consumers act consistently on the basis of their preferences and beliefs (Rokka and Uusitalo, 2008, p.517). This is the subjective experience of an individual through which one can measure product attributes from various bundles of goods. With the rise of environmental issues consumers are well aware of their environmental product selection. In terms of auto mobility, studies have found that while consumers are highly aware about negative impacts of auto mobility, they usually are not ready to accept changes in car use and purchase behavior. Although attitude and corresponding behavior are interrelated; in practice they find it hard to translate these values of attitude into behavior (Young et. al. 2010, p.20; Rijnsoever et al. 2009, p.335).

2.3 Consumer Decision-Making Process
Consumer behavior is an intermingle of more than one academic disciplines. It blends with psychology, sociology, economics, business and anthropology (Jansson, 2009, p.17). But the relationship of consumer behavior with marketing is inseparable. However, consumer behavior is a vast area of subject that starts with problem recognition and ends up with post-purchase behavior and evaluation (ibid).

In order to understand green consumer behavior, one must start by understanding the consumer decision making process. This decision making is the outcome of a consumer's behavior (be it positive or negative) towards a certain product or service

2.3.1 The Five Stage Consumer Decision making Process
Depending on the consumer, product, situation, thought process every decision making may be different or unique (Wilson & Woodside, 2001, p.401). However, based on general observations of consumer decision process and case studies, the 'stage model' or the 'five stage consumer decision making' model is developed (Kotler, 1988, p.194; Solomon, 2009, p.350).

According to this model, a consumer goes through five stages (figure 03) during the decision making process. These stages are, Problem Recognition, Information Search, Evaluation of Alternatives,
Figure 03: Stages of Consumer Decision Making Process

Image source: Solomon, 2009, p.351

A consumer, recognizing the need searches for information available for satisfying that specific need. The information search may have various sources, such as friends, family, product commercials, internet search etc. Upon receiving sufficient information, the consumer evaluates or compares available alternative products or services that would meet his/her needs. Upon completion of this comparison process, the consumer then decides on which product or service to obtain, and after completing the purchase, the consumer evaluates the purchased product or service against the original need. If there is a gap between the product performance and the need, the consumer starts over these stages by initiating further information search and so on. A brief inspection of the different stages might be helpful in understanding the consumer decision making process.

Need Recognition

This is the initial stage in the consumer decision process. A consumer recognizes or realizes his/her need to solve a problem or fulfill a deficiency at this point. The need or problem recognition stems from the comparison of the two states of the consumer – the desired state and the actual state (Bruner II & Pomazal, 1988, p.54). In simpler terms, when a consumer feels that s/he is not getting the desired level of satisfaction from an existing product or service, or that s/he would like a need to be satisfied through a certain product or service that s/he does not possess yet, it may be assumed that a problem is recognized by the consumer (ibid.).

The need recognition can be triggered by an external stimuli (such as the smell of fresh baked croissants while walking by a patisserie) or an internal stimuli (such as feeling hungry) or both (Kotler,
1988, p.195). As the mentioned example, the need could be as simple as need for food, or as complex as the need for enjoying a movie in THX\textsuperscript{10} certified surround sound system.

**Information Search**

Upon recognizing a need or a problem that is deemed important enough, the consumer begins acquiring information concerning the solution to his/her problem or need. For low-involvement purchases, this stage tends to be short while for the high-involvement purchases information search is almost always extensive (Jobber, 2004, p.79).

The consumer searches for information from different sources as his/her knowledge of the product/service may be non-existent or may be limited to only certain attributes that s/he has experience with (Moorthy, Ratchford, & Talukdar, 1997, p.268). The information sources for the consumers include - personal sources, commercial sources, public sources, and experiential sources (Kotler, 1988, p.196). Consumers usually gather most information from the commercial sources, such as advertising, displays, dealers, sales personnel etc., and use the other sources to evaluate (ibid.).

**Evaluation of Alternatives**

Evaluation of alternatives usually takes place simultaneously with the stage of information search (Assael, 1992, p.36). According to Moorthy et al. (1997), consumer’s information search and alternative evaluation is influenced by the consumer's prior conception and knowledge of the market and/or products/services. On top of that, practical factors such as affordability, practicality etc. of the product/service is weighed in during the evaluating (Assael, 1992, p.36).

However, the most important criteria the consumer considers during this stage is the various attributes of the product or service itself, as each consumer sees a product or service as a bundle of different attributes (Kotler, 1988, p.197; Peter & Olson, 2005, p.74). Upon collecting sufficient information, the consumer evaluates and compares among the available alternatives that would serve the need. Usually for the higher costing and/or technical products, this step is very extensive as the consumer usually wants the alternative list to be exhaustive (Jobber, 2004, p.79)

**Purchase Decision**

This step is the outcome of the alternative evaluation step. Here the consumer chooses the alternative that would satisfy his/her need. The consumer's decision of not selecting any alternatives (as none of the available alternatives may be suitable for the need) is also taken in this stage. Upon deciding, the consumer makes the purchase. However, a consumer may delay the purchase even after making the final decision because of various factors, such as lack of available funds, unavailability of the preferred brand etc., or may not purchase immediately as the existing brands or alternatives do not satisfy his/her needs completely (Assael, 1992, p.37).

Kotler (1988, p.201-202), explains the inter-relation between these two most important steps in consumer decision making process (alternative Evaluation and Purchase Decision). According to this inter-relation model, upon the completion of the evaluation stage, the consumer forms a purchase intention. S/he then compares this purchase intention with attitude of others (such as friends or family

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\textsuperscript{10} THX is the name of high-fidelity audio-visual reproductions in movie theaters, home theaters, computer speakers etc. It is a quality assurance system that ensures that the audio visual signals of the file are optimized. THX stands for Tomlinson Holman Crossover. More can be found at [http://www.thx.com](http://www.thx.com).
members) towards the product, and also takes into account the unanticipated situational factors (such as lack of funds, unavailability of the brand etc. as mentioned above). Upon receiving affirmation, the consumer makes the purchase. This relationship is depicted in the figure 04 below.

**Figure 04: Steps between Evaluation of Alternatives and a Purchase Decision**

Source: Kotler, 1988, p.201

However, it must be kept in mind that low-involvement purchases (such as chewing gums, or chips) do not usually include these steps so intensively (if included at all), while high-involvement purchases (such as electronics products, automobiles etc.) may involve these steps in its full extent (Kotler, 1988, p.202; Jobber, 2004, p.79).

**Purchase Evaluation**
This perhaps is the most important step for the business enterprise in the consumer decision making process. Here, the consumer evaluates his/her purchase decision and measures his/her satisfaction. If a high degree of satisfaction is attained, likelihood of repeat purchases would be greater, while dissatisfaction would not only eliminate the chance of a repeat purchase but also result in negative marketing of the product/service by the concerned consumer (Kotler, 1988, p.202-203; Assael, 1992, p.37).

Consumer's post-purchase behavior, when dissatisfied, may also include the returning or abandoning the product, or try to find information to confirm the high-value of the product to dissolve the dissonance factor (Kotler, 1998, p.203; Peter & Olson, 2005, p.403). This is a very basic and simple approach that we as consumers take on a daily basis while selecting products to shop. This process implies that a product or service is a solution to a problem and we respond to that problem by researching, deciding, and finally acquiring the product/service that answers the said problem.

Authors (Kotler, 1988; Jobber, 2004; Assael, 1992) have specifically mentioned that these five stages are not always equally important. For example, the decision process for purchasing hand soap and a TV
would be different. While a consumer might rely on prior experience during a hand soap purchase and get it done in minutes without even comparing between alternatives, s/he might spend days in the information search stage and in comparison stage before finally deciding and making a TV purchase.

This decision model along with the evaluation of alternatives to decision model (figure 04) is applied extensively in the case of high-involvement purchase scenarios (Kotler, 1988, p.194-201).

2.3.2 High Involvement Purchase Decision Making: The Cognitive Consumers

As mentioned earlier, automobile purchase falls under the high involvement product purchase category. It is also a durable product as the consumer would own it for a considerable amount of time. Needless to say, it is also an expensive product and complex buying procedure. So, it is only natural that the consumer would want to make sure that s/he picks the best alternative and do not do a mis-purchase (Laurent & Kapferer, 1985, p.42).

So, the authors believe, some further understanding is required aside from this simple five stage process. As the green car is not merely the solution to a problem but is an effort to answer the growing consumer awareness of the environment, an examination of the high-involvement product decision making process is required. Since the term involvement is an abstract construction, it can not be measured directly on scale (Kapferer and Laurent, 1985/1986, p.49). The decision making process is comparatively complex in terms of high involvement purchase process. Consumers undertake more extensive pre-purchase information search in high involvement purchase (Foxall, Goldsmith, and Brown, 1998, p.28). The central point of this study is environment friendly cars. So, the framework has drawn concerning green car purchase decision process. Figure 05 illustrates the model below.
Depending on the product category, the level of involvement of information search and decision making differs from various extents (Laurent and Kapferer, 1985, p.41). According to, Rijnsoever et al. (2009, p.335) consumers form an attitude before they get involved in purchasing a new car that lead them towards the probability of possessing a new car. They seek information willingly in terms of extensive problem-solving situation (Peter and Olson, 2005, p.188). The process is not single dimensional (Kapferer and Laurent, 1985/1986, p.48) rather it involves three major steps (Foxall et al. 1998, p.28-29): stimulus (receiving environmental stimuli - attentional and perceptual filter), organism (interpretation, formation and evaluation), and response (developing, acting, re-evaluating, storing). The S-[O]-R psychology is based on cognitive science. Therefore, the definition of Rothschild (1984, p.217) can be considered as "Involvement is an unobservable state of motivation, arousal or interest. It is evoked by a particular stimulus or situation and has drive properties. Its consequences are types of searching, information-processing and decision making." The progression primarily generated from social, business, cultural, political and economic environment (Foxall et al. 1998, p.29). Consumers gather external information, for example, advertisement, as stimulus from different social context by using interpersonal observation and blend them with their cognition. Since the product is environment friendly, so the involvement is related with environmental attention and perception. After scrutinizing all the external information, consumers search for internal stored information to interpret newly entered stimulus that lead them to formulate an evaluation of alternative choices, therefore, consumers process
them by comparing with their previously stored (short-term and long-term memory) experience, beliefs and attitudes (Foxall et al. 1998, p.30) and clarify them with their necessities. However, when the new stimulus is entered, the organism recreates the process in order to fit that new stimulus. The consequence of this organism is new brand beliefs about brand’s attribute (Jobber, 2004, p.71). After weighting importance of attributes consumers form brand attitudes that lead them toward purchase intentions (Foxall et al. 1998, p.28). Thereupon, turning the intentions of brand purchase into behavior requires consideration of environmental and situational facilitation (Foxall et al. 1998, p.30) for example, socio-economic condition. In response of the entire factors, consumer may act to purchase the product or to reject it. Acceptance of the brand turns the consumers to re-evaluation stage and restores the cognition for further references. Conversely, rejection takes the consumer back to the circular process again.

2.3.3 Multi-Attribute Attitude Model

As discussed earlier, an automobile, as a product, is seen as a bundle of attributes to the consumers. The consumer, treating the product as such, compares different attributes of the different product choices and makes the final purchase decision. So, the authors need to consider choice behaviors as an automobile purchase involves a choice among two or more options (Ajzen, 2008, p.526). The Multi-Attribute Attitude model is a consumer decision model that deals with choice behaviors. It is also known as the Fishbein model named after its developer, Martin Fishbein (Solomon, 2009, p. 297).

The Multi-attribute attitude model assumes that consumer's attitude towards the attitude object is the reflection of his/her beliefs about several of the attributes of that said object (Solomon, 2009, p.297). As this study intends to examine the consumer preference concerning green cars (which is a bundle of multiple product attributes), the authors believe this theory would lay the basic ground work for understanding the consumer's attitude towards a multi-attribute product.

The model specifies the following three elements -

Attributes
The attributes are the characteristics of the attitude object or the product. These characteristics or attributes of the object are the ones that consumers would use during evaluating the object. For example, if the attitude object is environment-friendly cars, then the determining attributes might be fuel economy, price, operating cost, CO₂ emissions etc.

Beliefs
Beliefs are the preconception or cognition about the product that the consumer possesses. The degree to which a consumer perceives that the object has his/her desired attributes. Staying with the example of the green car, a consumer's perception about Brand X's or Brand Y's association with the above mentioned attributes would be constituted as beliefs.

Importance Weights
These are the self-assigned priority rankings that a consumer associates with the attribute list of the product. In other words, which of the many product attributes do matter most to the consumer while making the decision? In terms of green cars, the CO₂ emissions might be the most important attribute and there would have a higher importance weight, while operating cost might be less important and thus receive a lesser importance weight.
The mathematical equation for the model is denoted as,

\[ A_{jk} = \sum_{i=1}^{n} I_{ik} B_{ijk} \]

.................................................Equation (1)

Where,
\( i \) = attribute or product characteristic,
\( j \) = brand,
\( k \) = consumer or respondent,

such that:
\( A_{jk} \) = consumer \( k \)'s attitude score for brand \( j \),
\( I_{ik} \) = the importance weight given to attribute \( i \) by consumer \( k \),
and
\( B_{ijk} \) = consumer \( k \)'s belief as to the extent to which attribute \( i \) is offered by brand \( j \).

Solomon (2009, p.300) mentions that although this model may be used to measure consumer attitude, it does not, however, predict the behavior of the consumer. Solomon (2009, p.298-300) argues that more than often attitude towards an object may predict what s/he may choose after evaluating the alternatives but it does not ensure that the attitude would turn into behavior.

2.3.4 Theory of Reasoned Action (TRA) and Theory of Planned Behavior (TPB)

The limitation of the multi-attribute attitude model in predicting behavior leads towards exploring of other models that would explain the attitude-behavior gap. The authors understand that, to solve the marketing applied problems and make policy decisions it is of utter importance to locate and envisage customer’s behavior (Ajzen and Fishbein, 1980, p.4). Consumer psychology, in every stages of purchase decision, is concerned with attitude-behavior relationships (Haugtvedt, Herr and Kardes, 2008, p.525). But Solomon (2009, p.301) argues that the theory is concerned about predicting behavior rather than outcome of the behavior. However, the primary concern of this study is to measure the preference of green car that can be strengthened by the theory. Moreover, the theory has been extensively supported by Jobber (2004, p.71) for the understanding of high involvement purchase behavior. Theory of Reasoned Action is widely used in understanding the belief and attitude of consumers. The theory, by Martin Fishbein (1967), is based on assumptions that human behavior is rational and they systematically utilize all the information that are available to them. The TRA model is shown in figure 06 below.
“According to theory of reasoned action, a person’s intention is a function of two basic determinants, one personal in nature and the other reflecting social influence” Ajzen and Fishbien (1980, p.6). Hence, the personal factor is individual’s own positive or negative evaluation of certain behavior. On the other hand, the social factor works as a person’s intention to behave that stems from his/her social influence.

**Attitudes toward Behavior**

The term *attitudes toward behavior* refer to the degree of personal behavior to which performance of the behavior positively or negatively valued (Ajzen and Fishbein, 1980, p.4). It denotes that a person’s beliefs will be guided by his/her positive or negative outcomes (Ajzen and Fishbein, 1980, p.8). Attitudinal Belief ($A_B$) is based on salient beliefs. Each behavioral belief produces a favorable and unfavorable attitude towards behavior (Ajzen, 2005, p.123). A person’s beliefs that $A_B$ is the aggregation of accessible beliefs about the consequences of the behavior (Ajzen, 2005, p.123). If we take a look in the evaluation of purchase of environment-friendly cars, some people having favorable attitude and others an unfavorable attitude toward the behavior. According to Ajzen (2005), the expectancy-value model is in the equation:

$$A \propto \sum b_i e_i$$

…………………..Equation (2)

Where, $A_B$ stands for attitude towards behavior; $b_i$ is the behavioral belief that performing behavior $B$ will lead to outcome $i$; $e_i$ is the evaluation of the outcome $i$ when it occurs.

**Subjective Norms**

The second key determinant is subjective norms also known as normative beliefs. This is also based on salient beliefs (Kalafatis, Pollard and East, 1999, p.444). The person’s beliefs that other individual or group of people thinks s/he should or should not act (Ajzen and Fishbein, 1980, p.7). In general, subjective norm is the social pressure that one might face to engage in actual behavior. For example, in choosing environmental friendly products one might be motivated by his/her family or friends to think of buying green products. If s/he believes that the referents think that s/he should buy the product his/her subjective norm will exert pressure to act by buying the green product. This is the positive
exertion. On the other hand, people might get pressurized by peers not to act the way s/he wants to. Solomon (2009, p. 302) criticizes the theory by showing the relative impact of subjective norms on attitude across the culture. However, we have focused on only Swedish culture in the study.

According to Ajzen (2005), the expectancy value model in the equation is:

\[ SN \propto \sum n_i m_i \]

Equation (3)

Where, \( SN \) is the subjective norms and \( n_i \) stands for normative beliefs that referent \( i \) holds; \( m_i \) is the motivation to comply with referent \( i \);

TRA describes the two dimensional beliefs toward person’s behavior. However, the authors felt a need for more understanding of multi-component view of attitude-behavior phenomena that explains the concept of perceived control (Madden, Ellen and Ajzen, 1992, p.4). Theory of Planned Behavior (TPB) of Icek Ajzen (1985) that was extended based on Theory of Reasoned Action (TRA) has been implied in this study to address perceived attitude towards the behavior (Ajzen, 2005, p.118). Although the PB theory is very old it has been extensively used to understand the relationship among attitude-intention- behavior in choice process.

Figure 07: The Theory of Planned Behavior
Source: Adapted from Ajzen (2005)

Figure 07 illustrates the determinants of TPB model, i.e. Attitudes toward behavior (\( A_B \)), Subjective Norms (\( S_N \)) and Perceived Behavioral Control (\( P_{BC} \)). And the central factor of PB theory is individual’s intention (works as a motivational factor) to execute a specified behavior (Ajzen, 1991, p.181).
According to Ajzen (2005), human behavior towards certain action is guided by these three deliberations which in turn: behavioral beliefs, normative beliefs and behavioral control beliefs. Moreover, the perceived behavioral control has both the direct and indirect effect on actual behavior (Madden, Ellen and Ajzen, 1992, p. 4).

**Perceived Behavioral Control**

Perceived behavioral control refers to people’s perceptions of their ability to perform a given behavior. In case of purchase decision, it refers to the individual who lacks resources and the opportunity to perform actual behavior and tend not to form strong behavioral intentions (Kalafatis et al. 1999, p.445). Finally perceived behavioral control influences intentions and lead to perform behavior with the help of skills, resources and other specific prerequisites. An example of green cars can be taken into account. To buy a green car requires resources (money), so, having insufficient resources would mean that s/he would have a lack of opportunity to perform the buying decision.

\[
P_{BC} \propto \sum c_i p_i
\]

In this equation, \( P_{BC} \) is the perceived behavioral control; \( C_i \) is the control beliefs with a given factor \( i \); and \( P_i \) is the power with factor \( i \) (Ajzen, 2005, p.125).

In the TPB, behavior is a function of compatible intentions and perceptions of behavioral control. Conceptually, perceived behavioral control is expected to moderate the effect of intention on behavior, such that a favorable intention produces the behavior only when perceived behavioral control is strong. In practice, intentions and perceptions of behavioral control are often found to have main effects on behavior, but no significant interaction.

In the context of high involvement green purchase, the theory of planned behavior explains extensively more variation than the theory of reasoned action. While the TRA theory only takes into account the attitudinal and normative beliefs of the consumers, TPB includes the behavioral control (ability) of the consumer as well. This explains why a consumer’s beliefs (no matter how strong and profound they are) do not always translate into behavior (in other words, purchase decision).

**2.4 Summation of the Discussed Theories and Models**

The theories presented in this chapter, as mentioned above, are rooted in the research purpose of this study. All of these models and theories try to explain the consumer decision process and factors related to it from different perspectives.

The five-step decision process is the most basic of all the decision models and yet explains purchase decisions for all of the products in a general way. Now, our focus product in this study is Green Cars that as the product category falls under the category of high-involvement products. So, we have taken the five-step model as the base for our understanding and added the high-involvement purchase process to expand that understanding in the realm of the high-involvement purchase decision-making process.

An automobile is also classified as a bundle of attributes, so models and theories concerning consumers’ attitude towards multi-attribute purchase situations has been included in the discussion. The
Multi-attribute Attitude Model, Theory of Reasoned Action (TRA), and Theory of Planned Behavior (TPB) have been critically examined and explained to understand the consumer perception in the multi-attribute product decision-making situations. Attitude, Intention, and Behavior are the three important concepts identified from these models. Forming attitude is the first step that leads to positive attitude and attitude turns into behavior when all else goes well. The models identified subjective norms (peer pressure, social status, social influence etc.) and controlled behavior (financial situation, news of an upgrade on the selected product etc.) as the influencing factors for the transition between attitude and behavior. This transition between intention and purchase decision (behavior) is examined in Kotler's (1988) decision model (refer to figure 04).

As a green automobile is an environment related or green product, we examined and discussed the forming of green attitude in the minds of consumers. So, in light of our knowledge from the multi-attribute models, the green attitude towards the automobile would create (positive or negative) attitude towards the automobile, which in turns may or may not turn into behavior (purchase).

2.5 Development of the Framework for Consumer Preference in High-involvement Green Purchase

Based on the understanding of the theories and models discussed in this chapter and the scope and purpose of this study, the authors have developed an independent framework for understanding the consumer preference in high-involvement green purchase situation in a better light. The framework is presented in figure 08 below. The authors believe, this framework will explain the consumer preference scenario in light of this study.

From the five-step model (Kotler, 1988, p.194; Solomon, 2009, p.350) and the decision model (Kotler, 1988, p.201-202), the authors understand that the evaluation of alternative stage is where consumer forms attitude and evaluates the different product and or alternatives. The multi-attribute attitude model (Solomon, 2009, p.297) explains that the consumer evaluates each attribute of the product as well as the product itself as a bundle of those attributes when evaluating. And the factors of green attitude guidelines (Young et al., 2010, p.29) shows that green attitude towards a product is formed as a combination of consumer's strong green value, prior purchase experience, available time for information search concerning the product(s), knowledge about product relevant environmental issues, availability of the product, and of course, and affordability. As Ajzen (2008, p.526) and Solomon (2009, p.297-298) conforms that positive attitude towards an alternative leads towards forming positive intentions, so, this framework incorporates evaluation of attributes of the product and green attitude of the consumer towards the product as the criteria for evaluating alternatives and developing the green purchase intention.
Kalafatis et al. (1999, p.445) state that intentions do not translate into behavior due to lack of resources, opportunities, and sufficient strength of intentions. Ajzen (2005, p.125), in the TPB theory, and Kotler (1988, p.201-202), in the decision model, identify influence of subjective norms and unexpected situational factors (controlled behavior – as termed by Ajzen) as the causes of an intention turning (or not turning) into purchase decision (behavior). This framework incorporates these two influencing elements in between the transition from green intention towards green purchase decision (green behavior). However, the 'subjective norm' element, although very important part of this framework, has not been measured directly in this study.

So, according to this framework, a consumer evaluates the product alternatives based on his/her green attitude and by weighing or evaluating each product attribute. S/he then forms a green purchase intention and selects a product from the available alternatives. The consumer evaluates the influences from his/her subjective norms and also examines the unexpected situational factors (if any) before making the green purchase decision or turning his/her green intention towards green behavior.

The research questions of this study can be easily related to this framework. The research question concerning determining attributes can be incorporated directly in the 'evaluation of attributes' criteria of evaluating alternatives. While the research question concerning how these attributes influence the consumers refers to the entire framework in general. As, each of the components of this framework is highly connected to each other, they each play a role in identifying the 'how' concerning the influence of product attributes on green purchase decision. Similarly, the research question dealing with influence
of consumer's green consciousness on green product preferences may be derived from this framework as well by developing green consciousness profiles through measuring the green attitude.

Now, to measure the consumer preference as whole, the authors need to measure parts or components of this framework both separately and collectively. For example, as mentioned in the multi-attribute attitude model, the need to measure the preference of the offered product as a whole while also measuring the preference of each attribute of the said product at the same time is important. The concept of conjoint-analysis has been applied in order to accomplish this as this technique can measure respondent preference towards the whole product while measuring preferences for each attribute at the same time (Green and Srinivasan, 1978; Green, Krieger, and Wind, 2001).

2.6 Concept of Conjoint Analysis

"Conjoint Analysis attempts to determine the relative importance consumers attach to salient attributes and the utilities they attach to the levels of attributes".

(Malhotra, 1996, p.709).

In 1971, the application of Conjoint experiment (CA) started widely in modeling consumer preferences in competitive business arena (Green and Srinivasan, 1978, p.103). At first the measuring technique was introduced by Luce, a mathematical psychologist and Turkey, a statistician in 1964 (Green and Srinivasan, 1978, p.103; Johnson, 1974, p.121; Green et al. 2001, p.4). Conjoint Analysis (CA) also called ‘trade-off analysis’, is a widely used tool in marketing research. It is used to derive the ‘customer preferences structure’ and the utilities that they are obtaining from the products. The underlying conjecture of CA is the complex decision process which consists of not just a single attribute but several or many attributes conjointly (Chaudhuri and Bhattacharyya, 2008, p.6634). This is a trade-off for analyzing consumer’s preferences and intentions of buying a product and it is also measuring consumer reactions to either change made to product attributes or to new product entry to the current market (Green et al. 2001, p.4). In CA, respondents are presented with several alternative products with bundle of attributes jointly, and consumers’ interest in each of the products is measured (Kinnucan, 1994, p.93-98). According to Green et al. (2001, p.7), the basic Conjoint model can be represented by the following formula:

\[ s_j = \sum_{p=1}^{P} w_p y_j p \]

.........................Equation (5)

Where,
- \( P \) denotes the attributes and \( J \) is stimuli; \( y_j p \) denote the desirability of the \( P \)th attribute for the \( J \)th stimulus; \( s_j \) is respondents preference for \( J \)th stimulus and \( w_p \) denotes the consumer’s importance of weight for each of the \( P \)th attributes.

No conjoint studies have been done on the green automobile industry in Sweden. It is of immense importance to know what motivates consumers to think green and buy green. As it (Swedish Green Car Market) is a rapidly growing market (Lindfors and Roxland, 2010, p.1), it is still in need of knowing its consumers and their preferences. Thus, the authors find it important to investigate the value systems of green consumers using Conjoint Analysis.
3. THE SWEDISH GREEN CAR MARKET

Sweden, in accordance with the EU directives, undertook some major steps over the last few years aimed at reducing CO$_2$ emissions from automobile sources (Lindfors & Roxland, 2010, p.1). The government incentive programs together with the social awareness of the general citizens have created a surge in the sales of green cars in Sweden (ibid.). This chapter examines the current state of the Swedish green car market as well as the future direction of the market as well.

3.1 The Present Situation

The green car market in Sweden is very prominent. Of the new cars registered in the year 2010, 29.71% are green cars or 'miljöbil' while in 2009, 20.09% were green cars (Bil Sweden, 2011). If the European Union definition (automobiles with 140g/km CO$_2$ emissions or less) is considered, the numbers for 2010 and 2009 comes to 26.89% for 2009 and 39.21% for 2010, resulting in a 97% increase (ibid.). According to Edberg (2011), the sales of green cars have really lifted off during 2010. This claim can be supported not only by the percentage increase as above, but also with total number of sold vehicles as well. In 2009, a total of 35,599 vehicles with less than 120g/km CO$_2$ emission were sold while the number for 2010 is 74,493, an increase of almost 109% (Bil Sweden, 2011).

The most recent data for 2011 is also very promising. Table 1 compares the monthly new car registration data (following the EU definition of green cars) for the first 4 months of 2011 and compares them with those of 2010.

<table>
<thead>
<tr>
<th>Month</th>
<th>2010</th>
<th>2011</th>
<th>% Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sales (in Unit)</td>
<td>Sales (% of total)</td>
<td>Sales (in Unit)</td>
</tr>
<tr>
<td>January</td>
<td>4784</td>
<td>30.82</td>
<td>8080</td>
</tr>
<tr>
<td>February</td>
<td>5872</td>
<td>32.67</td>
<td>9656</td>
</tr>
<tr>
<td>March</td>
<td>8508</td>
<td>33.17</td>
<td>13681</td>
</tr>
<tr>
<td>April</td>
<td>8619</td>
<td>33.58</td>
<td>13009</td>
</tr>
<tr>
<td>Total</td>
<td>27783</td>
<td>32.76</td>
<td>44426</td>
</tr>
</tbody>
</table>

Source: BilSweden, 2011

Similar data with the Swedish green car definition is illustrated in table 2.
Table 02: New car registrations with 120g/km CO2 emissions or less (Swedish definition)

<table>
<thead>
<tr>
<th>Month</th>
<th>2010</th>
<th>2011</th>
<th>% Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sales (in Unit)</td>
<td>Sales (% of total)</td>
<td>Sales (in Unit)</td>
</tr>
<tr>
<td>January</td>
<td>2832</td>
<td>18.24</td>
<td>5019</td>
</tr>
<tr>
<td>February</td>
<td>3697</td>
<td>20.57</td>
<td>6155</td>
</tr>
<tr>
<td>March</td>
<td>5249</td>
<td>20.46</td>
<td>9346</td>
</tr>
<tr>
<td>April</td>
<td>5262</td>
<td>20.5</td>
<td>8798</td>
</tr>
<tr>
<td>Total</td>
<td>17040</td>
<td>20.09</td>
<td>29323</td>
</tr>
</tbody>
</table>

Source: BilSweden, 2011

Lindfors (2010), finds that the green car rebate program and the tax exemption by the Swedish government has really contributed towards the increase of green car sales especially that of diesel (clean diesel) vehicles. Edberg (2011) completely agrees with this observation and recognizes the automobile industry push as well. He explains that these days, all the automobile companies set a predefined goal of minimum expected green car sales. Tärnlund\textsuperscript{11} (2011) observes that these days consumers usually come in to an automobile dealership with the mindset of purchasing a green car as they want to help conserve the environment. He observes that sometimes up to 90% of the total sales of a car brand may be green cars (such as Saab or Opel).

New car registration data from past 5 years (starting form 2007), shows a steady increase of green car (both the EU and Swedish definition) purchase between 2007 and 2009. While the sales almost doubled during 2010 when compared to the sales of 2009. The first 4 months of 2011 has also been extremely positive for the sales of green cars (as observed above in tables 1 and 2). Based on the sales data from the first 4 months, we calculated the projected sales figure for the year 2011 and it can be compared to the data from years 2007 onwards in figure 09.

\textsuperscript{11} Mr. Anders Tärnlund is the Sales Executive (Försäljare) of Landrins Bil. Landrins Bil is the Opel, Saab, Mercedez Benz, Nissan, Subaru, Dodge, and Chrysler dealership in the Eskilstuna, Västerås, and Avesta area.
Figure 09: Annual Sales of Green cars (EU and Swedish definition) in Sweden

The authors visited several automobile dealerships in Umeå and Stockholm region (including Volvo, BMW, Peuguot, and Ford dealerships) and observed that the fuel economy and emission data of each vehicle is displayed along with the technical specifications and price. Upon inquiry, the sales personnel revealed that it is not the Swedish government requirement to display the emissions data but they do it so for company policy and also consumer demand. Edberg (2011) also confirms this while adding the presence of extra marketing effort on behalf of the sales staff to satisfy the consumer queries concerning green cars.

3.2 Future Trends of Swedish Green Car Market

Edberg (2011) and Tärnlund (2011) acknowledges that the green car market of Sweden consists of a very small share of the transport automobiles (3.5-10 ton vehicles) and presently the auto manufacturers are working towards developing green transport automobiles. It is only natural that with the emergence of an effective transport automobile fleet, the Swedish green car market would grow significantly.

Another important development on the horizon is the introduction of electric car models or Electric vehicles (EV) in the year 2011 and onwards. Mitsubishi, Peuguot, and Nissan have already released electric car models (Edberg, 2001; Vasilash, 2010c, p.6). Opel has finalized its electric model but had to delay the release in the wake of the Japanese tsunami of 2011 (Tärnlund, 2011). Volvo, Ford, Toyota, GMC, BMW, Mercedes etc. are in advance stages of developing and marketing their respective electric vehicle model (Perujo & Ciuffo, 2010, p.4551). Saab is going to release normal sized electric vehicles within the coming 12 months (Tärnlund, 2011).

The authors, while visiting the Mitsubishi dealership in Umeå, got an opportunity to take a look at the i MiEV – Mitsubishi's electric car model but was surprised at the price tag of SEK 450,000. Edberg (2011) stated that since the technology is yet new, it would take some time before the price would get within consumers' reach. In the mean time the automakers are working towards making arrangements
for supplying electric cars as office fleet vehicles (Edberg, 2011; Tärnlund, 2011). “I expect office fleets of Swedish companies would soon comprise many electric vehicles and in the mean time the prices would go down. That is when the general public would be interested to purchase these EVs!” exclaims Edberg (2011).

The EVs currently available or soon to be available would have a driving range of 100-180 km before recharge is required (Perujo & Ciuffo, 2010, p.4551). As the recharge takes about 6-8 hours, these vehicles would be ideal for city drive and not for highway driving (Edberg, 2011). The range of the EVs do not seem like a big deal when it comes to practicality as over 90% of the drivers drive less than 90 miles or 145 km per day (Vasilash, 2010c, p.6). However, the predefined range and the length of recharging period creates a negative effect on the potential consumer (Vasilash, 2010c, p.6; Lieven, Mühlmeier, Henkel, & Waller, 2011, p.238; Perujo & Ciuffo, 2010, p.4550-4552). Edberg sees a solution to this problem, “Mitsubishi has a 'quick charging station' system (currently in use in Japan) that can recharge an EV within 40 minutes but unfortunately we do not have any in Sweden. Setting up these charging stations in Sweden would be a great incentive for people to purchase an electric vehicle”, he states.

There are currently no EV specific support programs from the Swedish government yet but both Edberg and Tärnlund are confident that it would soon change when Swedish automakers will introduce their EVs. Among the possible support or incentives, establishment of quick charging stations, price incentives, R&D funding for improving EV range, and further tax benefits may be included, hopes Edberg (2011).

The present data of the green car market of Sweden suggests that it is already a strong market and the inclusion of green transport cars and EVs will make this already strong market even stronger.
4. RESEARCH METHODOLOGY

Research can be defined as a systematic assessment of observed information. Saunders, Lewis, and Thornhill (2009, p.5) define research as a process of searching for information in a systematic way based on logical relationships. The rising environmental issues and its impact on consumers have been observed since the early 90’s (Polonsky, 1994, p.4). Numerous research methods and techniques have been using to formulate a systematic and objective understanding. No matter what methodological choices have been made to analyze these issues the core objective was to have deeper understanding on the subjects.

In this study the authors have used multiple-methods quantitative study to achieve the purpose of the analysis. The structured approach is the focal inquiry mode of this study as they (the authors) are conducting adaptive choice based conjoint analysis. The empirical data has been collected with the help of advanced conjoint software in the pre-defined sample frame ‘Sweden’.

4.1 Choice of Study

At present the green consumer behavior is one of the most captivating areas of concern to study about. The emergence of green consumer behavior is aggregated with the heightened rate of environmental disasters. In recent years, the environmental issues are the prime concern of majority of people (Wagner, 2003, p.1). Moreover, the emission of CO$_2$ is believed to be one of the foremost causes of global warming and global climate change (IPCC, 2001, p.5).

This study is being conducted at an important and critical period of time in the context of the Swedish Green car market. The recent market data shows a steady increase in the sales of green cars. And with more and more new models being released every year, consumers worldwide now have more options to choose from (Unruh & Ettenson, 2010a, p.98). Lindfors & Roxland (2010) observes that the range of available car brands and models paired with government tax incentives have made the Swedish car consumers adopt green models more readily.

And from the analysis of the future trends of the market, two ground breaking developments (introduction of EVs from different brands, and development of green models of transport cars) are about to take place. These developments should make this market even bigger and more lucrative than ever.

Understanding consumer behavior is a fascinating area in marketing discipline. To truly understand consumers the focus must be on consumers’ thoughts and forces that motivate them to perform a buying decision (Zaltman, 2003, p.17). Understanding the consumer preferences within an expanding market is absolutely essential (Shen & Villas-Boas, 2010, p.1259-1260). The authors believe this study would be a positive step towards obtaining a primary understanding of the consumer preferences of the Swedish green car market and would provide pathway for further researches in this field.

This study has investigated the high involvement product (cars) purchasing behavior of green consumers. A conjoint analysis has been conducted to identify the green factors that truly make them to take green purchase decisions.
4.2 Perspective
In recent years, a range of new phenomena has expanded in the study of consumer behavior (Stewart, 1990, p.750-754). Green consumer behavior is comparatively a new phenomena in the arena of consumer research. This study focuses on Preference and purchase behavior of green car consumers. After literature review the authors have realized the current importance of the study on environmental consumer behavior. And as Sweden is a prospective market for green consumers and no conjoint analysis has been done on automobile industry before, so the authors believe that conducting conjoint analysis based study would contribute towards the theory for further research.

4.3 Preconceptions
The authors understand that the integrity of the research design and findings while the neutrality of the conduction of the study is expected. However, preconceptions of the researchers may have some effects in these aspects.

Both the researchers possess a pro-environment attitude and are active green consumers. The literature reviewed in relation to this study has been primarily from pro-green sources and authors. However, the authors understand that a neutral view of the phenomena is essential in conducting this study and have approached this study as such to the best of their knowledge.

4.4 Research Philosophy
The study explains the determining factors of choosing environment friendly cars and the level of preference of selecting the attributes of the car. The study also explains the close inspection of the attribute selection at an individual level. Based on the area under discussion, the authors have decided to conduct an adaptive choice based conjoint analysis to know how consumers are behaving in green purchase decisions. Since the study has been initiated based on the current flourishing green car market in Sweden as mentioned earlier in the chapter 3, they have investigated how consumers are getting influenced by the existing green cars and their attributes. The research questions and objectives are set based on the extensive literature search. The selection of attributes began with the obtained literature as well as on pre-screened hands on data.

To conduct a quality research, the relevance of philosophical perspective is to develop knowledge and to understand the nature of the knowledge. Saunders et al. (2009, p.106-121); Kent (2007, p.47-49) and Bryman & Bell (2007, p.16-26) describes the philosophical underpinnings intensively from two basic dimensions: epistemology and ontology. Further, Saunders et al. (2009) has described extensively in four paradigms: Positivism, Realism, Interpretivism and Pragmatism. Among them the positivism philosophical paradigm is more suited with our study that falls under the natural science epistemology. Epistemology deals with acceptability of knowledge in a discipline (Bryman & Bell, 2007, p.16). To understand the subject of the study, the authors have observed different phenomena and obtained an objective outcome by using credible data and facts. On the other hand, ontological philosophical view considers the nature of the reality. In ontological consideration, objectivism philosophical paradigm is more relevant with this study because the environmental conscious consumers are assumed as an organization or as an entity that exist in the society as a whole.

The research questions have been developed based on the philosophical views of the authors and the study is structured on the basis of the existing theory of conjoint analysis. Since the aim of the study is
to measure the preferences of consumers, the authors have modeled the phenomena of green consumer behavior in a very structured way towards perception and preference of green cars. However, the authors have used multi-method quantitative approach to collect factual data in several structured steps that includes both adaptive choice based conjoint survey and in-depth structured interviews. Since the interview system may be related with impressions and feelings of both the interviewer and interviewee and thus may influence the data outcome, they have put every effort to maintain the integrity of data to the best of their knowledge by designing the in-depth interview in a semi-structured format aimed at extracting maximum information. The application of the related theories and selected research approaches differentiates the uniqueness of this study.

4.5 Research Approach
The two basic research approaches are used to the different research philosophies (Saunders et al. 2009, p.124). The deductive approach more interprets the positivism whereas the inductive approach is to interpretivism. The deductive approach is related with scientific studies that starts with the development of hypothesis from the theory and ends with the findings (Saunders et al. 2009, p.124-127).

A highly structured data collection approaches are applicable to ensure the validity of the data. On the other hand the inductive approach is more related to understanding the nature of the problem and the social phenomena (ibid.). It starts with observation and ends with introducing a theory. Thus the inductive approach is related with qualitative study that emphasizes on more flexible structure and requires a collection of qualitative data.

According to the nature of this study, the deductive approach is more applicable to measure the perception and preference of green car consumers. The study is ordered on the basis of existing consumer behavior theory to structured data collection methods. In order to be able to generalize the conclusion of the study the deductive approach facilitates to analyze data quantitatively. Therefore, the quantitative research approach is reasonable.

4.6 Research Strategies
Research strategy works as a basic pathway to carry out a research according to research objective(s) that drawn from the research question(s). Moreover, the proper data collection source and its availability, and the probable data collection constraints are also directed by the proper research strategies (Saunders et al. 2000, p.92). Saunders et al. (2009, p.142-150) has explained the research strategies in seven different ways according to the type of one’s research approach. These are experiment, survey, case study, action research, ethnography, grounded theory and archival research. Among them ‘the experimental research strategy’ is more associated with our research topic. Although the authors have conducted semi-structured expert interview as the study demanded expert opinion to summarize green car attributes, but this was a part to get to the actual conjoint survey. However, the basic rationale behind choosing experimental strategy is the conjoint analysis in which different attributes of a product are assorted and based on the attributes; different product concepts are built (Gustafsson, 1996, p.128). Moreover, a near-orthogonal array has been applied as experimental design approach to get actual data. However, the authors have conducted a post conjoint questionnaire survey to obtain respondents green perception and practice as well. So that, authors can interact more with respondents in order to obtain facts, opinions and attitudes in a very structured manner (Mc Daniel and Gates, 2007, p.73).
The research criteria for this study fall under deductive approach as it is more interrelated with quantitative study (Saunders et al. 2000, p.93; Kent, 2007, p.182). Besides, the authors have used a new approach of conjoint analysis- ACBC, to collect their data regarding consumer preference on a bundle of attributes of high involvement green purchase and perception towards green as well.

So, all things considered, Multiple-method approach has been used to draw the inference on the study. Expert interviews and concept testing survey is used along with conjoint analysis aiming to get objective inferences. The multiple-methods are used on the importance of particular research problem (Hurmerinta-Peltomäki and Nummela, 2004, p.164). Thus the use of multiple measures ensure some uniqueness of the study which otherwise may have been uncovered by using single methods (Jick, 1979, p.603). Combinations of multi-methods and techniques often achieve the research objectives in a prolific way (Kent, 2007, p.61).

Figure 10: The Three-Phased Data Collection Process

Therefore, the three-phased study (Figure 10) has been carried out to strengthen the methodological approach of the study. Taking expert interviews at the first phase have enabled the authors to have deeper understanding on how consumers behave and what features they prefer in actual purchase environment. The focal phase- the application of conjoint analysis would broaden the in-depth insight on individual’s value-system in high involvement green purchase context. Furthermore, the supplementary self-administered questionnaire survey has made the purpose of understanding the green concept of respondents.

4.7 Acquiring Adaptive Choice Based Conjoint Software
Sawtooth Software Inc. from Seattle, WA, specializes in conjoint analysis related software products for marketing researchers. The ACBC software module is one such software product from Sawtooth. The
module works as an add-on to Sawtooth Software's SSI-Web (Sawtooth Software Inc. Web-based Interviewing Software) software and is priced at US$ 10,000.

However, Sawtooth has an Academic Grant program for Masters and PhD students through which it gives free license to the required software and relevant modules to conduct academic studies. The application package for this grant consists of a research overview, name(s) of the required software and/or modules, and the rationale behind selecting the specific type of conjoint methodology over the others.

The authors applied for the Sawtooth Software Academic Grant on the 20 April, 2011, for the SSI-Web and the ACBC module to conduct this study. They included a brief overview of the study, their argument for choosing ACBC as the preferred conjoint method, and contact details of the study supervisor with their grant application. The application was successful and the authors received the grant on the 25th April, 2011. According to the conditions of the grant, they received complete (full-version) licenses for both SSI-Web and ACBC valid until the completion of this study. Sawtooth also requires that the authors send them an executive summary of their research findings and (if possible) a link to the completed paper.

4.8 Literature Sources
In order to search and access required and relevant literature (secondary sources of data) for this study, the authors have primarily used the resources of Umeå University Library. They have used printed books and research publications from the library collections and searched the online databases through the university webpage. The online databases accessed through the library webpage includes but not limited to EBSCOhost, Elsevier, Wiley, SAGE, JSTORE, Science Direct, and Emerald Full text.

Their searches included keywords such as 'Green Marketing', 'Green Automobile', 'Conjoint Analysis', 'Adaptive Choice Based Conjoint Analysis', 'Consumer Preference' etc. Although numerous articles corresponded to their search, they tried to select the ones most relevant to our choice of study subject. And also extra emphasis was given in the selection of articles from scientific journals. Another important secondary source has been the online knowledge base of the Sawtooth Software Inc. Articles and conference papers concerning conjoint analysis and techniques have been accessed through this source. The authors have also searched the DIVA portal to access prior student theses for additional help.

4.9 Adaptive Choice Based Conjoint Analysis
Depending on the research problems, researcher weighs multiple conjoint methods and tools (Orme, 2010, p.39-50). The conventional methods such as Traditional full profile conjoint analysis is also known as Conjoint Value Analysis (CVA), Adaptive Conjoint Analysis (ACA) and Choice Based Conjoint Analysis (CBC) are three primary systems that are widely used in previous research works (ibid.). Rating or rank order scale was the conventional approaches to conduct full-profile conjoint analysis. It deals up to with six attributes and presents with using paper and pencil cue-card. The orthogonal design is the base of the construction of full profile approach (Gustafsson, 1996, p.32). To reduce the shortcomings of CVA, the ACA was introduced by Sawtooth Software Inc. and it has enabled the researchers to handle more attributes at the same time than CVA. Besides, it is feasible to measure high involvement purchase decisions because respondents focus on each attributes and rank and rate their preferred choice before making considered decision (Orme, 2010, p.39-50). However, the constraint of using ACA appeared while applying price sensitivity. It often devalues the actual...
measurement since the likeliness of increasing devaluation depends on the increasing number of attributes are being studied (Orme, 2009, p.2). On the other hand, CBC is a widely used approach that excludes rating or rank order scales. It shows full profile of a product with a bundle of attributes and respondents are asked to select their preferred one. This method is more relevant with real-life purchase decision with the option of choosing none. However, CBC is considered as less informative than ACBC and it can be tedious to respondents as because of repetition while interviewing (Orme, 2010, p.114).

In this research study the authors have decided to apply Adaptive Choice based Conjoint Analysis (ACBC), a newly developed approach of conjoint analysis method, which consists of both ACA and CBC exercises.

“ACBC offers a question flow that incorporates the well-established theory that buyers make complex choices by forming a consideration set (typically cutting-off rules) and then choosing a product within that consideration set” (Orme, 2010, p.49).

The selection of relevant method of conjoint analysis is based on some key issues namely, attribute, mode of data collection, and sample size. Orme (2009, p.6) suggested that the ACBC is more effective if price is enlisted as an attribute. Price is an important factor in complex buying decision. In this study the authors have selected price as a parameter of measuring the probable variation in making considered decision. Moreover, they have conducted this study with six attributes which is again fitting ACBC as “appropriate studies typically involve about five or more attributes”, (SSI web help). The mode of data collection has been considered as computer adaptive because researchers believe that the more the interviewing method is interactive and appealing the greater the actual responses would be collected. Besides, ACBC offers a different data collection module that enabled respondents to build their own car in several steps. Another major issue is concerning sample size. ACBC can even out a small number of sample sizes (n< 100) (ibid.) as the authors have selected a limited number of sample sizes. Therefore, part-worth utility can be estimated at the segment level and at the individual level as well (Orme, 2010, p.118-124). Of all things considered, authors believe that ACBC is the best fit for the requirements of their study and it made them more enthusiastic to work with this new method.

Commonly, the conduction of conjoint analysis consists of several steps (Green and Srinivasan, 1978, p.105; Gustafsson, Herrmann and Huber, 2007, p.5; Malhotra, 1996, p.710). In this study the authors have controlled their conjoint process in five steps based on the importance of the ACBC application. The steps are summarized in the flow diagram (figure 11) below:
4.9.1 Formulation of Attributes

As it is known from previous discussions, a product/service is seen by the consumer as a bundle of attributes. An automobile is no exception. In fact, an automobile can be considered as a bundle of over a hundred (or even more) attributes. As this study measures the consumer preference towards the green car as a product through conjoint analysis, the authors would focus on a set of important attributes of the automobile.

To select the appropriate set of attributes for this study, authors have consulted prior studies conducted on consumer car preferences and have interviewed experts from automobile industry. In addition, they also conducted a pre-concept testing survey in Umeå that gave them a general idea of the list important car attributes as perceived by the consumers. The most important attributes for a green car that are identified from all these three sources are fuel economy, price, CO$_2$ emissions, engine power, brand, and car size. So, authors have developed their green car profiles with these six attributes for this study.

**Fuel Economy**
Fuel economy is one of the most important attributes while purchasing an automobile. According to Datamonitor (2010), fuel economy is one of the two most important attributes that influences consumer
decision. The price of fuel is a strong determinant in the green car purchase trends as an increase in fuel price increases the sales of fuel efficient or greener cars (Vasilash, 2010d, p.33).

In a study conducted during 2009 in the UK, Dixon and Hill (2009, p.16) finds that the Fuel Economy Label\textsuperscript{12} of the car is either very important or fairly important to about 73\% of the car buyers. The estimated cost of fuel for 12,000 miles of driving was another way of determining the importance of fuel economy as 74\% of the intended used car buyers, 69\% of used car buyers, 66\% of intended new car buyers, and 60\% of the new car owners find this information to be most or very important in their decision-making (Dixon & Hill, 2009, p.18).

Edberg (2011) believes that fuel economy is the top concern for the consumers in Sweden as it is directly concerned with the operating cost of the vehicle itself. He adds that the fuel consumption information (mil\textsuperscript{13}/liter) is almost always the first thing that a Swedish consumer would like to know. Tärnlund (2011) expresses similar beliefs.

So, this attribute could be an important indicator of the future operating cost of the vehicle. In case of Green cars, the authors consider, the fuel economy is of even more importance and would help determine the consumers perception towards its importance towards the green car purchase (be it intended or already purchased).

\textbf{CO\textsubscript{2} Emissions}

The defining attribute of green cars is the amount of CO\textsubscript{2} emissions. The amount of CO\textsubscript{2} emissions indicates the degree of environment-friendliness of the automobile. So, this is the key attribute in determining the consumer preference of green cars. 71\% of the UK residents identified CO\textsubscript{2} emissions as the top reason for climate change or global warming while 56\% believe that emissions from the automobiles is the top culprit and similar results are expected to be found across Europe (Bane, 2005, p.42). Moreover, over 80\% of the residents support penalizing drivers of high CO\textsubscript{2} emitting vehicles or rewarding drivers of low CO\textsubscript{2} emitting ones (ibid). Bane (2005, p.43) also finds that about 70\% of car owners are very concerned about the impact of automobile CO\textsubscript{2} emissions from vehicles to the environmental degradation.

Dixon and Hill (2009, p.18) find that about 47\% of used car owners and 50\% of new car owners view the CO\textsubscript{2} emissions amount of their vehicle as either most important or very important in their purchase decision. While about 62\% of intended used car owners and 51\% of intended new car owners regard the CO\textsubscript{2} emissions as most or very important (ibid).

While discussing about the importance of CO\textsubscript{2} emissions on the Swedish green car consumers, Edberg (2011) and Tärnlund (2011) points out that this emission data of an automobile is not directly relevant in the initial stages. However, as the automobile tax of a car is calculated on the basis of the amount of its CO\textsubscript{2} emissions, this emission information becomes a major factor for the consumers.

\textsuperscript{12} The Fuel Economy Label is a label that displays the CO\textsubscript{2} emissions, fuel consumption, and estimated fuel cost for 12,000 of driving the vehicle. This label needs to be displayed in the car showrooms on all vehicle as required by the UK government. More can be found at \url{http://www.lowcvp.org.uk/cutting-carbon/fuels-labels-explained.asp} or at \url{http://www.direct.gov.uk/en/Environmentandgreenerliving/Greenerhomeandgarden/Greenshopping/DG_064874}

\textsuperscript{13} 1 mil = 10 Kilometer
The authors think that the inclusion of this attribute in this study would give them an understanding of the consumers’ environmental consciousness and concerns while making the purchase decision.

**Price**
One of the obvious determinants of car purchase is price. Datamonitor (2010) lists the purchasing price of the vehicle as the other most important factor beside fuel economy that influences consumer purchase decision.

King (2007, p.15) states in the King Review of Low Carbon Cars, vehicle price falls under the most important factors that influences consumer decision concerning the purchase of a car. Lane (2007) identifies vehicle price as the top factor that creates or eliminates the attitude-behavior gap concerning consumers’ purchase of low-carbon or green vehicles. He also recommends using price incentives on behalf of not only the governments but also from the automakers to lure the consumers in purchasing greener cars.

Concerning the issue of price, Edberg (2011) states that although it is the most important factor for the consumers for decision-making, rarely would a Swedish consumer admit it. Rather, they would look for other information concerning the automobile and then in most cases make the final decision based on the price of the car. The initial information search, as Mr. Edberg points out, does not usually include the price of the car directly but in an indirect way (in most cases, the price factor needs to be initiated by the car salesperson during the process and then the consumer finds his/her comfort zone according to his/her budget).

Tärnlund (2011) agrees that price is the single most important factor while deciding on an automobile purchase. However, he also adds that consumers may not always be extremely rigid concerning the price as they sometimes show the willingness to pay more than their budget for an automobile that they believe would satisfy their needs.

It is no wonder that the consumer budget is always the major influence in the decision making process. So, the authors deem the price attribute of the green cars would be important. They believe this attribute would help them understand the impact of vehicle price on consume purchase.

**Engine Power**
The ability or power attribute of the car can be an important factor. The horse power count can be important in the winter driving conditions. Engine power or performance plays as an important factor for the consumers choice of an automobile (Dixon & Hill, 2009; Caulfield, Farrell, & McMohan, 2010; King, 2007; Lane, 2005).

Lane (2005, p.24-25) states that although the engine power is not the most important factor in consumer decision process, it is one of the must know factor for a consumer to finalize the decision. Similar findings are reported by Caulfield et al. (2010, p.384), while Dixon & Hill (2009, p.24) find that 37% of potential low carbon or green car buyers in the UK rates engine power as one of the most important factors for their upcoming purchase. Edberg (2011) and Tärnlund (2011) agree that engine

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14 The King Review of Low Carbon Cars is a British Government initiative led by Dr. Julia King, the Vice-Chancellor of Ashton University, to examine the vehicle and fuel technologies to reduce carbon emissions by 2050. More can be learned at [http://www.hm-treasury.gov.uk/king](http://www.hm-treasury.gov.uk/king)
power or horsepower measurement is indeed an important attribute for the Swedish consumers. So, this may be an interesting attribute to look at.

**Brand**
The make of the car is often a key factor for preferring one over the other. King (2007, p.15) lists brand of the automobile and image of the automobile as important factors in influencing the consumer decision process. Lane (2007, p.5) states car make or brand as one of the top rational factors for car purchase behavior.

Brand preference may stem from prior experience as Bloemer and Lemmink (1992, p.361) find that 80% of the car brand loyalty results from satisfaction with the brand itself that comes in the form of service and performance. The 'social status' element present in the car purchase process as mentioned by Lane (2007, p.7) may be another deciding factor in determining brand choice.

Tärnlund (2011) states that a car brand is important not only because of its image but also for satisfying specific consumer need(s) as well. He explains that when it comes to green cars, each brand may offer something unique (for example, only Opel offers an automatic transmission for a green car model) and therefore, if that unique feature is what the consumer believes to be significant, his/her decision may be biased towards that specific brand. So, the authors believe, this attribute should be a key player in this study.

**Car Size**
The size of the automobile is stated as one of the top determinants in consumer decision making by almost all the previous studies. King (2007), Lane (2005), Lane (2007) Caulfield et al. (2010), Dixon & Hill (2009) have identified as among the top 3 factors that influenced or would influence current or potential car buyers.

Dixon & Hill (2009, p.24) finds that 76% of potential and 77% existing green car users see the car size as one of the most important factor for their decision. Caulfield et al. (2010, p.384) find car size to be of more importance to the consumer than brand name while purchasing a car. Lane (2005, p.24; 2007, p.4) lists car size as one of the top 3 most important factors for car buyers.

In Sweden, consumers purchase automobiles with specific needs in mind and determine on the automobile size prior to making the purchase (Edberg, 2011; Tärnlund, 2011). So, the car size is obviously an important determinant in purchasing of a car. A consumer looking for a small car for short driving needs usually looks for a compact or 'Halvkombi', while a consumer looking for a family vehicle would want a 5-door hatchback or 'Kombi' (Edberg, 2011).

So, the authors understand that car size as an attribute in this study would be an important factor for them to understand the consumer preference.

**4.9.2 Formulation of Stimuli Set**
Defining levels of attributes is one of the most important aspects of a good conjoint design (Orme, 2010, p.51). In conjoint analysis, respondents express their preference towards a product by selecting the preferred levels of the attributes (ibid.). So, selecting levels for the product attributes is very important.
Table 03: Levels of Attributes

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fuel Economy (km/liter)</td>
<td>20, 23.8, 25, 26.3</td>
</tr>
<tr>
<td>Price (in SEK)</td>
<td>175000, 185000, 190000, 220000, 230000, 270000, 300000</td>
</tr>
<tr>
<td>CO₂ Emissions (g/km)</td>
<td>92, 99, 104, 109, 110, 119</td>
</tr>
<tr>
<td>Engine Power (Horse Power or hk)</td>
<td>105, 112, 115, 120, 122, 136</td>
</tr>
<tr>
<td>Brand</td>
<td>Volvo, VW, Renault, Ford, Peugeot, Toyota, Audi</td>
</tr>
<tr>
<td>Car Size</td>
<td>Coupé 2 Door (Coupé), Hatchback 3 Door (Halvkombi), Hatchback 5 Door (Kombi)</td>
</tr>
</tbody>
</table>

Orme (2010, p.52) expresses that appropriate and concise (unambiguous) information should be presented in designing the attribute levels so, the levels of attributes for this study are selected based on real automobile specification. According to the directions of Adaptive Conjoint Analysis guidelines, the optimal number of levels for each attribute ranges from 3 to 7 (Sawtooth Software Inc., 2011). Defining more attribute levels than is recommended by the guideline may create data analysis problems, such as imprecise part-worths (Orme, 2010, p.55). So, the levels for this study range from 3 to 7.

The seven automobiles selected for the attributes and levels construction are, Volvo V70, VW Golf, Renault Megane, Ford Focus, Peugeot 308, Toyota Prius, and Audi A3. These seven Automobile makes and models were selected based on data from BilSweden concerning the best selling and popular miljöbil or green cars in Sweden. The authors’ initial intention was to select the top 7 green cars but for several reasons they decided not to do so. Firstly, several automakers had more than one model on the best selling list, and the authors decided to keep only one model from each brand to provide more alternatives to the respondents. Secondly, as the authors wanted to include more options in terms of attribute levels, automobiles with similar or fairly similar attributes (even if they are from different automakers) to selected automobiles, were not chosen. The levels of attributes are shown above in table 03.

4.9.3 Selection of Data Collection Methods

Several steps have been taken to data collection. The basic structure of gathering data consists of three steps: expert interview, ACBC experiment and questionnaire survey. Moreover, to reduce the data collection error and minimize the lists of attributes at manageable size the authors have run a pre-screening test that includes both ACBC experiment and questionnaire survey.

Pre-screening

“The more difficult and often subjective task is to reduce the number of attributes to a manageable size so that the estimation procedures are reliable while at the same time accounting for consumer preferences sufficiently well”, (Green and Srinivasan, 1978, p.105)

A preliminary pre-screening effort usually leads the study to identify relatively important attributes that are preferred by consumers (Braun and Srinivasan, 1975, p.373-378). It helps to narrow down the
attributes to a manageable number. The objective of concept testing by developing questionnaire is to minimize likely errors in conjoint data collection. A self-administered closed-ended questionnaire survey has been conducted to formulate significant green car attributes. The questionnaire consists of two parts with fifteen questions. The first part: extraneous variables include demographic profiling such as gender, age, education, occupation and monthly income of respondents. Gleaning the background variables of respondents has enabled the authors to get the basic information so that they can make a comparative analysis as well as a customer profiling of who are current or potential green car purchasers. Background information might have positive or negative impact on purchase decision. The second part of the questionnaire consists of green perception variables. It consists of ten questions concerning the green practices and green products (cars). The second part of the questionnaire has been designed strategically to understand the green perception and preference of the respondents. The nine green car attributes has primarily been selected (based on previous studies) for the respondents to rank order with the aim of identifying to identify the attributes closest to their ideal.

The questionnaire includes dichotomous questions to obtain direct answers from respondents, multiple choice questions to get the green understanding of the respondents and ranking scale questions to obtain the most preferred attributes rank of their ideal green car. Ten respondents have been selected randomly (assuming they have the concept of “green cars”) from Umeå. Previously several studies have already been conducted on green car owners but they did not take potential customers in their consideration. To assemble the primary understanding of respondents, the researchers have considered both the “would be” consumers and existing green car owners as the subject of concept testing. Moreover, the existing green car owners already have gone through a purchasing process so the two segments might have a gap on the understanding of green perceptions and buying habits.

Sample Design
Sweden, as discussed in chapter 3, is a very prominent market for green automobiles. So, the authors have selected to conduct this green automobile-specific study in Sweden. To be precise, this study has been conducted in the Umeå Kommun (municipality) of Västerbotten landskap (province) in Northern Sweden for the convenience of the researchers as they both study and reside in Umeå.

As the authors intend to measure the consumer preference towards green car, the population for this study consists of the entire population of Sweden which (as of 31st March, 2011) is 9,428,054 (Statistics Sweden, 2011). Conjoint analysis can be conducted with a relatively smaller sample size (Orme, 2009, p.6). Moreover, the ACBC technique of the conjoint analysis (that has been applied to this study) has the capability to provide meaningful analysis even with a sample size as little as 9 respondents (Sawtooth Software Guide, 2011).

The ACBC survey can be conducted both on and off-line. However, in order to conduct an on-line survey, it requires a complete data base containing e-mail addresses of the prospective respondents, which the authors could not acquire due to the confidential nature of such information, limited time and financial resources. Therefore, they have focused only on the off-line or Computer Aided Personal Interview (CAPI) version of the ACBC interview. Due to the length of the CAPI survey and the need to administer it face-to-face with the aid of a laptop, the authors have decided on a sample size of 30 respondents. They have divided the sample into 9 car owners and 21 potential car buyers. They have split the sample in this 30%-70% split because the intended objective of this study is to measure the preference of existing car owners and potential buyers with an added emphasis towards the latter.
The respondents have been selected using non-probability sampling procedure. The reason behind selecting non-probability sampling is derived from two reasons, firstly, as mentioned above, the inability to acquire a sampling frame\textsuperscript{15} with e-mail addresses; and secondly, the nature of the survey makes it too expensive and too much time consuming to conduct a truly randomly sampled respondent selection.

Furthermore, the authors have employed convenience and judgmental sampling within non-probability sampling in selecting their respondents. Convenience sampling has been used in the form of interviewing respondents from within the researchers' comfort zone. And judgmental sampling has been employed in the sense that the authors interviewed respondents who seemed as a suitable respondent. The authors understand that, as Malhotra (1996, p.364-365) cautions, the employing of the convenient and judgmental sampling (non-probability sampling as a whole) may not allow them to make objective evaluation concerning the precision of the sample results and in the process, may make generalizing of the findings rather difficult.

The authors have conducted the surveys in a strategically important location in Umeå – Umeå University. As Tärnlund (2011) opined that younger population in Sweden is usually more environmentally conscious, authors have selected the university because of the high-concentration of younger population.

**Expert Interview**

The aim of the expert interview was to finalize the attribute list with levels and to gather knowledge on how consumers behave on actual green car buying situation. The authors have conducted two in-depth interview surveys with the local car dealers. Two car dealers have been selected strategically from geographical perspective. The dealers have been selected from two distinctive cities of Sweden: southern city greater Stockholm region and the northern city Umeå to cross check the opinion of dealers. The authors have decided to take two interviews to measure the likeliness of the answers of each interviewee. Although the authors have selected three sources (previously mentioned) to finalize the attributes, the consultation with the experts was the decisive factor to assemble more real life data on Swedish green car market. By cross-checking the answers of two experts, authors have come up with the final order of attribute list and the level of stimuli set for conjoint software survey.

The interviews have been prearranged through telephone appointments and took place at the business premises of the interviewees. The duration of the each interview was one hour. The span of the interview has been determined in accordance with the layout and the length of questionnaire. The interview questionnaire consists of eight main questions with thirteen sub-questions (Appendix-1) and English has been selected as the medium of conversation. To ensure the validity of the data obtained from interview, the authors have explained the concept of environmental consumer behavior and the purpose of the study as well. Although the face-to-face interviews were designed based on pre-selected open-ended questions, the interviewees were not constrained by fixed sequence of questions rather it was interactive and data were captured in narrative form.

\textsuperscript{15} A sampling frame refers to a representation of the elements of the target population, such as a sales database or a phone book (Malhotra, 1996, p.361).
**ACBC Data Collection**

SSI-Web CAPI Module has been used for collecting the primary data for this study. The CAPI interview has been employed in two major parts – the ACBC part and the supplementary questionnaire part. The ACBC part has been used to gather data concerning respondents' preference towards the green car while the supplementary questionnaire has been used to capture background information as well as to measure the green consciousness of the respondents. Both the ACBC section and the supplementary questionnaire have been described in detail at the 'Selection of Data Collection Design' section later in this chapter.

**4.9.4 Selection of Data Collection Design**

ACBC is a new approach to data collection that basically consists of three sections: Build-Your-Own section, Screening section and Choice Task section. The aim of the significant study design is to acquire better choice data by this survey design method, where the respondents are exposed to a purchase situation that imitates that of a real life counterpart (Johnson and Orme, 2007, p.4). To keep the respondents more engaged, the authors have designed the survey in four sections that produces different form of questions depending on respondent’s previous answer in each choice task. In addition, a supplementary questionnaire has been attached to gather background information of the respondents and their perception concerning environment friendliness as well. The flow-diagram to the conduction of data collection design has been illustrated below in figure 12. Moreover, for better understanding of the reader, we have included a screenshot each of the B-Y-O section, screening section, choice-task tournament section, and the calibration section.
Build-Your-Own Section
The survey has started with a brief prologue about the study to let the respondents know what they are expected to do. In the first section, respondents are presented with attribute lists and levels to select their ideal levels from each attribute in order to design their own hypothetical car in later sections. To reduce the biasness of the respondents, the authors have excluded price and brand names from B-Y-O section. Four attributes, namely, car size, CO\(_2\) emissions, engine power and fuel economy have been selected out of six attributes for this B-Y-O section. As Edberg (2011) points out, customers tend to choose less expensive options if they are offered the chance to choose, so, by excluding price, the authors wanted the respondents to focus extensively on the basic green attributes of a car. For similar reason, brand name is also excluded from this section so that consumer focus can remain on the green car attributes alone. The screenshot of the B-Y-O section is shown in figure 13.
Figure 13: Build Your Own Section

The ACBC algorithm gathers a collection of product concepts based on the respondent’s answers in B-Y-O section. In this study, the ACBC algorithm generates a pool of 24 (4X6) products (cars) that are near neighbors to the respondent’s preferred B-Y-O selections. These concepts are generated by applying a near-orthogonal design by altering a few of the attribute levels to the B-Y-O responses (Orme, 2010, p.119). The sequence and preference order for engine power and fuel economy has been selected from low to high and best to worst respectively. In contrast, the amount of CO$_2$ emissions is ordered as high to low and best to worst.

Screening Section
The collection of product concepts, derived from answers in B-Y-O section, has been shown in the screening section. In this study, the authors have selected mixed approach in B-Y-O product modification strategy. In screening section, 6 screen tasks have been selected with different combinations of attributes. Each task holds 4 product concepts with a change of minimum 1 attributes to maximum 3 attributes to vary from B-Y-O selections. The brand names and price is included in this section. The sequence and preference order of price is set from high to low and best to worst respectively. Although this is not the section where respondents are meant to decide their final choice but are shown a few product concepts (4) at a time in the screen to indicate whether these are the possibilities or not (Johnson and Orme, 2007, p.6). Figure 14 illustrates the screening section.
Figure 14: The Screening Section

The screening section includes ‘Must –haves’ and ‘Must-avoids’ to scan the previous answers of the respondents to identify whether the respondents are using non-compensatory screening rules (ibid.). The authors have selected 2 must-haves and 2 must-avoids (unacceptables) that comes after each new screen of 4 products. Respondents might show interest on only one level of some attributes in that case they were asked whether the level is absolute condition of choosing the attribute. On the other hand, respondents avoid some levels in their screen tasks that are undesirable to them. In must-avoids sections, respondents are given the opportunity to cutoff the undesirable levels. Besides, respondents are shown a ‘none’ option in each section if they do not want to select any absolute. However, if the answers of the respondent are inconsistent, the must-haves and the must-avoids screen might appear more than twice to obtain the consistent choice values.
We've noticed that you've avoided Automobiles with certain characteristics shown below. Would any of these features be totally unacceptable? If so, mark the one feature that is most unacceptable, so we can just focus on Automobiles that meet your needs.

- Car size: Hatchback 3 door (Häkrombi)
- Brand: Volkswagen
- Brand: Peugeot
- Brand: Ford
- Price (SEK): 270,000
- None of these is totally unacceptable.

Figure 15: Must-avoids Section

Figure 15 shows the screen shot of Must-avoids section. A similar screen appears for the Must-haves section as well.

Choice Task Tournament Section

In this section, respondents are exposed to a series of choice tournaments based on their selected product possibilities in section two. Here, they are asked to evaluate the products that are close to B-Y-O-specified products. The maximum number of product concepts brought in to this tournament is 16 and the number of concepts that are presented per choice task is 3. The choices of products in this section are attuned with the “cutoff rules”. To distinguish the information, key attributes (based on cutoff rules) are grayed out that are tied across the concepts and respondents are asked to evaluate the remaining differences. The choice tasks have continued in subsequent round until the final choice has been made. A screenshot of the choice-task tournament is shown in figure 16.
Among these three, which is the best option? (I’ve grayed out any features that are the same, so you can just focus on the differences.)

(1 of 6)

<table>
<thead>
<tr>
<th>Brand:</th>
<th>Toyota</th>
<th>Audi</th>
<th>Peugeot</th>
</tr>
</thead>
<tbody>
<tr>
<td>Car size:</td>
<td>Hatchback 5 door (Kombi)</td>
<td>Hatchback 5 door (Kombi)</td>
<td>Hatchback 5 door (Kombi)</td>
</tr>
<tr>
<td>Emissions:</td>
<td>99 g/km</td>
<td>109 g/km</td>
<td>99 g/km</td>
</tr>
<tr>
<td>Engine Power (Horsepower or hp):</td>
<td>136</td>
<td>136</td>
<td>115</td>
</tr>
<tr>
<td>Fuel Economy (km/l):</td>
<td>26.3</td>
<td>26.3</td>
<td>26.3</td>
</tr>
<tr>
<td>Price (SEK):</td>
<td>175,000</td>
<td>175,000</td>
<td>230,000</td>
</tr>
</tbody>
</table>

Figure 16: Choice-Task Tournament

Calibration Section
This is actually an optional part in the ACBC experiment. This section is used to calculate the ‘none’ threshold of the product. In this section, 4 concepts are presented to the respondents. The product concept selected in the B-Y-O section, the winning concept from the screening section, and two other concepts that the respondent have partially or fully chosen during the screening section are shown (Johnson & Orme, 2007, p.10). The respondent chooses each concept on a five point Likert scale ranging from 'definitely would buy' to 'definitely would not buy'. Figure 17 shows the screenshot of calibration section.
Supplementary Questionnaire Survey
Upon completion of the conjoint survey, the authors have included a supplementary questionnaire (appendix-3) to accompany the actual conjoint survey. The consumer's likelihood of green purchase is influenced by the environmental consciousness that s/he possesses (Okada & Mais, 2010, p.223). So, in this questionnaire, authors aim to get background information of the same respondents while assessing their environmental consciousness as well.

Okada & Mais (2010, p.222-224, 231-232) states that purchasing green (in the form of organic products) products (be it food items, personal care products etc.) indicates that a consumer is aware of the environmental issues and wants to make an impact in protecting the environment. So, the questionnaire is designed to examine the organic product purchase behavior of the respondents.

The probability of purchasing green or organic products is high among people with higher income levels, college degrees, higher employment status, and older age (Ngobo, 2011, p.98). So, the authors have selected the age levels, educational background, employment status, and income levels of the respondents as our background variable questions.
Kim and Chung (2011, p.40) states that environmental or ecological concerns of the consumer may be a key factor in the success of organic (ekologisk) products. While Mondelaers, Verbeke, and Huylenbroeck (2008, p.1132-1134), finds that superior quality, health benefits, absence of additives, and environmental benefit of the product as the key motivational factors for the consumers in choosing organic or environment friendly products. So, the authors included these four options on the question concerning the reason behind purchasing the environment friendly product.

Ngobo (2011, p.90), concurs that there exists a lack of trust concerning the quality claims of the so called organic products among the consumers and this may refrain them from purchasing green. Product brand is very important while purchasing organic products as consumers are reluctant to buy products from unknown brands (Rajagopal, 2007, p.237). Price of the organic products also plays a very important role in the purchase decision process as well (Ngobo, 2011, p.98). And of course, availability of the product is a key in purchase decisions concerning green purchases (Young et al., 2010, p.29). So, in the question regarding undesirable characteristics of environment friendly products, the authors have included options of higher price, lack of trust in product quality, unavailability, and lack of product from favorite brands. Also, a fifth option of 'I do not buy ekologisk products' is included to help to understand the respondent's green awareness (or lack of).

Findings by Laroche et al. (2003, p.514) suggest that 80% of the green conscious consumers would boycott products from a polluting firm. While Young et al. (2010, p.23) and de Pelsmacker et al. (2005, p.364) links product boycotting based on pollution issues or other environment related issues as a premier trend of the green consumer. So, the authors have included a question concerning a hypothetical situation involving the possibility of boycotting products based on environmental issues. Based on the relevant literature, authors believe, this question would help them get the measurement of a respondent's green consciousness.

Both dichotomous questions and multiple choice questions have been used to gather background information of respondents. The questions regarding green perception and practice have been formulated by using 5-point Likert scale and multiple choice questions as well (some answers are open to select more than one options).

The overall aim of this supplementary questionnaire is to assess the environmental consciousness of the respondents. Through this assessment the authors can get a picture of the respondents' preference towards green products and then compare it with the data obtained from the conjoint analysis questionnaire concerning the green car preference.

4.9.5 Selection of the Method for Evaluation of the Stimuli

In the first stage, SSI-Web has been used to conduct counting analysis for the ACBC section of the survey. This provides the authors with information concerning the number of times or frequency of levels selected during the B-Y-O section, and the frequency of levels being 'unacceptable' and 'must-haves' during the screening section. Also, using the outputs from this count analysis, SPSS (Software Package for Social Science) has been used to calculate the demographic information for the respondents.

In the second stage, using the SSI-Web again, authors have performed a monotone regression to obtain an individual level part-worth estimation of the attributes. Consumer preferences vary from person to person significantly and conjoint analysis basically deals at individual level (Green and Srinivasan,
So, to analyze the data both at individual and aggregate level, the part-worth utility needs to be estimated (Malhotra, 1996, p.715). The monotone regression method has been used to estimate Part-worth utility. The method can estimate part-worth utilities with small number of sample size and generate better results (SSI Web). Generally, monotone regression is better used in rank order conjoint analysis but in adaptive choice based conjoint analysis, the method has been using with the range of zero to one (ibid.).

In the third stage, the authors have used SMRT (Sawtooth Software Market Research Tools), the advanced market simulation tool from Sawtooth Software Inc. They have used SMRT to run a market simulation using the monotone regression data obtained from the second stage. This simulation has given them the share of preference and likelihood of purchase information for each of the seven automobiles. The authors have further used the simulator to calculate the sensitivity analysis to understand the changes in consumer preferences towards a product when an attribute level is changed.

The fourth and final stage contains the comparisons between respondent segments and individual attribute preferences. The comparison between the preferences of existing car owners to those of potential car owners has been conducted. Here the authors have also constructed respondent profiles based on their green consciousness level and compared these profiles with the individual attribute preferences to examine if any relationships exist. SPSS has been used to perform this analysis.

4.10 Assessing Quality Criteria

Researchers carefully consider the issues of validity and reliability although a large number of conjoint analyses do not take the issue into consideration (Green and Srinivasan, 1978, p.114). However, some general criteria of evaluating validity, reliability and generalizability have been considered to assess the quality of the study.

The applications of systematic data collection design and proper data analyzing tools have been used to increase the validity of the study. Validity increases with the number of attributes and levels. The manageable numbers of attributes provide better validity of the study because too many numbers of attributes and level might make the information overloaded to the respondents. In this study, the authors have applied multiple methods that include prior literature reviews, expert interviews and questionnaire survey to narrow down the number of attributes and its levels. Moreover, the application of relevant theories has provided greater validity.

The goodness of fit of the model is an estimation of reliability (Malhotra, 1996, p.719). Monotone regression in this study has been run to obtain the model fit of data. The Tau value of the regression analysis has been estimated to measure the degree of model fit. Moreover, the experiment has been designed to obtain the actual preference level of attributes by using several screening and choice task assessment.

The study has been conducted with judgmental and convenience sample that are non-probability sampling procedure. Generalization on statistical ground is not possible using non-probability sampling procedure (Saunders et al., 2009, p.213), however the purpose of the study is not to generalize statistically but to obtain better outcome by using adaptive choice based conjoint analysis (ACBC). Moreover, the sample size of the study is small (n=30) and has been conducted only in one city ‘Umeå’ that might not represent the entire population of Sweden. However, inference can be drawn as the methods of the study do not require large sample size and ACBC software can stabilize the small
number of sample size (SSI Web help). Nonetheless, the study can be taken into account for academic purpose to get an in-depth insight of green consumer behavior in high involvement context. The study can be used as a base of understanding the complex decision process by using ACBC analysis.
5. Results and Analysis
The aim of the study is to identify the determining attributes and the influence of attributes on high involvement choice process. Data has been gathered according to the design of the data collection methods. Besides preference and perception, socio-demographic data of consumers have also been collected in order to measure the effect of uncontrolled variables. In previous chapters, the research questions and objectives, relevant theories with a self-developed framework and research methodologies have been explained in conduction of the thesis. The main purpose of this chapter is to contextualize empirical data and explain them in light of research questions and objectives. Later, the scientific explanation of the experiment and the justification of theories have been explicitly elucidated in this chapter.

5.1 Descriptive Statistics
The quantitative description of green perception and inclination towards green purchase has been summarized along with socio-demographic data (age, employment status, educational qualification and income). The following tables and graphs have described the general patterns in the data set of 30 respondents.

5.1.1 Demographic Information of the Sample
The samples of this study have been classified according to several background information collected during supplementary questionnaire survey. In the following table 04 the authors have observed the percentage distribution of the sample based on their age group, occupation, education levels, and monthly income.

<table>
<thead>
<tr>
<th>Table 04: Demographic Statistics of Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Category</td>
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<tr>
<td>--------------------------------</td>
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<tr>
<td><strong>Age</strong></td>
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<td><strong>Employment Status</strong></td>
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<td><strong>Educational Qualification</strong></td>
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<tr>
<td></td>
</tr>
<tr>
<td><strong>Income (SEK/Month)</strong></td>
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</table>

n=30
As the survey has been conducted in the Umeå University area, it is of no surprise that the majority of our respondents are students (73.3%) and a combined 70% of the respondents are studying either bachelors or Masters level courses. The similar reasons can be sited for the 86.7% of the respondents with ages of 30 or younger. On the income category, only 23.3% of the samples earn more than 20,001 SEK per month.

5.1.2 Green Perception of the Respondents

To measure the extent of perception concerning the green products, the respondents were asked concerning the reasons that they think or believe inspire them in purchasing green or ekologisk products. This was a multiple-option question where the respondent could select more than one answers. The responses from this question are illustrated in figure 18 below.

According to the responses above, it can be clearly stated that concern for the environment is the dominant reason to the respondents for purchasing green products. While a significant percentage of respondents sited 'Good for Health' as the inspiration, the environmental reason is way ahead in inspiring the respondents. Edberg's (2011) observation that young population and the student population of Sweden is more concerned or green conscious in Sweden, seems to be reflected in this finding considering the composition of our respondents (See table 04).

To understand the green perception of the respondents even further, the authors have also asked them concerning the undesirable attributes of the green products. Like the inspiration question, this was also a multiple-option question. The responses from this question can be observed in the following figure 19.
Figure 19: Reasons for Undesirability of Green Products

Among the options, the respondents seem to choose 'Too Expensive' as the most undesirable aspect of the green products. The responses for the other options are quite low when compared to that of 'Too Expensive'. Young et al. (2010, p.29) states that affordability of the green product is one of the most important determinants of the green product purchase criteria, while Agron (2007, p.6) identifies price of the green products as the most undesirable aspect in the minds of green consumers. Here, the findings seem to reiterate both these findings.

5.1.3 Propensity of Green Purchase
After finding out the desirable and undesirable reasons of green purchase, the respondents were asked about the propensity of buying green products. The questions were designed to identify the extent of green behavior. Although the context is limited in only three aspects but it shows a great difference in buying habits.
Table 05: Propensity of Green Buying

<table>
<thead>
<tr>
<th>Category</th>
<th>Response</th>
<th>Percentage</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Occurrence of Ekologisk purchase</td>
<td>Always</td>
<td>83.3</td>
<td>1.17</td>
<td>0.38</td>
</tr>
<tr>
<td></td>
<td>Occasionally</td>
<td>16.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Most Recent Ekologisk Purchase</td>
<td>Within last week</td>
<td>50</td>
<td>2.10</td>
<td>0.80</td>
</tr>
<tr>
<td></td>
<td>Within last month</td>
<td>30</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>More than a month</td>
<td>20</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Most likely</td>
<td>26.7</td>
<td>1.70</td>
<td>0.79</td>
</tr>
<tr>
<td></td>
<td>Maybe</td>
<td>36.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Not Likely</td>
<td>36.7</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The table 05 portrays the frequency of green product purchase. 83.3% of respondents purchase green or ekologisk products regularly and 50% of them have purchased within last week of their response. It indicates that the green awareness of respondents is no longer limited to perception only as it transforms into action also, which conform to the theory of green attitude by Young et al. (2010, p.29). Therefore, the propensity of green purchase can be increased by minimizing the above identified reasons that might lead the consumers from the level of willingness to act green to actually acting green.

Later, respondents were asked about ethical consideration that how likely they would refuse to buy product from any environment polluting company? In response, 73.4% of respondents show indifference regarding in acting out. This directly contradicts the findings of Laroche et al. (2001, p. 514); Young et al. (2010, p.23); De Pelsmacker et al. (2005, p.364) concerning boycotting products from polluting firms. These authors found that green conscious consumers are more likely to boycott or show intentions of boycotting products from the said firms. The authors believe further investigation concerning this issue may yield important insights to the future researchers. However, this result might simply have been an outcome of lack of understanding the question scenario.

In summary, the experimental values of standard deviation shows the higher precision of data as they are less dispersed from mean values.

5.2 Conjoint Analysis

The data has been analyzed using several research tools that include SSI Web, SMRT and SPSS, which have been used to conduct different mode of analysis. The count, part-worth utilities, and relative importance have been calculated using SSI Web. The SMRT has been used to measure the share of preference, likelihood of purchase and market simulation. Therefore, the supplementary questionnaire has been analyzed by SPSS.
The first step of conjoint analysis is the Build Your Own count inclusive of the count of must haves and must avoids (Unacceptable). Afterward, the monotone regression data has been analyzed to calculate part-worth utilities and aggregate importance. The outcome of monotone regression has been run in SMRT to assess the share of preference, likelihood of purchase and sensitivity simulation. Subsequently, combining the outcome of conjoint analysis and questionnaire survey analysis, three green consumer profiles has been developed to segment the aspect of green consumer behavior.

5.2.1 Build Your Own (B-Y-O) Counting Analysis
In the beginning of the survey, the respondents got the opportunity to build their own automobile by selecting their preferred level for 4 different attributes. Table 06 below shows the frequency of selections along with percentage calculation for each of the presented levels.

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Level</th>
<th># of times chosen</th>
<th>% of Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>Car Size</td>
<td>Coupé</td>
<td>10</td>
<td>33.33</td>
</tr>
<tr>
<td></td>
<td>Halvkombi</td>
<td>8</td>
<td>26.67</td>
</tr>
<tr>
<td></td>
<td>Kombi</td>
<td>12</td>
<td>40</td>
</tr>
<tr>
<td>CO₂ Emissions</td>
<td>92 g/km</td>
<td>22</td>
<td>73.33</td>
</tr>
<tr>
<td></td>
<td>99 g/km</td>
<td>1</td>
<td>3.34</td>
</tr>
<tr>
<td></td>
<td>104 g/km</td>
<td>7</td>
<td>23.33</td>
</tr>
<tr>
<td></td>
<td>109 g/km</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>119 g/km</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>105 hk</td>
<td>4</td>
<td>13.33</td>
</tr>
<tr>
<td></td>
<td>110 hk</td>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>112 hk</td>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>115 hk</td>
<td>8</td>
<td>26.67</td>
</tr>
<tr>
<td></td>
<td>120 hk</td>
<td>5</td>
<td>16.67</td>
</tr>
<tr>
<td></td>
<td>122 hk</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>136 hk</td>
<td>7</td>
<td>23.33</td>
</tr>
<tr>
<td>Engine Power</td>
<td>20 km/l</td>
<td>12</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td>23.8 km/l</td>
<td>4</td>
<td>13.33</td>
</tr>
<tr>
<td></td>
<td>25 km/l</td>
<td>2</td>
<td>6.67</td>
</tr>
<tr>
<td></td>
<td>26.3 km/l</td>
<td>12</td>
<td>40</td>
</tr>
</tbody>
</table>

Respondent preferences for car size remains a fairly even distribution among the available 3 choices with Kombi being selected the highest number of times (12). So, establishing a pattern is rather hard in case of car size.
When it comes to CO$_2$ emissions, a clear majority of 22 respondents chose 92 g/km while no one choosing the relatively high emissions options of 109 g/km and 119 g/km. A trend of selecting less emitting vehicle may be apparent from this result even though all the options presented here would qualify as green choices by the Swedish definition.

In the engine power attribute section, 115 hk is preferred by most respondents (8) closely followed by 136 hk (7). Establishing a trend is difficult here as well because respondents have picked both high power and low power engines.

The results from the fuel economy attribute section is quiet baffling as an equal number of respondents (12) have chosen the least fuel-efficient and the most fuel-efficient options each. Over all, a slight majority of 16 respondents have chosen the two least fuel-efficient options. Previous studies by Dixon and Hill (2009, p.16, 18) has found fuel-efficiency as a key decider in the automobile purchase decision process. Edberg (2011) and Tärnlund (2011) list high fuel-efficiency as one of the most important attributes in the Swedish context. However, the B-Y-O results, fails to either confirm or reject these findings.

In the B-Y-O section, 92 g/km CO$_2$ emissions was chosen the most, 22 times, while 109 g/km and 119 g/km emissions and 122 hk engine power did not get chosen even once. The understanding from these findings can be summarized as respondents displaying green trends in the CO$_2$ emissions attribute section, as this was the only obvious green attribute as interpreted by them (the respondents).

5.2.2 Must-haves and Unacceptable section
During the adaptive choice based conjoint survey, respondents were given options of selecting or choosing 'must-have' and 'unacceptable' options. Both these options were presented to the respondents at least once (please refer to the 'Screening Section' segment of 'Selection of Data Collection Design' section at Chapter 4) during the survey. The count results of these two sections are presented in table 07 and table 08 respectively.

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Level</th>
<th># of times chosen</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO$_2$ Emissions</td>
<td>99 g/km</td>
<td>1</td>
</tr>
<tr>
<td>Engine Power</td>
<td>115 hk</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>120 hk</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>122 hk</td>
<td>1</td>
</tr>
<tr>
<td>Fuel Economy</td>
<td>23.8 km/l</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>25 km/l</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>185000</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>190000</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>220000</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>270000</td>
<td>8</td>
</tr>
</tbody>
</table>

Table 07: Must Have Count
From the must-have count table, it can be seen that the price options were selected 15 times in total compared to 6 times for fuel economy, 6 times for engine power, and only once for Emissions. The surprising fact is the selection of price level 270,000 SEK 8 times as this clearly contradicts Edberg's (2011) observation concerning consumers usually not very willing to pay more than 200,000 SEK for a Miljöbil. Tärnlund's (2011) explanation that importance of price can sometimes become trivial due to the presence of another desirable attribute may be a reason in this case.

Table 08: Unacceptable Counts

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Level</th>
<th># of times chosen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brand</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ford</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Peugeot</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Renault</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Toyota</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Volkswagen</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Car Size</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Volvo</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Coupé</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Kombi</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>92 g/km</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>CO₂ Emissions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>120 hk</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>122 hk</td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>136 hk</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>Engine Power</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fuel Economy</td>
<td>25 km/l</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>26.3 km/l</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>190000</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>220000</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>230000</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>270000</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>300000</td>
<td>15</td>
</tr>
</tbody>
</table>

On the other hand, the authors can clearly understand that the higher prices are generally undesirable or 'Unacceptable' in the course of this survey. With 32 selections for the price levels of more than 200,000 SEK as undesirable, it can be safely assumed that price was a big factor in the consumers’ minds. Except for fuel economy and emissions, respondents had a wide range of opinions in terms of what they deem unacceptable in their automobiles.

The multi-attribute attitude model lists attributes, beliefs, and importance weights of the attributes as the determining factor in choosing a product. With the count reports from both the B-Y-O and Must-haves and Unacceptable sections, the authors can get a glimpse of the attribute evaluation of the
consumers in selecting or choosing their preferred automobiles. These responses also deal with our first research question of determining the defining attributes of purchasing a green car.

5.2.3 Part-worth Utilities
Monotone regression has been used to analyze six defined attributes to obtain the part-worth value of each level of attributes. The utilities were determined within arbitrary additive constant that refers to the restriction of the comparison between utilities of different attributes. The part-worths of each level of attributes have been exhibited in the figures (20-25) below by using piece wise linear curve where X-axis represents levels of attribute and Y-axis represents utilities. As the sum of the utilities has to be ‘zero’, each attribute levels have both positive and negative utility values that indicate the most acceptable and less acceptable levels respectively. Although, positive values indicate the greater preferences of respondents, the negative values can not be ignored. As this is a controlled experiment, when all else are equal, a level with a lower utility value simply means that it is relatively less desirable than that with a higher utility value.

![Figure 20: The part-worth utilities of the attribute ‘Fuel Economy’](image-url)
**Figure 21:** The part-worth utilities of the attribute ‘Brand’

**Figure 22:** The part-worth utilities of the attribute ‘Engine Power’
Figure 23: The part-worth utilities of the attribute ‘Emission’

Figure 24: The part-worth utilities of the attribute ‘Car Size’
In the conclusion, monotone regression has been run to measure the model fit, which is also an indicator of measuring validity of the study. The average Tau value [Kendall’s Tau value of 1.000= perfect agreement in rank order sense; 0= complete lack of correspondence; -1= perfect reverse relationship, (SSI Web)] of monotone regression estimation was 0.99867 and the median Tau value was 1.00000 that indicates the goodness of fit of each individual choice concept.

5.2.4 Aggregate Importance

However, to fully answer the first research question, the importance weight of the attributes must be examined (as required by the multi-attribute attitude model). Using a monotone regression method, the aggregate importance weight of each attribute to the respondents have been calculated. The importance weights of the attributes are shown in the figure 26 below.
As mentioned in Chapter 4, these 6 attributes were selected in 3 different steps, pre-screening questionnaire surveys, prior literature review, and expert interviews. The results from our analysis find that the price attribute is relatively more important than the other attributes across the respondents with an importance weight of 20.57%. Attributes brand and engine power follow with weights of 18.79% and 18.28% respectively. Emissions have an importance weight of 16.5%, fuel economy 14.68%, and car size 11.19%.

One may identify an interesting aspect from these results as authors (King, 2007; Lane, 2005; Lane, 2007; Caulfield et al., 2010; Dixon & Hill, 2009) have identified car size as one of the most important (among the top 3) factors in car purchase decision making, here it has relatively lower importance compared to the other attributes. Similarly, the importance of emissions and engine power, which are regarded as of relatively lower importance than car size and fuel economy by Dixon & Hill (2009) and Bane (2005), have relatively greater importance than those of car size and fuel economy. The findings are consistent with the above mentioned previous studies and expert opinions of Edberg (2011) and Tärnlund (2011) as price and brand has the two relatively highest importance weights.

So, to answer our first research question, based on the conjoint experiment, it can be said that although all 6 attributes have different degrees of importance in consumer decision making concerning the green car purchase, price, brand, and emissions are relatively more important to the Swedish consumers.

5.2.5 Likelihood of Purchase and Share of Preference

With the understanding of the part-worth utilities and the aggregate weight of the attributes, the attribute preferences of the respondents can be valued. However, in order to understand the product preference, and the influence of each attribute on the product preference, the further analysis and understanding of this data are needed. The data from monotone regression has been run through the
SMRT market simulator software to gain an in-depth insight on the respondents’ preferences. It must be noted that, while running the simulation, we used the actual attribute configurations of the 7 automobiles (Audi A3, Toyota Prius, Peugeot 308, Ford Focus, Renault Megane, Volkswagen Golf, and Volvo V70) used in the developing of attribute levels in this study. This was done to predict the behavior of the consumers to the actual product as during the conjoint experiment hypothetical products by mixing different attribute levels are used to measure the consumer preference towards each attribute (Orme, 2010, p.76-84). SMRT analyzed the data and provided the following information concerning the 'Share of Preference' and 'Likelihood of Purchase' for each of the 7 automobiles as illustrated in figure 27.

![Figure 27: Likelihood of Purchase and Share of Preference for the studied Automobiles](image)

When compared to the Part-worth utilities described before, both these share of preference and likelihood of purchase information may be puzzling. For example, the brand 'Audi' is the most preferred brand with the utility score of 22.16, and yet, its automobile model A3 is ranked 5th out of 7 examined automobiles in the category of Likelihood of purchase and share of preference respectively.

If the authors revisit the TRA and TPB theories along-side the Multi-attribute Attitude Model, the rationale behind the above puzzle can be understandable. Automobile, as a product, is a bundle of attributes. So, besides judging each attribute of the product, naturally the consumer would judge the product as a whole as well. Also, as the TRA and TPB suggests, consumer's attitude towards the product is derived from the individual’s attitude, subjective norm, and perceived behavioral control.

As the Green Attitude model by Young et al. (2009) identifies, among others, green values and environmental knowledge of the consumers as the key factors in developing green attitude, it can also
be said that the green attribute levels of the automobiles (emissions and fuel-efficiency in case of this study) plays a significant part in creating positive green attitude towards the product. This can also be evident from the part-worth utility data illustrated in figures 20 and 23 as lower emissions and higher fuel-efficiency are generally preferred to the relatively higher emissions and lower fuel-efficiency levels by the respondents.

Now, from the part-worth utility analysis, the authors know that consumers have a positive attitude towards the brand Audi, but do not always do so towards the other attributes of the A3 model. Besides the brand, the A3's attributes are 105 hk engine power (-5.3 utility), halvkombi size (1.44 utility), 23.8 km/l fuel economy (-6.86 utility), 109 g/km emissions (-21.17 utility), and SEK 230,000 price (-12.37 utility). So, the A3, as a product with a bundle of attributes, does not appear as preferred and even though it is an Audi car, consumers’ attitude towards it is not as good as it is towards the brand Audi. On the other hand, the Volkswagen Golf, with its brand Volkswagen (-0.71 utility), 122 hk engine power (-13.84 utility), halvkombi size (1.44 utility), 26.3 km/l fuel economy (12.34 utility), 99 g/km emissions (-7.8 utility), and SEK 175,000 price (38.8 utility) manages to appear relatively more attractive to the consumer as a whole product, as it succeeds in creating positive attitude. The Golf's more greener attribute levels paired with lower price level helps in creating preferable green attitude towards the car when compared to that of A3.

5.2.6 Sensitivity Simulation

To further examine the respondent sensitivity to the varying degrees of attribute level, a sensitivity simulation has been ran that showed the likelihood of purchase for each of the cars with variations in the attributes by one level at a time and holding others constant (Orme, 2010, p.81). The results of the simulation are displayed in figures (28 – 33) below.

![Figure 28: Sensitivity Simulation for Price](image-url)
Figure 29: Sensitivity Simulation for Fuel-Efficiency

Figure 30: Sensitivity Simulation for Engine Power

Figure 31: Sensitivity Simulation for Emissions
From these sensitivity analysis data, the variations in likelihood of purchase for each automobile can be studied. For example, from figure 33, if the Golf's brand was Audi instead of Volkswagen, its purchase likelihood would increase considerably while if its brand was Renault, the purchase likelihood would decrease. Similarly, from figure 28, the purchase likelihood for Prius would almost double if its price were SEK 175,000. Similar findings can be found across the board.

The likelihood of purchase is an indicator of consumer's positive intentions towards a product (Orme, 2010, p.81) and as the authors know from previous discussions intentions towards (green) products is formed from (green) attitude. In this experiment, respondent's attitude is visible as a combination of attitude level utility and attributes importance weight. A good example of this can be visible in figure 32 (car size), where the purchase likelihood does not vary significantly for any automobiles regardless of the level. The reason behind this maybe explained as the relatively lower importance weight of car...
size as an attribute coupled with the relatively limited difference among the levels of the said attribute. Exact opposite results may be observed in figure 28 (price) where purchase likelihood for all the automobiles vary greatly with every change in attribute level.

5.2.7 Existing vs. Potential Car Owners

Another aspect of understanding the answer the 'How' question can be understood by examining the difference of preference between existing the car owners and the potential owners. Using the monotone regression data from the SSI Web, the importance weight of each attribute of these two respondent segments have been calculated. The result of this calculation is presented in figure 34.

![Figure 34: Importance of Attributes among Existing and Potential Car Owners](image)

From the figure above, the differences in preferences between the two segments can be clearly identified. Engine power (20.31%) is the most important attribute with brand (19.90%) being second for the existing owners, while price (21.31%) is the most important one for the potential car owners with brand (18.31%) being second most important for them as well. Emissions have almost similar importance for both the segments.

The difference of attribute importance may be understood as a difference in attitude of the two groups of respondents. Young et al. (2010) lists prior purchase experience as an important determinant for creation of consumer's green attitude in their green attitude model. The findings here can conform to that model as existing car owners have had prior purchase experience of purchasing a car and therefore, have formed a different attitude than those who have not purchased a car yet. This prior experience may also help us understand the high relative importance of performance (engine power) among the car owners.
5.3 Aggregate Importance of Attributes by Green Consumer Profiles

From the responses to our green behavior related questions (green product purchasing habit, green product purchasing frequency, and possibility of boycotting a brand for polluting the environment) of the supplementary questionnaire, the three levels of consumer green consciousness have been identified. Of the 30 respondents, 3 (10%) possess high green consciousness level, 16 (53.33%) possess medium level, and 11 (36.67%) respondents have a low green consciousness level.

Using the monotone regression data from SSI Web, the importance of different attributes across these three consumer profiles have been calculated. The results from this calculation are shown in Figure 35.

![Figure 35: Aggregate Importance of Attributes by Green Consumer Profile](image)

The aggregate importance for the entire sample is listed in table 09 for comparison purposes.

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Brand</th>
<th>Car Size</th>
<th>Emissions</th>
<th>Engine Power</th>
<th>Fuel Economy</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Importance</td>
<td>18.79</td>
<td>11.19</td>
<td>16.5</td>
<td>18.28</td>
<td>14.68</td>
<td>20.57</td>
</tr>
</tbody>
</table>

As it can be seen from the above figure, the most important attribute for the high green conscious profile is CO$_2$ emissions with an importance weight of about 25%. For the medium conscious profile, price is the most important attribute with brand as a very close second. And in the low green conscious profile, price is the most important attribute with emissions ranked 5$^{th}$ out of 6. Engine power is favored equally by all the respondent profiles. An interesting observation can be found in the
importance of emissions as the low conscious respondents value it more than the medium conscious ones.

Categorically, among the profiles, brand has the highest relative importance to the medium profile, car size is also more important to the medium profile, emissions is favored by the high profile, engine power is marginally more favored by the high conscious respondents, and both fuel economy and price have highest importance to the low conscious respondents. Inversely, brand is least important to high conscious respondents among the profiles, car size to low, emissions, engine power, and fuel economy to medium, while price is least important to the high conscious respondents.

When compared to the overall aggregate importance, the profile specific importance seem different and varied, except in the case of engine power where the average importance seems to be closer to those of all three profiles. The largest difference can be observed in the importance of emissions between the high conscious profile (24.93%) and the overall average (16.5%). However, it is quiet hard to observe any relationship or trends while comparing these two sets of information.

Across the profiles, the only visible trend can be established is in the importance of price as with increasing level of green consciousness the importance of price tends to get lower. This finding is consistent with findings of Laroche et al. (2001, p.519) that consumers are willing to pay more for environment friendly products. To further explain this trend, we wanted to investigate the effect of income level on the green consciousness of the respondents. The composition of the three green consciousness levels across the income categories is shown at figure 36.

*Figure 36: Composition of Green Consciousness Levels across Income*
The majority of the respondents in both medium and low consciousness profile earn less than SEK 20,000 per month while the majority of the high conscious profile earns over SEK 30,000 a month. This split may explain the less importance of price among the high conscious profile. However, it must be remembered that the respondents were mostly university students and therefore, the income dispersion may not be balanced.

Our third and final research question concerning the effects of environmental consciousness on green car purchase decision may not be fully answered based on our findings. Based on the findings, the only definite trend can be ascertained is the decrease of price sensitivity with the increase of green consciousness level. That is, the more green or environment conscious a consumer is, the less important price of the green automobile becomes to him/her towards decision making.

5.4 Summary of the Empirical Findings

The authors have reviewed theoretical references to strengthen the understanding of environmental consumer behavior and decision process from different aspects. Empirical data were analyzed in light of research objectives and research questions and presented earlier in this chapter. A theoretical analysis of our findings may be important to understand the answers to the research questions. Also, as the research questions are rooted in the developed framework for consumer preference in high involvement green purchase, the authors believe a thorough discussion of our findings in relation to the framework is eminent. All of the research questions are related with consumer decision-making and therefore, the five stage decision making model (Kotler, 1988) and decision model (Kotler, 1988) serves as the base of theoretical understanding for the thesis.

With regards to the first research question, the findings suggest that price, brand, and engine power are relatively more important attributes to the consumers when selecting green automobiles. Although the authors have used statistics (in the form of monotone regression) to assess the importance of the attributes, better understanding of the reasons behind the importance of these attributes can be gained. The multi-attribute model (Solomon, 2009) explains the importance weights of attributes as a key determinant of the product selection process. According to the theory, these weights are self assigned by the consumers and play a big part in the decision making. The assigning of these weights arrives from the consumer's beliefs concerning the product and attributes of the products. Individual preferences or utilities of each attribute have been calculated for each of the respondents and based on that an aggregate importance of each attribute in the decision making process (figure 26) have been identified. This aggregate importance of attributes answers the first research question.

The second research question investigates the effects of the attributes in consumer decision making. From the framework, the authors know that the evaluation of product alternatives is done based on the consumers green attitude and evaluation of each attribute of the product. So, the consumers, based on their green attitude (which is a combination of six factors as mentioned by Young et al. (2010)), and the importance weights of the attributes as mentioned above, form preferences (intention) towards a product alternative. This preference through the share of preference and likelihood of purchase (figure 27) can be measured as calculated by the market simulator tool. This gives some indication of which products are preferred. Now as the TRA (Ajzen and Fishbein, 1980), TPB (Ajzen, 1985), and the framework suggests, attitude turns into behavior with the effects of subjective norms and unexpected situational factors (controlled behavior). Based on the authors experience during conducting the surveys, comments such as “I wish I could drive a Coupé but a kombi would be practical for my family” or “This car looks good but my friends wont approve of a non European car” could be easily
translated into subjective norms, while comments such as “If I had little more money, I could go for the Volvo” may be interpreted as unexpected situational factor. So, to understand the effect of each attribute in consumer decision making, the authors ran a sensitivity analysis through the market simulator. The effect of varying one attribute at a time to the likelihood of purchase is measured in this analysis (figures 28-33). This analysis helps to answer the question as to how each attribute affects the consumer green car purchase decision-making.

In line with the research purpose and to add to the understanding of the 'how' question, both existing and potential car owners have been included in the sample design. This way, the authors had the opportunity of measuring the effect of prior purchase experience to the purchase decision-making. The prior purchase experience is one of the factors in forming green attitude and influences the green product choice process (Young et al., 2010, p.29). So, using monotone regression, the authors have calculated the aggregate importance of attributes in decision making between these two groups of respondents and found the effect of prior purchase experience in green car purchase decision-making.

The third research question, concerning the green consciousness level of the respondents and decision process may be seen as an extension of the how question above as it also deals with the effect of green consciousness on the purchase decision-making. The similar calculation of importance of attributes across the three green consciousness profiles (figure 35) provides with the insight concerning this question.
6. Conclusion and Recommendations

In the conclusion and recommendations chapter, the key findings have been presented and discussed. Then the findings have been linked towards the theoretical and practical contributions that they have. The limitations of this study have been presented in light of both those limitations and the findings. Finally, the recommendation for possible future researches has been presented.

6.1 Key Findings

This study was undertaken in Umeå to investigate the consumer preference of the Swedish consumers in context of green automobiles. The authors employed conjoint analysis method in examining and measuring the consumer preference in a high involvement green purchase decision situation. This study was guided by several research objectives and three specific research questions. Through the course of the study, the realm of consumer preferences has been investigated to accomplish the objectives and answer the research questions.

The authors have examined previous studies, conducted a pre-screening survey, and interviewed automobile industry experts to identify Brand, Engine Power, Emissions, Car Size, Fuel Economy, and Price as the most important attributes of the green automobiles. The consumer preferences towards each of these attributes have been calculated and the preference or utility value for each level of these attributes has been discovered. And upon further examining these preference values, the study suggests that Price, Brand, and Engine Power are relatively more important to the consumers in determining the purchase decision.

Next, the authors have examined the influence of each attributes on the consumer decision making by applying simulation techniques. Here the authors understand that preference of one attribute level is not an indicator of the preference of the product. The product, as an attribute bundle, is measured by summing up the preferences of all the attribute levels that composes the product. If, in a product bundle, a relatively less preferred attribute level combined with other less preferred attribute levels would result in an overall lower preference of the product itself and vice versa. The product bundles presented in the study represented real specifications of seven strategically selected automobile models, and based on the respondents' utility values, all these product bundles had mixed levels of attribute levels according to the consumer preferences. For example, Volvo has a high preference as a brand while the emissions of its model had a very low level of preference, and as a result, Volvo's model (V70) received a lower preference level from the consumers compared to the other models. However, in the simulation scenario, when the emissions level of the V70 is changed to a more preferred level, the preference level for the model increases. Similar trends can be seen for all the automobile models across all the attributes. This suggests that the utility values or preference for each of the attributes that make up the automobile model influences the consumer choice. Varying or altering the less preferred attribute level(s) with more preferred ones is likely to increase the preference of the product.

The authors also investigated the possible reasons for the forming of the utility values among the consumers. For the respondents have been divided between existing and potential car owners and examined their preference towards different attributes. The findings show that while price is the most important attribute to the potential car owners, engine power (car performance) is the most important one for the existing owners. From this finding, the authors have concluded that prior purchase experience is one of the factors for shaping and modifying consumer preferences in green automobile context.
In the continued search for possible reasons for the utility value formation, the authors have developed three respondent profiles (high conscious, medium conscious and low conscious) according to their green consciousness by using green attitude and behavior related questions in the supplementary questionnaire survey. The examination of the consumer preferences across these three developed profiles have failed to provide definitive trends or distinctions among the profiles. For example, the importance of emissions is higher among the low conscious green profile than it is in the medium conscious profile. The only distinctive trend that has been discovered is the relationship between price and green consciousness level. The study shows that the importance of price reduces with the increase of green consciousness level. In other words, a highly conscious green consumer is likely to pay less attention to the price of a green car than a consumer with relatively lower green consciousness level.

6.2 Theoretical and Practical Contributions of the Study
The application of Adaptive Choice Based Conjoint analysis to measure consumer preference is a unique technique in the context of academic studies in business education. This is the first time this ACBC technique has been employed in USBE. The unique research design accommodates the ACBC technique in study should be helpful for undertaking of similar further studies. The authors have combined the decision making theories, multi-attribute attitude model, factors of green attitude framework, TRA, and TPB in designing of this study and developed an integrated framework comprising of all these theories and models to apply in the high involvement green product purchase decision context. This framework may be helpful and applicable in the future high involvement green purchase related studies. The findings concerning the relationship between green consciousness level of the consumers and importance of price sensitivity in decision making might provide useful for the understanding of green consumer behavior for the future studies.

This green car related study examines the consumer preference concerning the green car purchase process. The important attributes and their relative importance in consumer decision making as well as the importance of attribute levels using factual automobile information have been identified. Although conducted on a very small scale, the authors believe, this study can very well be a demo for future large scale study projects. The differences identified between preferences between existing car owners and potential car owners may be of interest to the automobile companies and dealerships in devising separate marketing strategies of green cars for these two groups of consumers.

6.3 Limitations of the Study Recommendations for Future Research
While every effort was made to make this study meaningful and significant, the authors understand that it has certain lacking in the form of specific limitations. The following limitations of this study are acknowledged:

This study was conducted in Sweden and therefore only the Swedish definition of ‘Green car’ was taken into account. Therefore, a global generalization may be inappropriate and unachievable.

The study was conducted based on respondents from Umeå region only. Although the authors tried to study the Swedish consumers’ attitude towards green cars, a study based on only one city may not be entirely representative of entire Sweden as traffic situation and related issues may differ across different regions and consumption patterns and preferences may vary accordingly.

While the study relates to the marketing field of ‘Green Consumer Behavior’, it has only focused on the automobile sector. A study incorporating other green product sectors might have yielded a
better understanding of green consumer behavior as a whole.

This study examined the consumer preferences related to the specifications available to existing green cars only. The developments in the pipeline are not considered. So, upon the arrival of such developments, a similar study might be needed to be conducted.

The authors understand that the green market is evolving fast. This study aims to examine the current green consumers. Further evolution to the green consumer behavior may yield a need to study many different aspects of the consumer preferences apart from the ones that have been examined in this study.

The authors have employed Adaptive Choice Based Conjoint analysis (ACBC) with the aid of ACBC software. As this is the newest conjoint analysis technique, there remains a lack of scientific works employing and/or explaining it.

A limited number of questions were used to measure and develop green consciousness profiles due to the lack of available time. This may have lead to the possibility of insufficient profiling and in turn, may have affected the findings.

6.4 Recommendations for Future Research
The recommendations for further studies would stem from two perspectives, from the above mentioned study limitations and from the findings of this study.

Based on the study limitations, a study following similar research design consisting of a larger sample size with significant geographical representations across Sweden may have greater generalizability and significance. A study incorporating other green product categories along with automobiles may be helpful to understand the green consumer behavior as a whole. The consumer perception concerning the new trends in green automobiles, such as the development of electric vehicles, may be worth investigating.

From the findings of the study, the attributes with greater importance on consumer decision making do not entirely conform to the findings of the previous studies. This may be indicative of the fact that either the Swedish green automobile market has different characteristics or the findings might not be representative of the Swedish market. In either case, a thorough investigation may yield better understanding. As the possibility of insufficient green consciousness profile may explain the absence of visible trends in the importance of attributes in decision making among the three green consciousness profiles, a future study using vigorous measures for developing green profiles may be undertaken to reexamine the relationship between the profiles and attribute importance in decision making.
List of References


De Craecker, F & De Wulf, L (2009), Integration of Green Marketing Within the Automotive industry: A Case Study of Four Car Manufacturers on the Belgian Market, Masters Dissertation, Halmstad, University of Halmstad.


Appendices

Appendix 1

Semi Structured Questionnaire for Expert Interview

1. When did you start selling or thought of selling miljöbil?
   a) Why did you start selling miljöbil?
   b) What was the initial response?
   c) What were the initial marketing initiative on your behalf?

2. Does the Swedish Government push to sell miljöbil?
   a) If Yes, How?
   b) Is there any government regulation concerning display of CO₂ emissions and/or fuel economy information?

3. Do you recommend miljöbil to your customers?
   a) If yes, how do your customers react to that suggestion?

4. Do the customers come willingly searching for a miljöbil?
   a) If yes, What information do they ask for?
   b) What features are they interested in?

5. What are the changes that you have noticed concerning car purchase behavior over the past few years?
   a) Could you give us an approximate percentage of the miljöbil you sell per year?
   b) Do you follow any corporate guidelines concerning the selling of miljöbil?

6. Do the customer usually buy the miljöbil after gathering sufficient information?
   a) What are the price ranges that the customers are looking for a miljöbil?
   b) What other factors are the consumers concerned about before purchasing?

7. What is the age group of the typical miljöbil consumer?
   a) Do the consumers care about the emissions data?

8. Please rank the following attributes in the order of importance to the customers while purchasing a miljöbil (use numbers 1-9 in corresponding boxes):

<table>
<thead>
<tr>
<th>Car Size</th>
<th>Price</th>
<th>Engine Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fuel Economy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Car Safety</td>
<td>Car Brand</td>
<td></td>
</tr>
<tr>
<td>CO₂ emissions</td>
<td>Fuel Type</td>
<td>Style, appearance &amp; color</td>
</tr>
</tbody>
</table>
Appendix-2

Pre-screening Questionnaire to Narrow down the Attribute List

Dear Respondent,
We, the students of Masters program of Marketing at Umea University, are conducting a research on “A Conjoint Analysis in High Involvement Purchase Decision Process - in Context of Green Cars in Sweden”. We appreciate your participation. We are conducting this survey as part of our thesis work.

PART- ONE

Gender: □ Male □ Female
Age: □ Under 20 years □ 20-25 years □ 26-30 years □ More than 30 years

Educational background:
□ High school graduate □ Bachelors □ Masters □ PhD. or equivalent
□ Professional degree □ None of the above

Occupation: □ Student □ Self-employed □ Employed □ Unemployed

Income (monthly):
□ Less than 10,000 SEK □ 10,001-15,000 SEK □ 15,001-20,000 SEK
□ 20,001-25,000 SEK □ 25,001-30,000 SEK □ 30,001-35,000 SEK
□ 35,001-40,000 SEK □ More than 40,000 SEK

PART- TWO

1. Do you buy environment-friendly products? □ Yes □ No
   If your answer is ‘Yes’ to #1, go to #2. For ‘No’, go to #3.

2. Please specify why?
   □ Superior quality □ Good for environment □ Both

3. Please specify the reason- why not?
   □ Too expensive □ Quality not reliable □ Not readily available in the market
   □ I do not want to buy

4. If you find any company intentionally or semi-intentionally pollute environment, would you prefer to buy the product of that company?
   □ Yes □ No □ Indifferent

5. While traveling, would you participate in the carbon footprint off setting program offered by the airlines or bus companies?
   □ Yes □ No □ Indifferent

6. Do you currently own a car? □ Yes □ No
   If your answer is ‘Yes’ to #6, go to #7. For ‘No’, go to #8.

7. Is your car environment friendly?
   □ Yes □ No

8. Do you intend to buy environment-friendly cars?
   □ Yes □ No □ May be

9. Please specify the reason of not buying environment-friendly cars?
   □ Expensive □ Unavailability □ Performance (engine power)

10. Please rank the following attributes in the order of importance to you while purchasing an
environment-friendly car (use numbers 1-9 in corresponding boxes):

<table>
<thead>
<tr>
<th>Car Size</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fuel Economy</td>
<td>Engine Power</td>
</tr>
<tr>
<td>Car Safety</td>
<td>Car Brand</td>
</tr>
<tr>
<td>CO$_2$ emissions</td>
<td>Fuel Type</td>
</tr>
<tr>
<td></td>
<td>Style, appearance &amp; color</td>
</tr>
</tbody>
</table>

**Thank You!**
Appendix-3

Supplementary Questionnaire

Which age group do you belong to?
- 20 or less
- 21-25
- 26-30
- Over 30

Please specify your educational background:
- High school graduate
- Bachelor's
- Master's
- PhD, or equivalent
- Professional degree
- None of the above

Please select your occupation:
- Student
- Self-employed
- Employed
- Unemployed

Please select your occupation:
- Student
- Self-employed
- Employed
- Unemployed

Which of the following income levels (8EK per month) do you fall into? Please select.
- 10,000 or less
- 10,001-15,000
- 15,001-20,000
- 20,001-25,000
- 25,001-30,000
- 30,001-35,000
- 35,001-40,000
- 40,000 or more
How often do you purchase environment-friendly or 'Ekologisk' products?

- Always
- Almost always
- Occasionally
- Almost never
- Never

When was the last time you purchased an environment friendly or ekologisk product?

- Within last week
- Within last month
- More than a month
- I do not buy ekologisk product

Which of the following reasons inspire you to buy environment-friendly or ekologisk products?

(select all that applies)

- Superior product quality
- No additives or conserving agents (Konservingsmetal)
- Good for the environment
- Good for health

Which attributes of the environment-friendly or ekologisk products do you find undesirable?

(Please select all that applies)

- Too expensive
- Not readily available
- Not sure about the quality
- My preferred brand(s) do not produce ekologisk products
- I do not want to buy environment-friendly products

If you find out that any company is either intentionally or semi-intentionally polluting the environment, how likely would you purchase products of that company?

- Most likely
- Likely
- Maybe
- Probably not
- Definitely not
## Appendix- 4

**Individual Importance of Attributes (data from Monotone Regression)**

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## Appendix-5

### Simulation data

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### Average Utility Values

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**Average Importances**

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