DETERMINANTS OF THE ACCEPTANCE OF ELECTRIC VEHICLES

AN EMPIRICAL ANALYSIS

MASTER THESIS IN MARKETING

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INTRODUCTION

1. Introduction

In the light of the increasingly important matter of climate change, the global aim has become to reduce and, eventually, to eliminate factors which have detrimental effects on the environment. Furthermore, constantly increasing fuel prices as well as the matter of environmental friendliness have not only been relevant factors for car manufacturers, but also for motorists all over the world. Consequently, the matter of alternatively driven vehicles has been gaining great importance within the previous years. Nevertheless, the fact that alternatively driven vehicles are presently still considered as niche products poses a problem. Hence, the question of which factors and characteristics make alternatively driven vehicles a niche product is of great interest for this study.

Since several different types of alternatively driven vehicles exist, the focus of this thesis is only on Electric Vehicles which are purely driven by batteries. The main focus of this study is on determining consumer preferences as well as the importance of product-related factors such as investment and ongoing expenses (purchase price, maintenance costs, fuel costs and governmental support, like e.g. incentives), technical characteristics (driving range, charging time, acceleration performance and maximum speed), infrastructure of charging and gas stations, environmental friendliness as well as brand and model variety. Furthermore, the focus of this study is on consumer-related buying criteria, i.e. socio-demographic background such as age, gender, income, marital status, educational background and profession. Furthermore, the aim of this study is to determine whether or not and/or to what extent both product- and consumer-related buying criteria have an influence on consumers' decision to purchase an Electric Vehicle.

On the one hand, an analysis of already existing studies and theories is made in order to derive different buying decision criteria relating to vehicles in general. On the other hand, a quantitative empirical study on the importance of certain vehicle attributes is conducted, whereat consumers both living in Austria and Denmark are surveyed. The conceptual model used in this thesis is mainly

the “Technology Acceptance Model” (TAM), which is extended by variables derived from other models, such as the “Diffusion of Innovation Model” and the “Theory of Planned Behaviour”.

2. Problem Statement

Due to current environmental problems caused by vehicles, the global aim is to diminish greenhouse gas emissions. In order to do so, conventional vehicles would have to be replaced by alternatively driven vehicles such as the Electric Vehicle. However, the launch of Electric Vehicles is still in the initial stage and hesitant. For that reason, it is of great interest which factors are of importance to consumers when making product- and consumer-related buying decisions related to vehicles. From this problem statement, research questions are derived.

2.1. Research Questions

The objective of this thesis is to answer the following two research questions:

Research Question 1: Which indicators determine the consumers’ acceptance regarding the use of Electric Vehicles?

Research Question 2: Which factors and characteristics of an Electric Vehicle motivate consumers to consider using an Electric Vehicle?

THEORETICAL BACKGROUND

3. The Electric Vehicle

> *”There is considerable interest in electric (...) cars because of environmental and climate change concerns, tougher fuel efficiency standards, and increasing dependence on imported oil.”* (Deal, 2010, p. 5)

Within the context of long-term emission targets, Electric Vehicles are of increasing global interest and have developed into a topical concept (European Parliament, 2010). Above all, automobile events such as the International Geneva Motor Show in 2011 present new and future trends within the automotive industry and consequently, they stress the importance of the Electric

Vehicle concept.[1] According to the Green Car Institute (2010, p. 4) and Anderson & Anderson (2010), several investigations show that the concept of Electric Vehicles has by now been of interest for more than a century and that there indeed is a consumer market available. Due to numerous benefits Electric Vehicles involve in the context of energy consumption and protection of the environment, these cars are beyond doubt the means of transport of the future.[2]

3.1. The Electric Vehicle – Definition

The Electric Vehicle is commonly defined as a vehicle featured with an electric motor powering the wheels.[3] Erwing & Sarigöllu (2000, p. 114) describe it as an innovative vehicle and beyond that, it has *"the highest engine efficiency of existing propulsion systems and zero tailpipe emissions" (*European Parliament, 2010, p. 7). In addition, Anderson & Anderson (2010) state, that the Electric Vehicle is less pollutive and more energy-conserving than regular fuel cars, while additionally being more cost-saving and averaging twice the distance of a regular fuel car.

Due to their research on the technology of the Electric Vehicle, Larminie & Lowry accomplished to show the essence of the Electric Vehicle concept. Whereas the term Electric Vehicle is commonly related to the conventional Battery Electric Vehicle, Larminie & Lowry (2003, p. 7ff) distinguish between six different categories of the Electric Vehicle: (a) Battery Electric Vehicle, (b) Hybrid Electric Vehicle, (c) Vehicles using replaceable fuel, (d) Vehicles supplied by power lines, (e) Vehicles using solar energy from radiation and (f) Vehicles storing energy by alternative means. In the context of this paper, the focus will entirely be on the Battery Electric Vehicle, which will simply be referred to as Electric Vehicle. As Larminie & Lowry state (2003, p. 8), the characteristics of this Electric Vehicle are that *"it consists of an electric battery for energy storage, an electric motor, and a controller. The battery is normally recharged from main electricity via a plug and a (...) charging point."*

[1] http://www.salon-auto.ch/de/pavillon_vert/ - accessed March 28, 2012
[2] http://going-electric.org/mission-statement/ - accessed March 29, 2012
[3] http://www.electricauto.org/?page=EVGlossary#EV – accessed March 29, 2012

3.2. Historical Development of the Electric Vehicle

Due to steadily increasing fuel prices as well as the climate change, alternatively driven vehicles such as the EV have gained great interest within the last decade. However, the EV was already invented decades before the invention of conventional vehicles, namely in 1830. Around 1900, Electric Vehicles in the U.S. even amounted to twice as many as conventional vehicles, only to result in peak sales twelve years later. After this period, however, the sales of Electric Vehicles started being in decline and, eventually, they stopped entirely. (Sulzberger, 2006) The reason of this development was assumed to be due to the Electric Vehicles lacking characteristics in comparison to gasoline or diesel vehicles, such as low acceleration speed and short driving range (Bellis, 2011). In addition to that, the lack of important characteristics, decreased fuel prices were another reason for the EV's extinction at that time. Moreover, Henry Ford began with mass productions of gasoline vehicles which back then could be purchased for $500 to $1,000, whereas an Electric Vehicle cost at least $1,000. Consequently, today's so-called conventional vehicle had become the consumers' preferred choice.

However, certain factors such as the protection of the environment as well as the dependency on fuels have become reasons for re-considering alternatively driven vehicles such as the EV as major means of transportation. (Bedi et al., 2011, p. 15ff) Today's manufacturers such as Nissan and GM even state, that the future means of transportation clearly seem to be Electric Vehicles and have therefore decided to begin with the mass production of EVs. In addition to that, Electric Vehicles are assumed to have the most potential within niche markets such as public transport and means of transportation specifically designed for areas like airports or warehouses. (AVERE, 2012)

3.3. Strengths & Weaknesses of the Electric Vehicle

In terms of the Electric Vehicle, the International Energy Agency (IEA, 2011, p. 8) has compiled a number of both positive and negative aspects: the Electric Vehicle emits zero vehicle emissions of greenhouse gas and air pollutants, features a low noise level and offers high efficiency and relatively low cost of the

electric motor. However, the IEA states that a major disadvantage of Electric Vehicles is their reliance on batteries which currently have very low energy and power densities compared to liquid fuels. Moreover, Electric Vehicles lack both speed and good acceleration of conventional vehicles (Anderson & Anderson, 2010, p. 166). Larminie & Lowry (2003, p. 5ff) add that although the price gap between Electric Vehicles and conventional vehicles has been highly decreasing, the consumer still has to pay a premium price for an EV, resulting from costly batteries.

According to PricewaterhouseCoopers (PwC, 2011, p. 7), there also exist both strengths and weakness related to Electric Vehicles. In one of their publications about Electric Vehicles, PwC states that financial and legislative support by the government continues in terms of grants, tax credits and low interest loans. Furthermore, the environmental legislation steers the industry towards a clean and sustainable energy solution. However, government support is realized regionally rather than globally, while other governments entirely abandon support in order to focus on their existing core competencies, like e.g. conventional vehicles. Beside the governmental aspect, infrastructural facilities are taken into account: in order to build an easily accessible network of battery change and charging stations, both public and private sources make high investments. On the other hand, future investments might be at risk due to high cost and marginal success of several pilot programs. Additionally, consumers might be averse to Electric Vehicles due to price premium, lack of charging stations in cities and extended battery charging times. Despite the price premium consumers would have to pay, technology breakthroughs and the use of innovative materials result in lower cost per kWh and significantly longer battery ranges. The progress of R&D and Technology begins to stagnate, which is due to decreased funding and/or the emergence of competing. According to the European Association for Battery Electric Vehicles (2009, p. 1), negative aspects of the EV are outbalanced by its advantages: if the use of Electric Vehicles became common, global implications would be the saving of approximately 20% of oil production, the elimination of almost all traffic noise and a significant reduction of urban pollution, traffic and parking congestion.

3.4. Current and Future Market

Already ten years ago, a basic market research reviewed and/or conducted by the Green Car Institute has shown that both substantial fleet and consumer markets for EVs exist as the desire to purchase EVs is there, representing the basis of a market. Fleet managers as well as consumers do understand the functionality of EV technologies and believe that EVs in fact can meet their fleet or family requirements. In the past, automobile manufacturers have had difficulties introducing alternative fuel vehicles like EVs to the fleet market, especially regarding the requirement of a new infrastructure. Fleet purchase decisions are based on brand loyalty, past experience, vehicle suitability for its planned use and price, including purchase price, operating cost and infrastructure development costs (Green Car Institute, 2002, p. 3ff).

Today and in the future, there is an urgent need for environmentally friendly vehicles. Several technologies for the production of EVs have been developed by now. Even though these EVs presently are very high-priced, the purchase price is expected to drop due to increasing demand which in turn would allow quantity production (Larminie & Lowry, 2003, p. 20). Currently, still only a few thousand EVs are being produced worldwide. However, there are several automobile manufacturers planning to produce larger amounts within the next two to three years. Without strong policy support like making Electric Vehicles more cost-competitive and providing proper recharging infrastructure, EVs are nevertheless unlikely to succeed within the following five to ten years (International Energy Agency, 2011). Hawranek & Neubacher (2010, p. 80) confirm this by stating that in the long term, the EV will remain a niche product, due to its high purchase price and limited driving range.

4. Buying Decision Criteria

Today, there exist several technical possibilities for alternatively driven vehicles like EVs. However, these possibilities are not easy for potential purchasers to comprehend which can be due to consumers having too little relation to Electric Vehicles and being too little aware of and/or having too little information about them (Peters et al., 2006). Consequently, the question arises which actual attributes of an EV are of importance and relevance for the consumer. The

following subsections will address both product-related and consumer-related buying decision criteria (Diez, 2006).

4.1. Product-Related Buying Criteria

Product-related buying criteria can be explained as comparison criteria relevant for the comparison of different products. In the scope of this paper, product-related buying criteria are divided into the following three categories: (a) investment and ongoing expenses, (b) technical characteristics and (c) infrastructure.

4.1.1. Investment and Ongoing Expenses

Investment and ongoing expenses include all criteria being monetarily related to the car, which are divided into (a) purchase price, (b) maintenance costs, (c) price of fuel and (d) governmental support.

4.1.1.1. Purchase Price

According to Greene (2001) and Mau et al. (2008), the purchase price is the most important factor within the buying decision process, since the weighting of all other mentioned factors depends on it. The reason for this is that consumers intend to maximize the marginal value which is related to a higher purchase price. Greene (2001) adds that price elasticity is higher when comparing alternative fuel vehicles such as EVs to conventional vehicles than when comparing conventional vehicles with each other. For that reason, consumers are significantly more price-sensitive when choosing alternative fuel vehicles than when choosing conventional vehicles. Among others, price elasticity depends on market share, fuel type and drive concept; i.e. the higher the market share, the lower the price elasticity. Greene (2001) adds that, when comparing two vehicles of the same vehicle category but with alternative dynamics, the purchase price is a significantly more important purchase criterion than when comparing two vehicles with entirely different drive concepts. Consequently, the purchase price is of great importance when buying an EV. Mau et al. (2008) even state that the purchase price is the most important factor when buying a vehicle. Due to the currently high battery price –

up to 50% of the purchase price of an EV – consumers have to pay a price premium when buying an EV (Ramsey, 2010). However, a study conducted by Deloitte (2011, p. 10) showed that the majority of respondents would not be willing to pay a price premium for an EV over a conventional vehicle. Consequently, and in order to make EVs more cost-competitive with conventional vehicles, a significant amount of the battery price would have to be subsidized by the industry or government. Additionally, factors such as interest rates, governmental incentives and quality ratings are of great importance for consumers when buying a new vehicle (PricewaterhouseCoopers, 2011, p. 3).

In April 2012, a survey conducted by EurotaxGlass (Europe's leading provider of information, data, publications and services for all types of vehicles) showed that 36 percent of the Austrian respondents consider the purchase price of an EV crucial. Furthermore, a total of 38 percent of the respondents stated they would consider purchasing an inexpensive Electric Vehicle, while only 12 percent stated not to purchase an EV at all, regardless of a high or low purchase price. According to 35 percent of the respondents, the general use of EVs in Austria would only prevail at the same purchase price of EVs compared to conventional vehicles. However, 25 percent of the respondents do not at all believe in the general acceptance of EVs as long as fuel still is affordable.[4]

On the Danish market, the purchase price of an Electric Vehicle is much higher than on the markets in the U.S. and other EU countries, even though Danes do not have to pay the registration tax when purchasing an EV. On average, EVs such as the Mitsubishi iMiev or the Tesla Roadster costs approximately DKK 81,000 more in Denmark than in other countries. Consequently, the high purchase price of EVs hinders increasing sales within Denmark. (Bredsdorff et al., 2011)

4.1.1.2. Maintenance Costs

Maintenance costs can be explained as annual costs which occur when maintaining operating conditions. With regards to alternatively driven vehicles such as EVs, consumers view maintenance costs as a critical factor, since the maintenance of EVs and conventional vehicles highly differ from each other.

[4] http://www.ots.at/presseaussendung/OTS_20120420_OTS0036/eurotaxmarketresearch-anhang - accessed May 15, 2012

The battery's final durability represents the main cost component of an EV's maintenance, which currently amounts to six years. (Greene, 2001) However, Greene (2001) states that due to constant development of new battery technologies, a battery's durability will possibly amount to more than ten years in the future. In addition to this, the low mechanical wear of EVs and the fact that an EV's battery does not have to be replaced more than once, makes the maintenance costs of EVs become less important (Biere et al., 2009). Nevertheless, a survey conducted by the Canadian Automobile Association (Desrosiers Automotive Report, 2002) concluded that 19 percent of the respondents consider maintenance and service costs of a vehicle to be more important than safety of a vehicle.

4.1.1.3. Fuel Costs

Apart from the purchase price and maintenance costs, also fuel costs play an important part when buying a vehicle. The survey conducted by the Canadian Automobile Association (Desrosiers Automotive Report, 2002) concludes that 31 percent of the respondents consider the fuel economy of a vehicle to be more important than safety of a vehicle. Greene (2001) states, that for consumers the fuel costs depend on (a) the amount of miles driven by car, (b) possible future fuel costs per driven mile, (c) the vehicle consumption and (d) the discount rates. Greene's logit model (1997) shows a relation between the market share of alternative fuels and the price advantage compared to conventional fuels and their availability. In this model, Greene assumes a fuel availability of 25 percent and a price advantage of 10 US cents per gallon. Under these assumptions, a market share of 20 percent would be reached. With all other conditions being equal, a price advantage of 25 US cents per gallon would result in a market share of 80 percent. Consequently, 5 percent fuel availability would be sufficient in order to reach a market share of 20 percent. It is arguable, whether or not these calculations comply with reality, since this model is based on a survey which does not consider factors such as vehicle features. Nevertheless, Greene's logit model shows a relation between fuel availability (see chapter 4.1.5. – Infrastructure), fuel price and market share: the

higher the fuel availability, the lower has to be the price advantage compared to conventional vehicles in order to reach a certain market share.

4.1.2. Governmental Support

This subsection intends not only to elaborate governmental incentives to users of EVs, but also to what extent different governments support countries, federal states and communities in order to enhance the use of EVs.

In Canada, Potoglou & Kanaroglou (2007) conducted a survey on consumers' behaviour with regards to conventional and alternatively driven vehicles. According to this study, governmental support such as lower purchase price or remission of the VAT (value-added tax) positively affects buying behaviour, whereas incentives such as free parking or the unconditional use of car-pool lanes are less important. However, a Californian study conducted by Adler et al. (2003) shows that remission of parking fees does have a positive effect on buying behaviour. In the scope of this study, respondents are willing to pay a price premium of $200 to $900 when purchasing a vehicle. In addition, this study confirms Potoglou & Kanaroglou's survey results showing that remission of the VAT has the most positive effect of all incentives. The Desrosiers Automotive Report conducted by the Canadian Automobile Association (2002) even concluded that 34 percent of the respondents consider price and incentives to be more important than safety of the purchased vehicle.

According to the Austrian Automobile Club ÖAMTC, the only general incentives when purchasing an EV are so far the saving of the "NoVa" (the standard fuel consumption tax), which accounts for 16 percent, as well as the saving of the engine-related insurance tax. Furthermore, depending on the different Austrian federal states and communities, a discount of up to 30 percent of the purchase price can be granted to private individuals.[5] In addition to this incentive, the survey conducted by EurotaxGlass[6] showed that 18 percent of Austrian respondents expect the use of an EV to be advantageous over conventional vehicles, such as motorised vehicle prohibition or city tolls due to Federal Emission Control Acts. However, a survey conducted by two Viennese

[5] http://www.oeamtc.at/?id=2500%2C1137548%2C%2C – accessed May 10, 2012
[6] http://www.ots.at/presseaussendung/OTS_20120420_OTS0036/eurotaxmarketresearch-anhang accessed May 15, 2012

universities and the Austrian Institute of Technology (AIT) in 2012 showed that the current incentive system for the use of EVs is by far not sufficiently elaborated. On the other hand, Denmark attempts to decrease the use of conventional vehicles by charging three times the registration tax of Electric Vehicles when purchasing a conventional vehicle. However, this alternative is very unlikely to be successfully realised in an automotive country like Austria.[7] In addition to the lower registration taxes of EVs, Denmark's political party "Det Radikale Venstre" requests incentives such as free parking for EV users and the legal requirement for all gas stations to install charging stations for EV.[8]

From 2011 until 2014, further support measures for the increase of EVs' circulation within Austria are taken by "EMPORA" (E-Mobile Power Austria). This is by now the most extensive R&D (Research & Development) project in Austria and financed by the Climate and Energy Fund of the Austrian government. A total of 21 Austrian project partners cover the entire value-added chain of electric mobility, i.e. from all vehicle-related concerns to the point of selling to the customer. By working closely together with research partners as well as partners from both automotive and energy industry, the aim of this project is to find solutions to the problems relating to electric mobility, such as infrastructure and driving range, as well as to meet the needs and expectations of consumers.[9]

Not a governmental organisation, but a company with the aim of mandating the global improvement of the infrastructure EV users need, is "Better Place". Originally from California, Better Place was established in Denmark in the beginning of 2009. Better Place Denmark is owned by Better Place Global and the Danish company "Dong Energy". The main mission of Better Place is to encourage governments to enhance and support the development of charging and battery switch stations and, in turn, to achieve a general standard of infrastructure worldwide.[10] According to the consumers on the Danish market, the aim of Better Place Denmark to establish a sophisticated

[7] http://science.apa.at/site/natur_und_technik/detail?key=SCI_20121018_SCI4409170049762782 – accessed October 19, 2012
[8] http://www.dr.dk/Nyheder/Politik/2012/07/26/215130.htm - accessed July 30, 2012
[9] http://www.empora.eu/das-projekt - accessed April 12, 2012
[10] http://danmark.betterplace.com/om-better-place/om-better-place/ - accessed May 1, 2012

combined network of battery switch stations and charging stations is the ideal solution to the infrastructural problem.[11]

4.1.3. Technical Characteristics

An EV's technical characteristics are mainly nonmonetary product-related attributes such as (a) driving range, (b) charging time, (c) acceleration performance as well as (d) maximum speed.

4.1.3.1. Driving Range

Since EVs do not come with engines or generators and only have a short battery life, they provide more limited driving ranges than conventional vehicles (PwC, 2009, p. 2ff). In consequence of the current technologies, the average driving range of most EVs covers only 160 kilometres between battery charges. The short battery life and, thus, the low driving range of EVs is mainly caused by the low energy density, i.e. the battery's low capability of storing electrical energy. Presently, the driving range of recently introduced EVs does not meet the consumers' expectations, i.e. for more than 60% of a survey's respondents expect a driving range of at least 160 kilometres in order to consider purchasing an EV. (Deloitte, 2011, p. 6) However, the standardised survey conducted by EurotaxGlass (2012) showed that 70 percent of polled driving licence holders living in Austria mainly use their vehicles within the city. The survey conducted by the two Viennese Universities and AIT (2012) confirm this by respondents stating that 95 percent of their distances could be covered with an EV's average driving range of 16 kilometres. Thus, the low driving range of Electric Vehicles compared to conventional vehicles should not present an obstacle in terms of considering the purchase of an EV.

4.1.3.2. Charging Time

The duration of the charging or refuelling process is utterly important for the consumers' buying decision, since only few consumers would be willing to accept a charging or refuelling process of at least one hour. The purchase price

[11] http://www.elbiler.dk/html/om_elbiler.html - accessed May 1, 2012

as well as a charging process of six hours would rather discourage consumers from purchasing an Electric Vehicle than its limited driving range. According to this, the charging time of an EV is assumed to be an even more important factor than its driving range. (Segal, 1995)

In order to fully re-charge the battery of an EV, a time period of four to six hours should be expected. A further issue are quick charges, i.e. in order to charge the battery to only 80% of its capacity, a time period of 30 minutes should be expected. Since factors such as purchase price, driving range and charging time determine whether or not the Electric Vehicle will become accepted, researchers are constantly working on improving existing battery technologies.[12]

A survey conducted by Deloitte (2011) determined consumer expectations related to technical characteristics of the EV, and showed that consumer expectations are not consistent with current technologies. The majority of the survey's respondents stated that they expect an EV's battery to be re-charged within two hours or even less, whereas only a small percentage of the respondents would find a charging process lasting eight hours acceptable. Since it is most realistic that the charging process lasts eight hours, EV users face the challenge of re-charging their vehicles only at home or at their workplace. Consequently, the establishment of a sophisticated charging station infrastructure has to be considered, which means installing charging stations at office buildings, supermarkets etc. A further challenge is the matter of battery switch stations, which should enable EV drivers to exchange batteries within a maximum of two minutes. This solution would simplify the charging process and, in addition, decrease the battery costs.

4.1.3.3. Acceleration Performance

Potoglou & Kamaroglou's (2007) state that consumers highly value acceleration performance and high maximum speed (See chapter 4.1.3.4. – Maximum Speed). Burge et al. (2007) confirm the importance of high acceleration performance on the basis of their stated preference survey about vehicle purchasing choices. Whereas size and maximum speed of the vehicle as well

[12] http://www.fueleconomy.gov/feg/evtech.shtml - accessed May 15, 2012

as fuel economy were of smaller importance, households with both low and high income stated that they would be willing to pay a price premium for high acceleration performance. Since Electric Vehicles are able to achieve at least as high an acceleration performance as conventional vehicles, these findings can be considered to be in favour of EVs.

Especially for male, solitarily respondents of the survey conducted by Potoglou & Kamaraglou (2007), high acceleration performance is an essential attribute when purchasing a vehicle. Although there is not yet proof of a change in consumers' attitudes, the high acceleration performance can be seen as a possibility to improve the global image of Electric Vehicles.

4.1.3.4. Maximum Speed

On average, the maximum speed a purely battery-driven EV can reach is 172 km/h. For that reason, Electric Vehicles do not significantly differ from the average of today's conventional vehicles. Without sophisticated cooling systems, however, the EV cannot maintain this maximum speed for a long time, by reason of overheating issues. (Grünig et al., 2011)

Unlike Potoglou & Kamarogklou (2007), Dagsvik et al. confirm the findings of Burge et al.'s (2007) survey. According to the findings of Dagsvik et al.' survey conducted in Norway (2002), the maximum speed was not of great importance to the respondents, whereat male respondents younger than 30 years and older than 50 years found this technical characteristic more important than other respondents.

4.1.4. Environmental Friendliness

Alternatively driven vehicles such as Electric Vehicles are considered to show great promise for the reduction of greenhouse gas emissions as well as other traffic-related factors affecting the environment.

The environmental friendliness of Electric Vehicles depends on the type of the source of electricity. Whereas some power plants producing the electricity

may emit tailpipe pollutants, Electric Vehicles driven by electricity derived from nuclear-, wind- or solar-powered plants are environmental friendly.[13]
When being active, the Danish wind turbines produce more power than there is actual use for. Consequently, there is a possibility that Electric Vehicles can exploit the excess of wind power in the future. (Danish Energy Agency, 2009)

According to Helmers (2009, p. 162ff), consumers do not only consider greenhouse gas emissions, but also noise emissions to be an environmental factor. Electric Vehicles have an advantage over conventional vehicles, as they have an utterly low noise level. Hence, the common use of Electric Vehicles would – especially in larger cities – be advantageous for both drivers and residents. However, critics have a rather sceptical attitude towards this factor, as pedestrians, cyclists and other motorists might not be able to hear approaching Electric Vehicles which, for that reason, could cause accidents more easily. However, in order to reduce the risks of accidents, automobile manufacturers are currently working on an artificial engine noise.

4.1.5. Infrastructure

Not only financial and technical attributes, but also external factors such as the infrastructure of charging and gas stations are of great importance to the buying decision. However, the automobile industry, oil companies as well as body shops previously demonstrated strong resistance against Electric Vehicles. Since they had invested much money in the improvement and extension of the infrastructure for conventional vehicles, they intended to protect their businesses by influencing policymakers. (Sovacool & Hirsh, 2009)

[13] http://www.fueleconomy.gov/feg/evtech.shtml - accessed May 20, 2012

The illustration below shows a typical Electric Vehicle charging station.

Figure 1: Example of Electric Vehicle Charging Station

Source:
http://blogs.dallasobserver.com/unfairpark/2011/11/electric_vehicle_charging_stations_coming_to_fair_park_as_part_of_energy_depts_ev_project.php

In Denmark, the before-mentioned company “Better Place” puts a lot of effort in both improvement and extension of the charging station and battery switch station infrastructure for Electric Vehicles. According to Andersen et al. (2009), such innovative systems for battery charging have significant potential to help overcome EV-related technological issues such as limited driving range and the long charging process.

Since the charging station and/or gas station infrastructure is an important factor for the buying decision, Brownstone et al. (1995) tried to determine to what extent potential buyers of alternatively driven vehicles would accept to pay a higher price for re-charging/re-fuelling their vehicles in order to help improving the infrastructure. For the group of potential users of natural-gas powered vehicles, the availability of the respective fuel source was of greatest importance. Furthermore, this group stated to accept a higher fuel price in order to accomplish an improvement and extension of the infrastructure. The Electric

Vehicle came second in the survey. Due to the long charging process, it is more likely for users to charge their vehicles' batteries by night at home.

The study of Potoglou & Kanaroglou (2008) resulted in respondents stating that in case of a lower availability of fuel or electricity, the value of an alternatively driven vehicle decreases.

In Austria, neither driving range nor the current charging station infrastructure should pose a problem. According to users of Electric Vehicles, the Austrian charging station infrastructure already meets a large part of the consumers' needs, and for that reason, there is a high practicability.[14]

4.1.6. Brand and Model Variety

According to Greene (2001), the brand as well as model variety of a vehicle is of great importance to consumers. Different attributes such as design and technical characteristics are valued differently by consumers, i.e. they might be interested in a certain drive technology but cannot find it in connection with the favoured vehicle brand or the correct size. Since the demand of alternatively driven vehicles such as the EV is still relatively low compared to conventional vehicles, it is unlikely for auto manufacturers to start mass productions of new brands or models. Consequently, the brand and model variety of innovative drive technologies is rather unlikely to increase in the near future. On the other hand, providing the consumer with large brand and model varieties is one of the essential requirements to achieve a wide dissemination of Electric Vehicles. According to Helmers (2009), the dissemination is more likely to succeed if leading, well-established auto manufacturers offer Electric Vehicles, since only these companies have the resources to provide the required infrastructure of points-of-sales and body shops.

Nevertheless, although a survey conducted by the "Center for Automotive Management" (CAMA) revealed that consumers would be willing to pay a price premium for an Electric Vehicle of a well-known brand, they would

[14] http://science.apa.at/site/natur_und_technik/detail?key=SCI_20121018_SCI44091700497627 82 – accessed October 19, 2012

be willing to pay an even higher price premium for better technical characteristics.[15]

4.2. Consumer-Related Buying Criteria

In the context of this thesis, consumer-related buying criteria are divided into demographic and socio-economic criteria. Demographic criteria are age, gender as well as family status (marital status and number of children), whereas socio-economic criteria include criteria such as educational background, employment status and income.

4.2.1. Age and Gender

It is assumed that factors such as age and gender of potential buyers of vehicles do have an influence on the buying decision. On the one hand, younger consumers are often more likely to have a lower income and are therefore more price-sensitive when buying a vehicle. This assumption is confirmed by a study conducted by Dagsvik et al. (2002), which showed that consumers at an age under 30 years are more sensitive to both purchase price and ongoing expenses than older consumers. Consequently, younger consumers prefer to purchase conventional vehicles rather than cost-intensive alternatives such as Electric Vehicles. On the other hand, this might result in age affecting the choice of driver technology. Furthermore, age and gender may have an effect on the importance of technical characteristics, such as acceleration performance. This was also confirmed by Potoglou & Kamaroglou's study (2007), which revealed that a high acceleration performance is of greater importance to male respondents than to female respondents. Furthermore, Dagsvik et al.'s research (2002) revealed that a high maximum speed is a technical characteristic of great importance to male respondents in the age groups of 18 to 29 years and above 50 years.

As discussed earlier in chapter 4.1.3.1. (Driving Range), the use of batteries instead of combustion engines results in a relatively lower driving range of Electric Vehicles compared to conventional vehicles. In 2002, Dagsvik

[15] http://www.automotiveit.com/study-ev-brands-matter-but-features-are-more-important/news/id-00433 - accessed April 2, 2012

et al.'s research revealed that respondents rate the factor driving range differently, according to gender and age, whereat female respondents at an age above 50 years are more likely to accept a lower driving range of 100 km. In contrast, male respondents at an age of 30 to 49 years are more likely to accept the low driving range than male respondents within the age group above 50 years. Furthermore, the study concludes that respondents in the age group under 30 years require their vehicles to cover higher driving ranges than respondents of higher age groups.

4.2.2. Family Status

It is assumed that factors such as the marital and family status of potential buyers of vehicles do have an influence on the buying decision. On the one hand, technical characteristics such as size and safety are assumed to be of greater importance to persons living in a relationship and/or to persons with children in their households, than to solitarily consumers or single persons without children. On the other hand, Potoglou & Kamaroglou's study (2007) revealed that especially the group of solitarily male respondents ascribed great importance to technical characteristics such as high acceleration performance. Consequently, there is a proof for the fact that family status as well as the number of children in the household affects product-related buying decision criteria such as technical characteristics.

4.2.3. Employment Status

Besides factors like age, gender and family status, it is assumed that also the employment status of potential buyers of vehicles do have an influence on the buying decision. According to Potoglou & Kamaroglou (2007), the probability of consumers purchasing an alternatively driven vehicle is lower when being employed. This can be explained by the fact that the gas station infrastructure for conventional vehicles is considerably more sophisticated than the current infrastructure of charging stations for Electric Vehicles. Consequently, consumers using their vehicles as a means of transport to their workplace would purchase a conventional vehicle rather than an EV. Furthermore, it is assumed that unemployed consumers are more price-sensitive than employed

consumers and, thus, they are more unlikely to purchase cost-intensive vehicles such as EVs. The employment status of consumers is not only of importance due to infrastructure or price-sensitivity towards purchase price and ongoing expenses, but also due to a vehicle's driving range. Since employed consumers are assumed to daily cover larger driving ranges than unemployed consumers. However, employed persons who have to cover more than the relatively limited driving range of Electric Vehicles are rather unlikely to consider purchasing an EV. In summary, the consumer's employment status might affect the importance of product-related buying criteria such as purchase price, driving range and charging/gas station infrastructure.

4.2.4. Educational Background

Although Potoglou & Kanaroglou' study (2007) revealed a positive correlation of a higher educational background and the acceptance of alternatively driven vehicles, educational background it is not assumed to have an effect on the product-relation buying decision. However, since this factor belongs to typical socio-demographic information, it was included in this part of the thesis.

4.2.5. Income

Besides factors like age, gender and family status, it is assumed that also the level of income of potential buyers of vehicles do have an influence on the buying decision. On the one hand, consumers with a higher level of income are more likely to be less price-sensitive towards the relatively high purchase price and ongoing expenses of an Electric Vehicle. According to Potoglou & Kanaroglou (2007), characteristics of a vehicle such as purchase price and ongoing expenses are of greater importance to consumers with an average annual income than to consumers with a high annual income. Nevertheless, the study also revealed that persons of households with an average annual income are rather prone to alternatively driven vehicles than to conventional vehicles.

Furthermore, the study revealed that the higher the level of income, the lower is the price sensitivity. In addition, the willingness to pay a price premium for alternatively driven vehicles and the involving incentives such as remission of the standard fuel consumption tax or free parking depends on the level of

income. For this reason, the level of income affects the product-related criterion investment and ongoing expenses.

In light of the above, it can be argued that consumer-related buying criteria, i.e. socio-demographic background, such as age, gender, family status, employment and income have an effect on the product-related buying decision.

In the next section of the thesis, different models are discussed, in order to eventually derive the final conceptual model for this topic.

5. Conceptual Model

This section of the thesis has the aim to critically review different models. These models are the Theory of Planned Behaviour (TPB) by Ajzen, the Technology Acceptance Model (TAM) by Davis & Venkatesh and the Diffusion of Innovation Model by Rogers. In the following, a conceptual model derived from the above-mentioned theories is drawn. In order to explain the major line of thoughts, the first model to be elaborated on is the Theory of Planned Behaviour.

5.1. Theory of Planned Behaviour

The Technology Acceptance Model by Davis and Venkatesh was derived from the Theory of Planned Behaviour. Consequently, this theory has to be elaborated first, in order to understand the Technology Acceptance Model. The Theory of Planned Behaviour is an extended model of the Theory of Reasoned Action by Ajzen and Fishbein and consists of the attributes “Attitude towards Act of Behaviour”, “Subjective Norm” and “Perceived Behavioural Control”. The factors “Behavioural Intention” and “Actual Behaviour” are to some extent influenced by these two attributes. The factor “Attitude towards the Act of Behaviour” indicates the belief of a person that certain behaviour will lead to certain outcomes, whereas the factor “Subjective Norm” indicates the belief that a certain person is of the opinion that one should or should not perform certain behaviour. (Schiffman et al., 2008) Furthermore, Schiffman et al. state that “Perceived Behavioural Control” indicates whether or not persons are able to act according to their actual intentions. The major assumption of the Theory of

Planned Behaviour is that both intention and behaviour are correlated with the natural personality of a person, the external or social influence and control (Ajzen, 2005). Based on the Theory of Reasoned Action and the Theory of Planned Behaviour, Davis proposed the Technology Acceptance Model in 1985, in order to be able to predict behavioural intentions in relation to technological innovations.

For the purpose of this research topic, the factor “Subjective Norm” will be included in the conceptual model. However, this factor will be renamed to “Social Norms”. The social norm is a construct which simplifies both description and explanation of human behaviour (Cialdini & Trost, p. 151). Furthermore, Sherif (1936) describes social norms as negotiated rules of social behaviour.

5.2. Diffusion of Innovation Model

Another model used in the context of this thesis is the Diffusion of Innovation Model by Rogers (1962). According to Rogers (2003, p. 5), “*diffusion is the process in which an innovation is communicated through certain channels over time among the members of a social system. It is a special type of communication, in that the messages are concerned with new ideas*.” In his model, Rogers mentions four elements, which are innovation, communication channels, time and social system. Within the element innovation, there are certain attributes that have an influence on whether or not and to what extent a person is willing to early adopt or accept new technologies. These elements are Relative Advantage, Compatibility, Complexity, Trialability and Observability. Relative advantage indicates whether or not consumers find the innovation better than similar conventional products. Complexity indicates the challenge to understand the innovation, whereas Trialability indicates to what extent the innovation has to be studied before it can be launched. Compatibility deals with past experience, whereas Observability deals with the results after the launch of the innovation. Due to the fact that the re-introduction of alternatively driven vehicles such as EVs is still in the initial stage, neither past experience nor results of the launch can be considered. For the purpose of this research, it was decided to only include the element Relative Advantage to the conceptual

model, in order to determine whether consumers rate the innovation, i.e. the Electric Vehicle, better than conventional vehicles.

5.3. Technology Acceptance Model

As discussed before (5.1. – Theory of Planned Behaviour), the Technology Acceptance Model was derived from the Theory of Reasoned Action and the Theory of Planned Behaviour. The model was created by Davis (1985), with the purpose to explain as well as to predict behavioural intentions of a person towards technological innovations. According to Davis (1985, p. 24), a "potential user's overall attitude toward using a given system is hypothesized to be a major determinant of whether or not he actually uses it. Attitude toward using, in turn, is a function of two major beliefs: perceived usefulness and perceived ease of use." Within the Technology Acceptance Model, both perceived usefulness and perceived ease of use are affected by design features. Perceived usefulness is affected by perceived ease of use, whereas attitude towards using is affected by both perceived usefulness and perceived ease of use. Eventually, attitude towards using has an influence on the actual use of system. (Davis, 1985) The correlations between these attributes are illustrated in Figure 2.

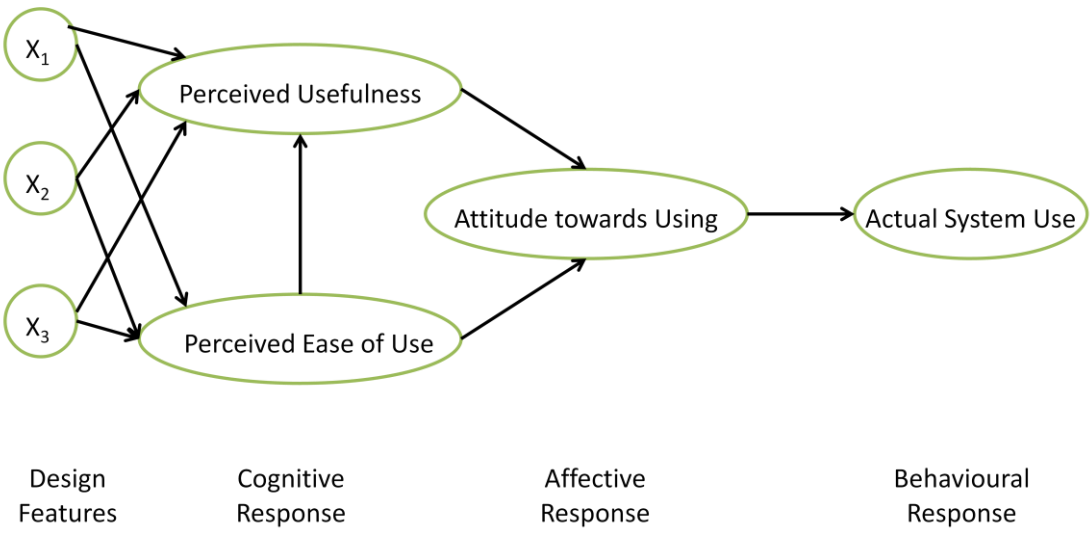

Figure 2: Technology Acceptance Model
Source: Davis et al., 1985, p. 24

According to Davis (1985), perceived usefulness indicates the extent to which individuals believe the use of particular systems would improve their job performance, whereas the factor perceived ease of use indicates to which extent individuals believe the use of particular systems would exclude physical or mental effort. Due to these attributes, the Technology Acceptance Model is a commonly accepted model in order to explain as well as to predict individuals' attitude towards technological innovations. For these reasons, the Technology Acceptance Model was considered to be suitable for this research topic.

Although considered to be an appropriate model for this study, certain adjustments have to be made. The attributes Perceived Usefulness, Perceived Ease of Use and Attitude towards Using were included from the original Technology of Acceptance Model. Since the empirical study of this thesis does not last for a long enough period of time, the factor Actual System Use cannot be determined and is therefore replaced by Intention to Use. As mentioned earlier in the Diffusion of Innovation Model, Relative Advantage is added to the conceptual model.
Furthermore, the attribute Perceived Enjoyment – a part of Van der Heijden's User Acceptance Model of Hedonic Information Systems (2004) – is included, as this was revealed to have a significant influence on the users' acceptance of new technologies (Sun & Zhang, 2006). According to Davis et al., (1992), Perceived Enjoyment indicates whether or not and to what extent the activity of using new innovation technologies is perceived enjoyable. Furthermore, Davis (1989) states that Perceived Enjoyment is of great importance within the acceptance of user technologies and has therefore a great effect, for hedonic systems in particular.

The new attributes derived from the previously mentioned models now consist of: Relative Advantage, Perceived Usefulness, Perceived Ease of Use, Perceived Enjoyment, Social Norms, Attitude towards Using and Intention to Use. In order to be able to determine whether or not and to what extent Perceived Usefulness and Perceived Ease of Use affect Attitude towards Using, the attribute Price Acceptance is included in the conceptual model, which can be seen in Figure 3.

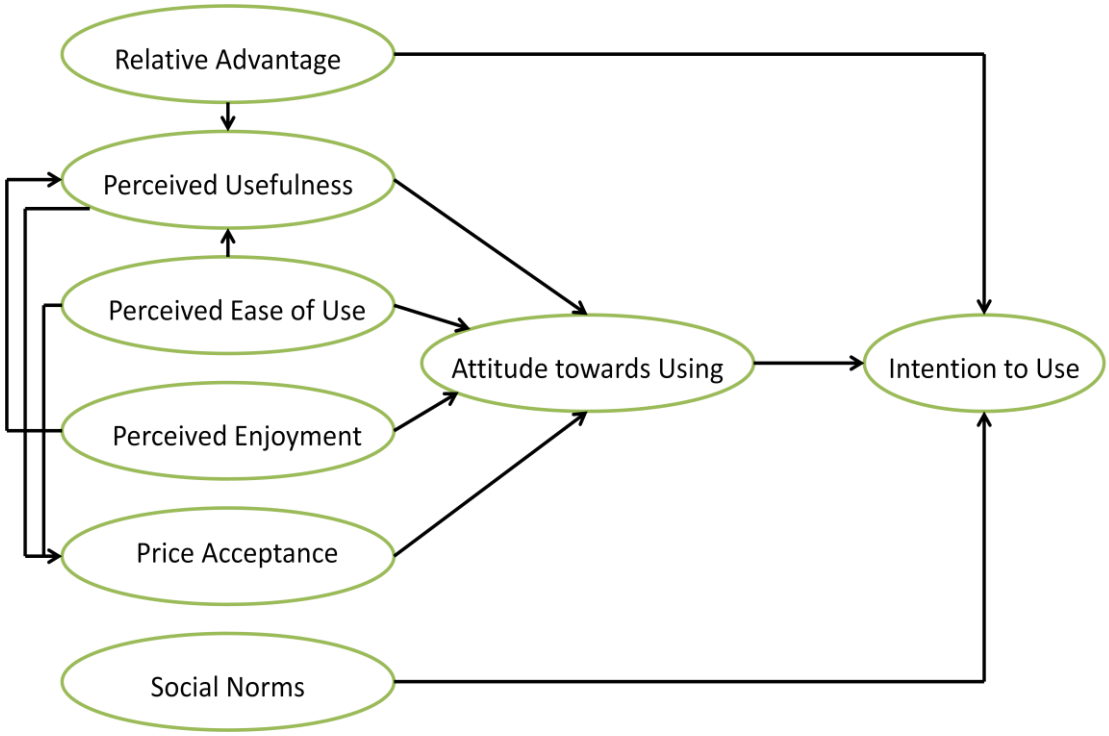

Figure 3: Conceptual Model

From this new conceptual model, the following hypotheses for the empirical study are derived:

H_1: Perceived Ease of Use positively affects Perceived Usefulness
H_2: Perceived Ease of Use positively affects Attitude towards Using
H_3: Perceived Usefulness positively affects Attitude towards Using
H_4: Perceived Enjoyment positively affects Perceived Usefulness
H_5: Perceived Enjoyment positively affects Attitude towards Using
H_6: Relative Advantage affects Perceived Usefulness
H_7: Relative Advantage affects Intention to Use
H_8: Perceived Usefulness positively affects Price Acceptance
H_9: Perceived Ease of Use positively affects Price Acceptance
H_{10}: Price Acceptance positively affects Attitude towards Using
H_{11}: Social Norms positively affect Intention to Use
H_{12}: Attitude towards Using positively affects Intention to Use

The derived hypotheses will be tested and discussed in the empirical part of this thesis.

EMPIRICAL PART

6. Methodology

The aim of this part of the thesis is to present the design as well as the results of the empirical study. According to the elaborated model in chapter 5 (Conceptual Model), the study aims at examining both Austrian and Danish respondents' acceptance in terms of using an EV. For this reason, respective effects of relative advantage, perceived usefulness, perceived ease of use and perceived enjoyment with regards to using an EV are examined. Furthermore, the respective effects of price acceptance, social norms, attitude towards using as well as the intention to use an Electric Vehicle are determined. As discussed in the context of the conceptual model, these are important attributes. The empirical study is quantitative, in terms of a questionnaire. The use of this method is considered most suitable for this study, since its purpose is to investigate which factors are most important for consumers on the Danish and Austrian market in order to purchase an EV. Furthermore, a quantitative research seems to be the most appropriate method as this thesis attempts to test both theory and hypotheses mentioned in the conceptual model (chapter 5). These hypotheses will be tested in the analysis, in order to support general ideas. For this reason, the approach can be argued as deductive reasoning, which is a top-down method working from general assumptions further down to testing specific hypotheses (DeVault).

6.1. Questionnaire Design

This section explains the structure and the selected scale of the questionnaire, which can be seen in Appendix A. Within the scope of this study, respondents living in Austria and Denmark are of interest. Hence, two sets of questionnaires were prepared by means of the survey programme "Surveyxact" – one in German and one in English. The questionnaires both consisted of a total of 21 questions. The first part of the questionnaires served as introduction in order to

explain the survey's purpose and to ensure absolute anonymity and personal privacy of the respondents. The very first question of the surveys was a skip question, asking the respondents whether they currently live in Austria or Denmark. Since only responses from Austrian and Danish residents are of interest for this study, respondents who answered this question negatively dropped out of the survey. This measure was taken in order to ensure only respondents relevant for the empirical study answered the rest of the questionnaire. Among others, the questions in the second part of the questionnaires consisted of statements, using the 7-Point Likert Scale. According to Schiffman et al. (2008), this scale not only simplifies it for the interviewer to create a questionnaire and to interpret its results but also for the respondent to reply to the questions. Another advantage of using this scale is that respondents are provided the option to properly respond to a question although they are neutral toward it. Furthermore, closed-ended questions were used, i.e. respondents are provided certain response options in advance (Lewis-Beck et al., 2004). According to Bryman (2008), this type of questions has certain advantages over open-ended questions, as closed-ended questions are easier for the interviewer to compare as well as process and, for the respondents, this type of questions can clarify the meaning of certain questions and simplify the process of completing the survey. The third part of the questionnaire consists of demographic closed-ended questions and one open-ended question. It was decided to only use one open-ended question in this survey, as this question type is time-consuming for interviewers to process (Bryman, 2008). Although Blumberg et al. (2005) state that using a Likert Scale in studies like this may result in bias, it was decided to exclude the "don't know" response option throughout this questionnaire, since there might have been a risk of respondents answering the questions with "don't know" out of laziness (De Vaus, 2002). However, as mentioned earlier, the 7-Point Likert Scale in these questionnaires included the option to respond neutrally to the questions, in case that the respondents were undecided.

When using social media as a distribution channel of information, it is important to be aware of the risk that the respondents who receive the questionnaires do not reflect the general population. They can be argued to be similar and to have

very similar opinions on Electric Vehicles as the researcher, since many of the respondents are friends, colleagues or family. For that reason, this point demanded extra focus and precautions were taken in order to assure that also respondents outside the researcher's network received the questionnaire as well. There was a great focus on spreading the questionnaire as much as possible, in order to improve the validity of the sample and in order to get different responses from different segments.

6.2. Data Collection Procedure

In order to receive constructive feedback and then to eliminate confusing questions and response options as well as the risk of misinterpretation and misunderstanding, a preliminary questionnaire was provided to ten respondents. This pre-test resulted in revealing misunderstandings in terms of questions as well as missing response options, which were then rephrased. The questionnaire of interest for Danish residents was not conducted in Danish but in English, in order to be able to also receive answers from international students living in Denmark and hence, to increase the amount of responses. The questionnaire of interest for Austrian residents was conducted in German, as it can be assumed that the use of the English language is not as common in Austria as in Denmark.

The data collection was carried out electronically, via the Internet. Both questionnaires were mainly distributed on the social network Facebook, in order to receive as many responses as possible. Several friends and family members forwarded the respective link of the questionnaire to their acquaintances and colleagues. The questionnaires were distributed from June 29 until July 8, i.e. the data collection via Facebook lasted over a period of ten days. During the same period of time, e-mails including the link to the respective questionnaires were sent out, in order to reach family members and friends or acquaintances not being registered on Facebook. It is questionable whether this was an ideal time to send out the surveys, as some potential respondents might have been inaccessible due to vacation time. Furthermore, several other students from Aarhus School of Business were writing their Master theses and therefore also conducting surveys during the same period of time. Hence, it can be assumed

that some of the potential respondents on Facebook did not take part in this survey as they were satiated by different kinds of surveys being sent out at the same time.

6.3. Sample

After a period of ten days, a total of 314 questionnaires had been answered – 116 respondents answered the English questionnaire, 198 respondents answered the German questionnaire. After sorting out incomplete responses, a total of 202 responses – 50 Danish residents and 152 Austrian residents were processed. It is arguable whether this relatively small size of sample can be considered to be representative. Hence, larger sample sizes of both Austrian residents and Danish residents would have been eligible.

106 (54 percent) of the overall respondents are female, 20 (10 percent) respondents are male and 69 (35 percent) respondents refused to state their gender. Regarding the age, 86 (44 percent) respondents are 30 years old and younger, 57 (24 percent) respondents are above 50 years old and three (2 percent) of the respondents are above 80 years old. Furthermore, 36% of the respondents are married, 35 percent are in a relationship, and 24 percent are single. 30 percent of the respondents state that they have children.

Within the sample, there is a relatively high level of education, i.e. more than half of the respondents (N=132, 67 percent) have an academic background, whereas 28 percent of the respondents have completed high school. The high amount of academically educated respondents within this sample is assumed to be due to the fact that the survey was carried out on Facebook, i.e. lots of respondents are assumed to be fellow students or other persons with the same or a similar educated background. Five percent of the respondents do not have any completed education. However, this question of the survey should have included the response option “Apprenticeship”, in order to separate these two groups from each other.

Within this sample, 59 percent of the respondents are employed, whereas ten percent are self-employed. 19 percent of the respondents are students, while eleven percent are either unemployed, housekeepers or retired. A total of 30 percent of the respondents have a monthly household income of

up to DKK 15,000 or € 2,000 after tax, while further 20 percent of the respondents have a monthly household income between DKK 16,000 and 25,000 or between € 2,000 and 3,000 after tax. 44 percent stated a higher level of monthly household income after tax, and five percent answered the question with “not stated”.

A more detailed insight of the sample results can be found in Table 1.

Table 1: Socio-Demographic Data

Variable	Category	N	%
Gender	Male	20	10%
	Female	106	54%
	Not stated	69	35%
Age	18-25 years	20	10%
	26-30 years	66	34%
	31-40 years	38	19%
	41-50 years	24	12%
	51-60 years	34	17%
	61-70 years	8	4%
	70-80 years	2	1%
	Over 80 years	3	2%
Family Status	Single	48	24%
	In a relationship	71	35%
	Married	72	36%
	Children	61	30%
Education	No school completed	9	5%
	High school or similar	54	28%
	Bachelor or similar	45	23%
	Master or similar	69	35%
	PhD or similar	18	9%
Employment Status	Employed	116	59%

	Self-employed	20	10%
	Unemployed	4	2%
	A student	37	19%
	A housekeeper	8	4%
	Retired	10	5%
	Unable to work	0	0%
Income	Up to 15,000	58	30%
	16,000 - 25,000	39	20%
	26,000 - 35,000	28	14%
	36,000 - 45,000	30	15%
	46,000 - 50,000	30	15%
	More than 50,000	0	0%
	Not stated	10	5%
Country	Austria	152	75%
	Denmark	50	25%

6.4. Statistical Analysis

The statistical analysis was carried out by means of the programme SPSS Amos. The Testing of the hypotheses was carried out by hierarchical Ordinary Least Squares (OLS) regressions. The first step of the statistical analysis was to add the covariates to the model. Secondly, the respective defined independent variables were added. In all cases where the Relative Advantage was defined as independent variable, Environmental Friendliness was added. Before explaining the results of the hypothesis testing, a bivariate illustration of the correlation between covariates and independent variables with the dependent variable is drawn.

7. Results

In this section of the thesis, the dependent variable “Intention to Use” is determined. Secondly, independent variables such as “Perceived Usefulness”, “Perceived Ease of Use”, “Perceived Enjoyment” and “Price Acceptance” are determined.

7.1. Dependent Variable – Intention to Use

The dependent variable “Intention to Use” is determined by means of four items: (a) “If I had an EV available, I would favour driving it rather than a traditional vehicle”, (b) “If I were to purchase a vehicle within the next 5 years, I would purchase an EV”, (c) “I would recommend others to purchase an EV” and (d) “There is a high probability that my next vehicle will be an EV”. The mean value of these items is between 2.94 and 4.63 (see Table 2). The determined mean value of all four items is 3.76 (SD=1.65). In order to test the reliability, Cronbach’s Alpha was used, which should be at least 0.70. In this case, the reliability coefficient was 0.89, which proves the high reliability of the items.

Table 2: Items of Intention to Use

(1=very unlikely, 7=very unlikely)	M	SD
Intention to use (Cronbach-α=0.89)	3.76	1.65
If I had an EV available, I would favour driving it rather than a traditional vehicle.	4.63	1.90
If I were to purchase a vehicle within the next 5 years, I would purchase an EV.	3.24	1.94
I would recommend others to purchase an EV.	4.23	1.94
There is a high probability that my next vehicle will be an EV.	2.94	1.88

7.1.1. Independent Variables

Among others, independent variables such as “Perceived Usefulness”, “Perceived Ease of Use”, “Perceived Enjoyment” and “Price Acceptance” are determined in this section.

7.1.1.1. Perceived Usefulness

“Perceived Usefulness” was determined by means of six items (see Table 3). The items’ mean value was between 3.54 (“Using an EV would be

advantageous for me") and 4.95 ("I would consider an EV a useful means of transport"), so the overall mean value was 3.98 (SD=1.67). With Cronbach's Alpha=0.95, the reliability of this scale is high.

Table 3: Items of Perceived Usefulness

(1=highly disagree, 7=highly disagree)	M	SD
Perceived usefulness (Cronbach-α=0.95)	3.98	1.67
Using an EV would increase the quality of my life.	3.80	1.95
Using an EV would be useful for me.	3.86	1.86
Using an EV would be beneficial for me.	3.82	1.80
Using an EV would be convenient for me.	3.54	1.94
Using an EV would be advantageous for me.	3.91	1.89
I would consider an EV a useful means of transport.	4.95	1.81

7.1.1.2. Perceived Ease of Use

The construct "Perceived Ease of Use" was determined by means of six items (see Table 4). The mean value was between 4.06 ("I believe it would be easy for me to schedule battery re-charging with my time planning") and 6.19 ("I believe learning to operate an EV would be easy for me" and "I believe it would be easy for me to become skilful at using an EV"), i.e. the respondents' agreement within this construct was much higher compared to the previous constructs. The overall mean value of all six items within this construct was 5.46 (SD=1.12). With Cronbach's Alpha at 0.79, the reliability is absolutely sufficient.

Table 4: Items of Perceived Ease of Use

(1=highly disagree, 2=highly agree)	M	SD
Perceived ease of use (Cronbach-α=0.79)	5.46	1.12
I believe an EV would be easy for me to use.	5.41	1.78
I believe learning to operate an EV would be easy for me.	6.19	1.31
I believe the operation of an EV would be clear and understandable for me.	6.16	1.28
I believe it would be easy for me to become skilful at using an EV.	6.19	1.27
I believe it would be easy for me to schedule battery re-charging with my time planning.	4.06	2.05
I believe an EV would be well-suited to carry out my daily tasks.	4.74	1.78

7.1.1.3.Perceived Enjoyment

The variable "Perceived Enjoyment" was measured by means of four items (see Table 5). The standard question of Perceived Enjoyment was "I would find using an EV ..." was followed by "uninteresting – interesting", "unenjoyful – enjoyful", "unpleasant – pleasant" and "unexciting – exciting". The mean value of these four items was between 4.77 and 5.59. The overall mean value was 5.01 (SD=1.39). With Cronbach's Alpha at 0.84, the reliability of this scale was very satisfying.

Table 5: Items of Perceived Enjoyment

	M	SD
Perceived enjoyment (Cronbach-α=0.84)	5.01	1.39
Uninteressting-interesting	5.59	1.75
Unenjoyful-enyoyful	4.77	1.73
Unpleasant-pleasant	4.89	1.62
Unexicting-exciting	4.78	1.63

7.1.1.4. Price Acceptance

From the scale of “Perceived Price Acceptance”, a rather lower agreement of the respondents was determined. The mean value of all four items (see Table 6) was 3.55 (SD=1.72), whereat the statement “The battery price of an EV (up to DKK 90,000) would be acceptable for me” had the lowest agreement with a mean value of 2.98. With a mean value of 4.31, the respondents’ relatively highest agreement was received from the item “To pay a price premium (...) for an EV would be acceptable for me”. With Cronbach’s Alpha at 0.82, the reliability of this scale is very acceptable.

Table 6: Items of Perceived Price Acceptance

(1=highly disagree, 2=highly agree)	M	SD
Perceived price acceptance (Cronbach-α=0.82)	3.55	1.72
The purchase price of an EV seems reasonable to me (e.g. an Opel Ampera costs about DKK 650,000/€ 46,000).	3.37	2.01
To pay a price premium (→ to pay about DKK 28,000/€ 5000 extra) for an EV would be acceptable for me.	4.31	2.13
The battery price of an EV (up to DKK 90,000/€ 12,000) would be acceptable for me.	2.98	1.87

7.1.1.5. Attitude towards Using

The construct „Attitude towards Using” was determined by means of four items (see Table 7). The mean value was 5.41 (SD=1.58), i.e. the respondents’ agreement with the statements was relatively high. The lowest agreement was with the statement “I would find using an EV desirable” (M=4.88), whereas the highest agreement was with the statement “I find using an EV is something positive” (M=5.77). With Cronbach’s Alpha at 0.93, the reliability of this scale can be rated as very strong.

Table 7: Attitude towars Using

(1=highly disagree, 2=highly agree)	M	SD
Attitude to use (Cronbach-α=0.93)	5.41	1.58
I have a positive attitude towards using an EV.	5.67	1.67
I would find using an EV desirable.	4.88	1.90
I like the idea of using an EV.	5.31	1.85
I find using an EV is something positive.	5.77	1.52

7.1.1.6.Social Norms

The construct “Social Norms” was determined by means of six items (see Table 8), whose mean values varied between 3.01 (“Driving a vehicle that attracts others’ attention is important to me”) and 5.58 (“EVs have a positive image in society”). The overall mean was 4.12 (SD=1.13). With Cronbach’s Alpha at 0.71, the reliability of this scale is acceptable.

Table 8: Items of Social Norms

(1=highly disagree, 2=highly agree)	M	SD
Social norms (Cronbach-α=0.71)	4.21	1.13
EVs have a positive image in society.	5.58	1.45
People react positively when they see an EV on the road.	5.22	1.37
People whose opinions are important to me find EVs good.	4.90	1.63
Driving a vehicle that attracts others’ attention is important to me.	3.01	1.92
An EV would reflect my personality.	3.44	2.01
An EV would be a status symbol for me.	3.09	2.12

7.1.1.7. Relative Advantage – Product-Related Buying Criteria

The subject “Relative Advantage” was determined by means of four different variables: the importance of “Investment and Ongoing Expenses” (two items), of “Technical Characteristics” (five items), of “Brand and Model Variety” (one item) and of “Infrastructure and Environmental Friendliness” (one item). The second part of this subsection describes, to what extent these criteria apply to EVs, compared to conventional vehicles. The third and fourth parts of this subsection describe which of the mentioned criteria would be the main reason for the respondents to purchase or not to purchase an EV. The last two questions do not include the 7-Likert Scale, which means that the respondents were asked to only select one criterion.

7.1.1.8. Importance of Investment and Ongoing Expenses

The subject “Investment and Ongoing Expenses” had a mean value of 5.90 (SD=1.37). Although only determined by means of items, Cronbach’s Alpha (=0.84) indicated high reliability. Both items had the same mean value. The importance of “Technical Characteristics” had a mean value of 5.10 (SD=1.20), whereat “High Maximum Speed” (M=4.48) was the least important feature for the respondents. On the contrary, a vehicle’s driving range was rated to be the most important feature (M=5.60). Here, the Cronbach’s Alpha was 0.71 and was therefore considered acceptable. The “Brand and Model Variety” was at an average mean value of 4.43, the “Environmental Friendliness” had a mean value of 5.50. According to the respondents, the absolutely most important attribute (M=6.36) was the “Infrastructure” of gas or charging stations.

Table 9: Items of Relative Advantage – Product-Related Buying Criteria

(1=extremely unimportant, 2=extremely important)	M	SD
Investment and ongoing expenses (Importance) Cronbach-α=0.84)	5.90	1.37
Purchase price	5.90	1.50
Maintenance costs	5.91	1.45
Technical characteristics (Importance) (Cronbach-α=0.75)	5.10	1.20
Driving range	5.60	1.63
Charging/refuelling time	5.44	1.82
Acceleration performance	4.74	1.68
Maximum speed	4.48	1.70
Dependency on fuels	5.25	1.67
Brand and model variety (Importance)	4.43	1.83
Infrastructure (Importance)	6.36	1.11
Environmental friendliness (importance)	5.50	1.57

7.1.1.9. Product-Related Buying Criteria EV vs. CV

This part of the questionnaire was created in order to determine how the respondents assess product-related attributes of an EV in comparison to a conventional vehicle. The purchase price (M=6.27) as well as the maintenance costs of an EV (M=4.43) were rated to be higher than of a conventional vehicle, i.e. the mean value of both statements was 5.35. Unfortunately, the reliability coefficient is extremely low (Cronbach-α=0.12) and therefore unacceptable. Furthermore, technical characteristics of an EV such as driving range, acceleration performance, maximum speed and dependency on fuels were rated to be inferior to the technical characteristics of a conventional vehicle (M=2.53). Whereat the brand and model variety of current EVs on the market (M=1.99) as well as the charging/refuelling time (M=5.99) of an EV were also

rated negatively, an EV's environmental friendliness was assessed to be high (M=6.38).

Table 10: Product-Related Buying Criteria EV vs. CV

	M	SD
Investment and ongoing expenses (0.12) (1=lower;7=higher)	5.35	1.12
The purchase price of an EV is ... (1=lower;7=higher)	6.27	1.12
The maintenance costs of an EV are ... ((1=lower;7=higher)	4.43	1.86
Technical characteristics (Cronbach-α=0.62)	2.53	1.14
The driving range of an EV is ... (1=shorter; 7=longer)	2.04	1.44
The acceleration performance of an EV is ... (1=lower;7=higher)	2.82	1.72
The maximum speed of an EV is ... (1=lower;7=higher)	2.49	1.37
The dependency of an EV on fuels is ... (1=lower; 7=higher)	2.79	2.02
Brand and model variety (1=smaller, 7=bigger)	1.99	1.24
Infrastructure (1=worse; 7=better)	2.08	1.54
Charging/refuelling process (1=shorter; 7=longer)	5.99	1.57
Environmental friendliness (1=lower;7=higher)	6.38	1.14

7.1.1.10. Main Reason to Purchase an EV

In this question, the respondents were asked "Of those 10 characteristics (…), which one would be the main reason for you to buy an EV?" For more than two-thirds of the sample, the main reason to purchase an EV would be its environmental friendliness (N=136, 70 percent). On the contrary, technical characteristics (15 percent) as well as investment and ongoing expenses (13 percent) would be the least reasons to purchase an EV.

Table 11: Main Reason to Purchase an EV

	M	SD
Investment and ongoing expenses (MR to Buy)	25	13%
Technical characteristics	30	15%
Brand and model variety (Main Reason to Buy)	2	1%
Infrastructure (Main Reason to Buy)	2	1%
Environmental friendliness (Main Reason to Buy)	136	70%
Purchase price	19	9%
Driving range	5	2%
Charging time	2	1%
Acceleration performance	2	1%
Maintenance costs	6	3%
Dependency on fuels	21	10%
Environmental friendliness	136	67%
Variety of brands and models	2	1%
Charging station infrastructure	2	1%
Not stated	7	3%

7.1.1.11. Main Reason not to Purchase an EV

In this question, the respondents were asked to answer the question “Of those 10 characteristics (…), which one would be the main reason for you NOT to buy an EV?” For 73 percent of the respondents, investment and ongoing expenses (37 percent) as well as technical characteristics (36 percent) are the main reasons not to purchase an EV. Yet another 24 percent of the respondents stated the main reason for them not to purchase an EV would be the charging station infrastructure. Only one percent mentioned brand and model variety to be the main reason for them not to purchase an EV.

Table 12: Main Reason not to Purchase an EV

	M	SD
Investment and ongoing expenses (MRB)	73	37%
Technical characteristics	72	36%
Brand and model variety (MRB)	2	1%
Infrastructure (MRB)	46	24%
Environmental friendliness (MRB)	2	1%
Purchase price	66	33%
Driving range	34	17%
Charging time	21	10%
Acceleration performance	9	4%
Maximum speed	6	3%
Maintenance costs	7	3%
Dependency on fuels	2	1%
Environmental friendliness	2	1%
Variety of brands and models	2	1%
Charging station infrastructure	46	23%
Not stated	7	3%

7.2. Hypotheses

In order to test the Hypotheses, an OLS (Ordinary Least Square) Regression Analysis was made. The first step was to include the covariates into the model. Secondly, the respective defined independent variables were added. Where appropriate, the third step was to add “Environmental Friendliness” to the regression, i.e. in all cases where “Relative Advantage” was defined as an independent variable. Before describing the results of the regression analysis, a bivariate description of the coherence between covariates as well as independent variables and the dependent variables is made.

7.2.1. Prediction of Perceived Usefulness: H_1, H_4 and H_6

Before describing this part's results of the regression, the respective hypotheses are showed again:

H_1: Perceived Ease of Use positively affects Perceived Usefulness
H_4: Perceived Enjoyment positively affects Perceived Usefulness
H_6: Relative Advantage affects Perceived Usefulness

Regarding the covariates, only the family status correlates with Perceived Usefulness ($r=-0.202$, $p<0.01$). Respondents of the survey being in a relationship show lower values at Perceived Usefulness. This bivariate correlation can explain four percent of the variance. Perceived Ease of Use has a high positive correlation with Perceived Usefulness ($r=0.45$, $p<0.001$). This correlation can explain about 20 percent of the variance regarding the variable Perceived Usefulness. However, the correlation of Perceived Usefulness with Perceived Enjoyment is considerably stronger ($r=0.703$, $p<0.001$). The stronger Perceived Enjoyment and Perceived Ease of Use are, the stronger is Perceived Usefulness. Among the variables determining the Relative Advantage, the importance of Technical Characteristics ($r=-0.352$, $p<0.001$) and the importance of Brand and Model Variety ($r=-0.348$, $p<0.001$) are the variables which have a significant negative correlation with Perceived Usefulness. Each of these variables can explain approximately twelve percent of the variance of Perceived Usefulness. The importance of Environmental Friendliness correlates positively with Perceived Usefulness ($r=0.381$. $p<0.001$). The higher the importance of Environmental Friendliness is for the actual purchase, the higher are the values within Perceived Usefulness. This correlation explains a variance of approximately 14 percent. There are slightly lower correlations with the rating of an EV's characteristics such as the Charging/Refuelling Process ($r=0.169$, $p<0.05$) and the Environmental Friendliness ($r=0.169$; $p<0.05$). The overall results can be viewed in Table 13.

Table 13: Pearson Product-Moment Correlation of Covariates (Socio-Demographics) and Independent Variables (PEOU, PE, RA) with Dependent Variables (PU)

	r
Investment and ongoing expenses (Importance)	-0.085
Technical characteristics (Importance)	-0.352***
Brand and model variety (Importance)	-0.348***
Infrastructure (Importance)	-0.039
Environmental friendliness (importance)	0.381***
Investment and ongoing expenses	-0.011
Technical characteristics	-0.083
Brand and model variety	0.103
Infrastructure	-0026
Charging|refueling process	-0169*
Environmental friendliness	0169*
Investment and ongoing expenses (MRB)	-0.11
Technical characteristics (MRB)	-0.105
Brand and model variety (MRB)	-0.074
Infrastructure (MRB)	-0.008
Investment and ongoing expenses (MRNB)	0.042
Technical characteristics (MRNB)	-0.143*
Brand and model variety (MRNB)	0.022
Infrastructure (MRNB)	0.126
Perceived enjoyment	0.703***
Perceived ease of use	0.45***
<=30 Y	0.032
>50 Y	0.035
Higher education	0.049
Family Status - In A Relationship	-0.202**
Family Status - Children	0.045
Employed|Self employed	-0.034

Student	-0.064
Low income (<=15 t.)	0.04
High income (>36 t.)	-0.084
Austria	0.057

Legend: ***: p<0.001; **: p>=0.001 and p<0.01; *: p>=0.01 and p<0.05

When including the Covariates in the model, this results in no significant explained variance (F(10.183)=1.597, p>0.05, R2=0.03). However, there is a significant regression coefficient at the variable Family Status – “In a Relationship” (beta=-0.22, p=0.004). When adding the independent variables Perceived Enjoyment, Perceived Ease of Use and the variables that determine the Relative Advantage, the result is a highly significant regression model (F(28.164)=8.398, p<0.001). Furthermore, adding these variables make it possible to explain 52 percent of the variance, whereat the regression coefficients of Perceived Enjoyment (beta=0.55, p<0.001) and Perceived Ease of Use (beta=0.19, p<0.01) are highly significant. The high values in these scales have a positive influence on the values of Perceived Usefulness. Among the variables of Relative Advantage, only the importance of Brand and Model Variety tends to have significant influence (beta=-0.12, p<0.05). The more important the Brand and Model Variety, the lower are the values of Perceived Usefulness. After adding the independent variables, none of the covariate variables show a significant influence. Finally, after adding the importance of Environmental Friendliness and the attribute Environmental Friendliness of EVs to the model, only marginal changes occur. The explained variance increases from 52 to 53 percent. However, this change is only tendentiously significant (p<0.10). The regression coefficients of Perceived Enjoyment (beta=0.50, p<0.001) and Perceived Ease of Use (beta=0.20, p<0.01) remain practically unchanged. The importance of Environmental Friendliness itself has a positive influence (beta=0.14, p<0.05). The regression coefficient of the age group <=30 years (beta=0.14, p<0.10) is tendentiously significant, as well as the regression coefficient of Investment and Ongoing Expenses (beta=-0.14, p<0.10) (MRNB – Main Reason Not to Buy an EV). When respondents answered the question „What would be the main reason for you not to buy an EV” with Investment and

Ongoing Expenses, this had a negative effect on Perceived Usefulness. Consequently, this proves that Perceived Ease of Use and Perceived Enjoyment have a positive influence on Perceived Usefulness. On the contrary, the effect of Relative Advantage is not that clear. High Purchase Price and Maintenance Costs as well as a low Brand and Model Variety have a rather negative effect on Perceived Usefulness.

Table 14: Results of Regression Analysis - Perceived Usefulness

	Model 1		Model 2		Model 3	
	Beta	p	Beta	p	Beta	p
(Constant)		0.000		0.783		0.547
<=30 Y	0.12	0.230	0.11	0.161	0.14†	0.075
>50 Y	-0.04	0.626	0.03	0.671	0.04	0.527
Higher education	0.07	0.342	-0.02	0.709	0.00	0.965
Family Status - In A Relationship	-0.22**	0.004	-0.08	0.143	-0.09	0.114
Family Status - Children	0.02	0.783	-0.07	0.261	-0.08	0.246
Employed|Self employed	-0.17	0.181	-0.03	0.764	-0.03	0.750
Student	-0.23	0.105	-0.07	0.476	-0.09	0.383
Low income (<=15 t.)	-0.01	0.880	-0.10	0.178	-0.10	0.149
High income (>36 t.)	-0.10	0.269	-0.06	0.383	-0.06	0.321
Austria	0.04	0.698	-0.03	0.675	-0.07	0.343
Investment and ongoing expenses (Importance)			0.08	0.245	0.07	0.345
Technical characteristics (Importance)			-0.11	0.185	-0.10	0.201
Brand and model variety (Importance)			-0.12†	0.076	-0.12†	0.075
Infrastructure (Importance)			0.02	0.714	0.00	0.937
Investment and ongoing expenses			0.02	0.700	0.03	0.571
Technical characteristics			0.01	0.937	-0.03	0.666
Brand and model variety			0.06	0.355	0.06	0.392

Infrastructure	-0.03	0.609	-0.02	0.735
Charging|refueling process	-0.07	0.263	-0.05	0.354
Investment and ongoing expenses (MRB)	-0.05	0.455	-0.07	0.263
Technical characteristics (MRB)	-0.04	0.415	-0.05	0.379
Brand and model variety (MRB)	-0.02	0.761	-0.02	0.730
Infrastructure (MRB)	0.00	0.950	0.00	0.970
Investment and ongoing expenses (MRNB)	-0.11	0.107	-0.12†	0.083
Brand and model variety (MRNB)	0.03	0.559	0.04	0.488
Infrastructure (MRNB)	-0.04	0.558	-0.05	0.453
Perceived enjoyment	0.55***	0.000	0.50***	0.000
Perceived ease of use	0.19**	0.008	0.20**	0.005
Environmental friendliness (importance)			0.14*	0.035
Environmental friendliness			-0.06	0.338
df	10;183	28;165	30;163	
F	1.597	8.398***	8.204***	
R	0.28	0.77	0.78	
R^2	0.03	0.52	.053	
$p(\Delta R^2)$		***	†	

Legend: ***: p<0.001; **: p>=0.001 and p<0.01. *: p>=0.01 and p<0.05†, p>=0.05 and p<0-10;

Model1: Covariate. Model 2: Cov + Independents; Model 3: Cov+ independents+ Environmental Friendliness

7.2.2. Prediction of Price Acceptance: H_8 and H_9

Before describing this part's results of the regression, the respective hypotheses are showed again:

H_8: Perceived Usefulness positively affects Price Acceptance

H_9: Perceived Ease of Use positively affects Price Acceptance

The bivariate correlations show correlations of Education ($r=0.221$, $p<0.01$) and Perceived Usefulness ($r=0.377$, $p<0.001$). The higher the education and the Perceived Usefulness of the respondents, the higher is the Price Acceptance. In contrast, Perceived Ease of Use does not significantly correlate with Price Acceptance ($r=0.104$, $p>0.10$).

Table 15: Pearson Product-Moment Correlation of Covariates (Socio-Demographics) and Independent Variables (PEOU, PU) with Price Acceptance

	r
<=30 Y	0.052
>50 Y	0.014
Higher Education	0.221**
Family Status - In a Relationship	0.013
Family Status - Children	-0.007
Employed – Self-employed	0.087
Student	-0.052
Low income (<=15 t.)	0.014
High income (>36 t.)	-0.007
Austria	0.076
Perceived usefulness	0.377***
Perceived ease of use	0.104

Legend: ***: p<0.001, **: p>=0.001 and p<0.01, *: p>=0.01 and p<0.05

The covariates have a tendentiously significant effect on the explained variance of Price Acceptance ($F(10.183)=1.805$, $p<0.10$). The regression coefficient of Education is significant (beta=0.25, $p<0.01$). Together, the covariates can explain four percent of the variance. When adding these two independent

variables to the model, the regression model is highly significant (F(12.181)=4.805, p<0.001). The proportion of the variance explained (R2) is now at 19 percent. The following regression coefficients are now significant or tendentiously significant: Age>50 years (beta=0.13, p<0.10), Higher Education (beta=0.23, p<0.01), Perceived Usefulness (beta=0.44; p<0.001) and Employment Status (beta=0.21, p<0.10). The Price Acceptance is positively affected by higher Education, higher Age and Employment as well as the higher Perceived Usefulness. Consequently, the hypotheses related to the explained variance can only partially be confirmed. Perceived Usefulness proves to be a positive predictor of Price Acceptance, whereas Perceived Ease of Use does not have any effect on Price Acceptance.

Table 16: Results of Regression Analysis – Price Acceptance

	Model 1		Model 2	
	Beta	p	Beta	p
(Constant)		0.023		0.659
<=30 Y	0.05	0.630	-0.02	0.807
>50 Y	0.12	0.133	0.13†	0.099
Higher education	0.25**	0.002	0.23**	0.002
Family Status - In A Relationship	0.02	0.755	0.10	0.156
Family Status - Children	0.03	0.693	0.02	0.817
Employed|Self employed	0.15	0.227	0.21†	0.073
Student	0.07	0.594	0.16	0.215
Low income (<=15 t.)	0.08	0.404	0.09	0.307
High income (>36 t.)	0.06	0.525	0.10	0.217
Austria	0.17	0.056	0.19*	0.030
Perceived usefulness			0.44***	0.000
Perceived ease of use			-0.10	0.202
df	10;183		12;181	
F	1.805†		4.805***	
R	0.30		0.49	
R^2	0.04		0.19	
$p(\Delta R^2)$			***	

Legend: ***: p<0.001, **: p>=0.001 and p<0.01, *: p>=0.01 and p<0.05, †: p>=0.05 and p<0.10, Model 1: Covariate, Model 2: Covariate + Independents

7.2.3. Prediction of Attitude towards Using: H_2, H_3, H_5 and H_{10}

Before describing this part's results of the regression, the respective hypotheses are showed again:

H_2: Perceived Ease of Use positively affects Attitude towards Using
H_3: Perceived Usefulness positively affects Attitude towards Using
H_5: Perceived Enjoyment positively affects Attitude towards Using
H_{10}: Price Acceptance positively affects Attitude towards Using

The bivariate analysis shows significant correlations with the Family Status (Relationship: r=-0.176, p<0.05, Children: r=0.21, p<0.01). Within this survey, respondents being in a relationship have a negative Attitude towards Using, whereas respondents with children have a more positive Attitude towards Using. All independent variables show highly significant correlation coefficients (Perceived Ease of Use: r=0.449, p<0.001; Perceived Usefulness: r=0.635, p<0.001; Perceived Enjoyment: r=0.758, p<0.001 and Price Acceptance: r=0.282, p<0.001). The respondents' attitude is more positive, the more distinct Perceived Enjoyment, Perceived Usefulness, Price Acceptance and Perceived Ease of Use are. Furthermore, the correlation between the countries respondents live in and Attitude towards Using (r=0.122, p<0.10). The respondents living in Austria have a higher Attitude toward Using than respondents living in Denmark.

Table 17: Pearson Product-Moment Correlation of Covariates (Socio-Demographics) and Independent Variables (PEOU, PU, PA, PE) with Attitude towards Using

	r
<=30 Y	-0.045
>50 Y	-0.003
Higher education	0.049
Family Status - In a Relationship	-0.176*
Family Status - Children	0.21**
Employed|Self employed	-0.064
Student	-0.01

Low income (<=15 t.)	-0.035
High income (>36 t.)	-0.009
Austria	0.122†
Perceived ease of use	0.449***
Perceived usefullness	0.635***
Perceived enjoyment	0.758***
Price acceptance	0.282***

Legend: ***: p<0.001, **: p>=0.001 and p<0.01, *: p>=0.01 and p<0,05, †:p>=0.05 and p<0.10

The regression model of the covariates is significant (F(10.183)=2.008, p<0.05). The proportion of explained variance (R2) is at five percent. Here, the regression coefficient of Family Status – In a Relationship (beta=-0.16; p<0.05) and Family Status – Children (beta=0.22, p<0.05). When adding the independent variables to the model, the proportion of explained variance increases to 61 percent (F(14.179)=22.083, p<0.001). When adding the independent variables, the regression coefficients of both Family Status variables are not significant anymore (In a Relationship: beta=-0.03, p>0.10, Children: beta=0.10, p<0.10). However, due to the covariates, the group “Students” results in having a positive effect on the Attitude towards Using (r=0.18. p<0.05). The covariates Children, Low Income (beta=-0.11, p<0.10) and the country respondents live in (beta=0.11, p<0.10) are tendentiously significant. Here, the respondents living in Austria and having children do have a positive Attitude toward Using, whereas low income has a negative effect on Attitude towards Using. Among the independent variables, Perceived Enjoyment (beta=0.57, p<0.001) and Perceived Usefulness (beta=0.18, p<0.05) have a positive effect on Attitude towards Using. The higher Perceived Enjoyment and Perceived Usefulness, the more positive is the Attitude towards Using. The effect of Perceived Ease of Use (beta=0.10, p<0.10) is tendentiously significant, whereas Price Acceptance does not have any statistically relevant effect on Attitude towards Using (beta<0.001, p=0.985). Further details can be found in Table 18.

Table 18: Results of Regression Analysis – Attitude towards Using

	Model 1		Model 2	
	Beta	p	Beta	p
(Constant)		0.000		0.796
<=30 Y	0.06	0.565	0.03	0.672
>50 Y	-0.07	0.418	-0.01	0.824
Higher education	0.08	0.328	0.00	0.926
Family Status - In A Relationship	-0.16*	0.031	-0.03	0.570
Family Status - Children	0.22*	0.012	0.10†	0.068
Employed|Self employed	-0.08	0.491	0.06	0.476
Student	0.03	0.811	0.18*	0.042
Low income (<=15 t.)	-0.06	0.532	-0.11†	0.068
High income (>36 t.)	-0.09	0.288	-0.05	0.400
Austria	0.13	0.137	0.11†	0.066
Perceived ease of use			0.10†	0.086
Perceived enjoyment			0.57***	0.000
Perceived price acceptance			0.00	0.985
Perceived usefullness			0.18*	0.010
df	10;183		14.179	
F	2.008*		22.083***	
R	0.31		0.80	
R^2	0.05		0.61	
$p(\Delta R^2)$			***	

Legende: ***: p<0.001, **: p>=0.001 and p<0.01, *: p>=0.01 and p<0.05, †: p>=0.05 and p<0.10, Model 1: Covariate, Model 2: Cov + Independents

7.2.4. Prediction of Intention to Use: H_7, H_{11} and H_{12}

Before describing this part's results of the regression, the respective hypotheses are showed again:

H_7: Relative Advantage affects Intention to Use

H_{11}: Social Norms positively affect Intention to Use

H_{12}: Attitude towards Using positively affects Intention to Use

Among the covariates, only the low income correlates with Intention to Use ($r=0.178$, $p<0.05$). Respondents of this survey with low income indicate higher values at Intention to Use. Social Norms ($r=0.589$, $p<0.001$) and Attitude towards Using ($r=0.561$, $p<0.001$) have a highly significant correlation with Intention to Use. The higher the values within Social Norms and Attitude towards Using are, the higher is the Intention to Use. Among the variables of Relative Advantage, there is a significant correlation with the importance of Investment and Ongoing Expenses ($r=-0.175$, $p<0.05$), the importance of Technical Characteristics ($r=-0.379$, $p<0.001$) and the importance of Brand and Model Variety ($r=-0.279$, $p<0.001$) as well as the importance of Environmental Friendliness. The less important these attributes are for the buying decision, the higher is the Intention to Use. Furthermore, there is a significant correlation with the importance of Environmental Friendliness ($r=0.485$, $p<0.001$). The more important this attribute is, the higher is the Intention to use. In addition, respondents who estimate the Brand and Model Variety comparatively better have a higher Intention to Use ($r=0.211$, $p<0.01$). The respondents' Intention to Use also increases when estimating the Charging/Refuelling Process comparatively better ($r=-0.194$, $p<0.01$). Respondents who state that Technical Characteristics are a reason for them to buy ($r=-0.185$, $p<0.01$) or not to buy a vehicle ($r=-0.154$, $p<0.05$), have a lower Intention to Use. Finally, there are several tendentiously significant correlations with regards to "main reasons to buy" and "main reasons not to buy" (see Table 19).

Table 19: Pearson Product-Moment Correlation of Covariates (Socio-Demographics) and Independent Variables (SN, A, RA) with Intention to Use

	r
<=30 Y	0.1
>50 Y	0.011
Higher education	0.064
Family Status - In A Relationship	0.025
Family Status - Children	0.055
Employed|Self employed	-0.128
Student	0.093
Low income (<=15 t.)	0.178*
High income (>36 t.)	-0.113
Austria	-0.025
Social norms	0.589***
Attitude	0.561***
Investment and ongoing expenses (Importance)	-0.175*
Technical characteristics (Importance)	-0.379***
Brand and model variety (Importance)	-0.279***
Infrastructure (Importance)	-0.115
Environmental friendliness (importance)	0.485*
Investment and ongoing expenses	-0.14†
Technical characteristics	0.044
Brand and model variety	0.211**
Infrastructure	0.119†
Charging|refueling process	-0.194**
Environmental friendliness	0.108
Investment and ongoing expenses (MRB)	-0.018
Technical characteristics (MRB)	-0.185**
Brand and model variety (MRB)	-0.085
Infrastructure (MRB)	-0.001
Investment and ongoing expenses (MRNB)	-0.032
Technical characteristics (MRNB)	-0.154*
Brand and model variety (MRNB)	-0.031
Infrastructure (MRNB)	0.22**

Legend: ***: p<0.001, **: p>=0.001 and p<0.01, *: p>=0.01 and p<0.05

The regression with the socio-demographic variables does not show a significant result ($F(10.184)=1.168$, $p>0.10$). Consequently, Age, Income, Family Status, Educational Background and the Country respondents live in have no effect on Intention to Use. When expanding the model with the variables Social Norms (beta=0.32, $p<0.001$), Attitude (beta=0.17, $p<0.05$) and Perceived Usefulness (beta=0.42, $p<0.001$), this results in a highly significant model ($F(13.181)=21.004$; $p<0,001$). The proportion of explained variance (R2) is at 57 percent. When expanding the model with the variables of Relative Advantage, the proportion of explained variance increases to 62 percent, which can be considered to be significant. In consideration of that, significant regression coefficients show the importance of Technical Characteristics ($r=-0.17$, $p<0.05$) and the respondents' rating when comparing Technical Characteristics of EVs and conventional vehicles ($r=0.14$, $p<0.05$). The lower the importance of Technical Characteristics is generally estimated by the respondents and the better the Technical Characteristics of EVs are rated compared to Technical Characteristics of conventional vehicles, the higher is the respondents' Intention to Use. The regression coefficients of Social Norms and Attitude towards Using virtually remain unchanged. As expected, the regression coefficient of Perceived Usefulness decreases (from beta=0.42 to beta=0.33). When adding Environmental Friendliness to the model, the proportion of explained variance significantly increases to 66 percent, whereat the regression coefficient Importance of Environmental Friendliness is significant (beta=0.26, $p<0.001$). Due to that, the effect of Perceived Usefulness diminishes farther (from beta=0.33 to beta=0.26). Consequently, the Comparison Rating of Technical Characteristics of EVs and conventional vehicles is no longer significant. Further information can be found in Table 20.

Table 20: Results Regression Analysis - Intention to Use

	Model 1		Model 2		Model 3		Model 4	
	Beta	p	Beta	p	Beta	p	Beta	p
(Constant)		0.000		0.012		0.665		0.838
<=30 Y	0.03	0.735	0.00	0.968	-0.01	0.840	0.03	0.597
>50 Y	0.01	0.927	0.06	0.308	0.03	0.588	0.05	0.363
Higher education	0.06	0.438	0.01	0.778	0.01	0.775	0.04	0.431
Family Status - In A Relationship	0.04	0.629	0.16**	0.002	0.11*	0.037	0.10*	0.034
Family Status - Children	0.14	0.106	0.08	0.185	0.09	0.124	0.05	0.331
Employed|Self employed	-0.08	0.494	0.04	0.632	0.02	0.828	0.00	0.956
Student	-0.01	0.947	0.09	0.346	0.07	0.466	0.02	0.803
Low income (<=15 t.)	0.16†	0.097	0.17**	0.008	0.13*	0.040	0.12*	0.043
High income (>36 t.)	-0.06	0.520	-0.01	0.875	-0.03	0.648	-0.04	0.488
Austria	0.02	0.792	-0.03	0.593	0.05	0.438	-0.01	0.850
Social norms			0.32***	0.000	0.36***	0.000	0.32***	0.000
Attitude			0.17*	0.013	0.14*	0.034	0.13*	0.038
Perceived usefullness			0.42***	0.000	0.33***	0.000	0.26***	0.000
Investment and ongoing expenses (Importance)					0.00	0.971	-0.04	0.509
Technical characteristics (Importance)					-0.17*	0.017	-0.17*	0.014
Brand and model variety (Importance)					0.01	0.870	0.03	0.620
Infrastructure (Importance)					-0.01	0.806	-0.06	0.227
Investment and ongoing expenses					-0.04	0.432	-0.03	0.584
Technical characteristics					0.14*	0.021	0.08	0.192
Brand and model variety					0.09	0.129	0.09	0.120
Infrastructure					0.03	0.574	0.04	0.468
Charging|refueling process					-0.01	0.832	0.01	0.917
Investment and ongoing expenses (MRB)					0.07	0.211	0.04	0.419
Technical characteristics (MRB)					-0.05	0.282	-0.05	0.285
Brand and model variety (MRB)					0.02	0.744	0.02	0.681

Infrastructure (MRB)	-0.02	0.711	-0.02	0.705
Investment and ongoing expenses (MRNB)	0.00	0.968	-0.01	0.867
Brand and model variety (MRNB)	0.04	0.386	0.04	0.363
Infrastructure (MRNB)	0.09	0.112	0.06	0.270
Environmental friendliness (importance)			0.26***	0.000
Environmental friendliness			-0.02	0.735

df	10;184	13;181	29;165	31;163
F	1.168	21.004***	117.790***	13.270***
R	0.24	0.78	0.82	0.85
R^2	0.01	0.57	0.62	0.66
$p(\Delta R^2)$		***	**	***

Legend: ***: p<0.001, **: p>=0.001 and p<0.01, *: p>=0.01 and p<0.05†:p>=0.05 and p<0.10, Model 1: Covariate. Model 2: Cov + Independents, Model 3: Cov + Independents model + Relative Advantage, Model 4: Cov + independents + Relative Advantage + Environmental friendliness

8. Discussion and Implications

In this section of the thesis, the outcome of the hypotheses is summarised.

The hypothesis H_1: Perceived Ease of Use positively affects Perceived Usefulness can be confirmed, the results of the statistical analysis showed that Perceived Ease of Use has a highly positive effect on Perceived Usefulness. Due to highly significant correlations, the hypothesis H_2: Perceived Ease of Use positively affects Attitude towards Using can also be confirmed. Furthermore, the hypothesis H_3: Perceived Usefulness positively affects Attitude towards Using as well as the hypothesis H_5: Perceived Enjoyment positively affects Attitude towards Using can be confirmed. In addition to that, the third and last hypothesis relating to the Attitude towards Using H_{10}: Price Acceptance positively affects Attitude towards Using can be confirmed. The respondents' attitude is more positive, the more distinct Perceived Enjoyment, Perceived Usefulness, Price Acceptance and Perceived Ease of Use are. The testing of these hypotheses revealed that respondents living in Austria have a higher Attitude toward Using than respondents living in Denmark.

Regarding the predictors of Perceived Usefulness, the hypothesis H_4: Perceived Enjoyment positively affects Perceived Usefulness can be confirmed, since the results of the analysis showed a strong correlation between these two attributes. It can be argued, that Perceived Enjoyment has an even stronger positive effect on Perceived Usefulness than Perceived Ease of Use. The stronger Perceived Enjoyment and Perceived Ease of Use are, the stronger is Perceived Usefulness. The hypothesis H_6: Relative Advantage affects Perceived Usefulness can only partly be confirmed, since variables determining Relative Advantage such as Importance of Technical Characteristics as well as Brand and Model Variety have a significantly negative effect on Perceived Usefulness, whereas the importance of Environmental Friendliness has a positive effect on Perceived Usefulness. The higher the importance of Environmental Friendliness, the higher is the Perceived Usefulness.

Relating to the attribute Price Acceptance, the hypothesis H_8: Perceived Usefulness positively affects Price Acceptance can be confirmed, since the higher the educational background and the Perceived Usefulness of the respondents, the higher is the Price Acceptance. In contrast, the hypothesis H_9: Perceived Ease of Use positively affects Price Acceptance cannot be confirmed, since there was no significant correlation between Perceived Ease of Use and Price Acceptance.

Among the hypotheses related to Intention to Use, the hypothesis H_{11}: Social Norms positively affect Intention to Use as well as the hypothesis H_{12}: Attitude towards Using positively affects Intention to Use can be confirmed. The higher Social Norms and Attitude towards Using are, the higher is the Intention to Use. The third and last hypothesis relating to the Intention to Use H_7: Relative Advantage affects Intention to Use can also be confirmed, which was revealed by the fact that the less important variables of the Relative Advantage such as Investment and Ongoing Expenses, Technical Characteristics, Brand and Model Variety as well as Environmental Friendliness are, the higher is the Intention to Use an Electric Vehicle.

The main purpose of this paper was to elaborate the determinants of the acceptance of Electric Vehicles. Even though there is not as wide a range of theories and academic literature on this topic as there is on rather commercial

topics, it can be concluded in the light of above, that the combination of different types of literature as well as the derived conceptual model supported by the empirical study led to a successful testing of the generated hypotheses. Furthermore, the major outcome of the hypothesis testing was reliable as well as consistent with the derived hypotheses.

Consequently, the findings of this study demonstrate which determinants influence both product- and consumer-related buying decisions related to Electric Vehicles. Due to empirical evidence, this thesis can contribute to the currently not yet utterly advanced research area with respect to the acceptance of Electric Vehicles. In order to improve and adjust the current standards of EV-related matters to the results of this and previous studies, the findings of this study may be of interest for marketers, governmental departments and automobile manufacturers.

9. Conclusion

A conclusion of this thesis is drawn by answering the research questions.
Research Question 1: *Which indicators determine the consumers' acceptance regarding the use of Electric Vehicles?*

According to the literature used in the context of this study as well as the empirical study, the following can be concluded: Davis' Perceived Ease of Use determines the attitude towards Using and, thus, the consumers' acceptance regarding the use of Electric Vehicles. In addition to this determinant, Davis' factor Perceived Usefulness also affects Attitude towards Using and, consequently, determines the consumers' acceptance regarding the use of Electric Vehicles. Furthermore, Van der Heijden's indicator Perceived Enjoyment positively affects Attitude towards Using and, in turn, determines the consumers' acceptance regarding the use of Electric Vehicles. Last but not least, the empirical study revealed that the indicator Price Acceptance also determines the Attitude towards Using an Electric Vehicle. This part of the study revealed the only significant difference between Austrian and Danish residents – respondents living in Austria generally had a higher attitude toward using an

Electric Vehicle. In summary, Perceived Enjoyment, Perceived Usefulness, Price Acceptance as well as Perceived Ease of Use can be considered as determinants of the consumers' acceptance of Electric Vehicles.

Furthermore, the Intention to Use an Electric Vehicle can be equated with the consumers' acceptance of Electric Vehicles. The empirical study resulted in the evidence that Social Norms are determinants of the Intention to Use. In addition, the Attitude towards Using was confirmed to be a determinant of Intention to use. The last indicator determining the Intention to Use and, hence, the acceptance of Electric Vehicles is Relative Advantage.

Research Question 2: Which factors and characteristics of an Electric Vehicle motivate consumers to consider using an Electric Vehicle?

In the context of this study, these factors and characteristics were divided into two parts – product-related buying criteria and consumer-related buying criteria. Among the product-related buying criteria, the factor investment and ongoing expenses, i.e. purchase price, is of greatest importance to the consumers, followed by technical characteristics such as driving range and acceleration performance as well as the infrastructure of battery charging stations. However, the study revealed that for one-third of the sample, the only motivating factor for consumers to consider using an Electric Vehicle was the Environmental Friendliness, whereas monetary factors such as the high purchase price of Electric Vehicles were rather deterrent. Thus, the only reason for consumers to buy an Electric Vehicle is the factor Environmental Friendliness, whereas Purchase Price and Driving Range are the reasons for two-thirds of the respondents not to buy an Electric Vehicle. When taking the consumer-related buying criteria, i.e. socio-demographic factors, into account, family status, income, educational background as well as age are factors motivating consumers to consider using Electric Vehicles.

9.1. Limitations and Future Research

In relation to this study, there are also certain limitations which have to be considered for future research. Firstly, the area research of consumers' acceptance of Electric Vehicles mainly exists in a relatively early stage. For this reason, conclusions should only be drawn with great care. Furthermore, the empirical study cannot be generalised, due to its small and relatively undiversified sample. Recommendations for future research are to include further factors such as the area of living (city or countryside) into the consumer-related buying criteria, i.e. socio-demographic factors, in order to elaborate whether or not this factor has an influence of the acceptance of Electric Vehicles. Furthermore, it would be interesting to include the factor Actual System Use of the original Technology Acceptance Model, to then conduct a long-term analysis such as observations or long-lasting surveys, in order to examine whether or not factors such as Attitude towards Using as well as Intention to Use are actual predictors of the Actual Use of System.

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Appendix A – Questionnaire Austria

Lieber Umfragenteilnehmer,

ich bin Marketing-Studentin an der Aarhus School of Business und diese Umfrage ist Teil meiner Masterarbeit.

Die Umfrage behandelt das Thema "Akzeptanz von Elektroautos" und nimmt 5 bis 7 Minuten Ihrer Zeit in Anspruch.

Alle Informationen werden vertraulich behandelt und nur im Rahmen dieser Masterarbeit verwendet.

Vielen Dank für Ihre Mitarbeit!

Eva Emsenhuber

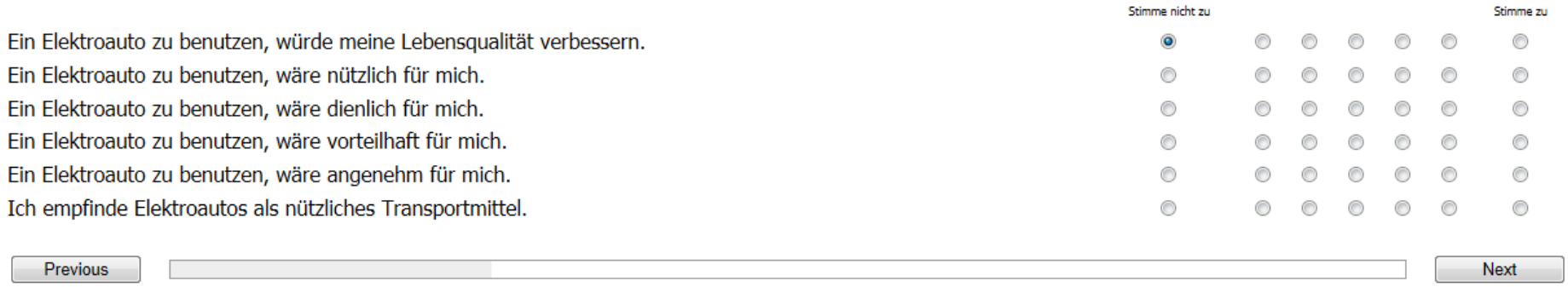
Previous

Q1: Ich lebe derzeit in Österreich.

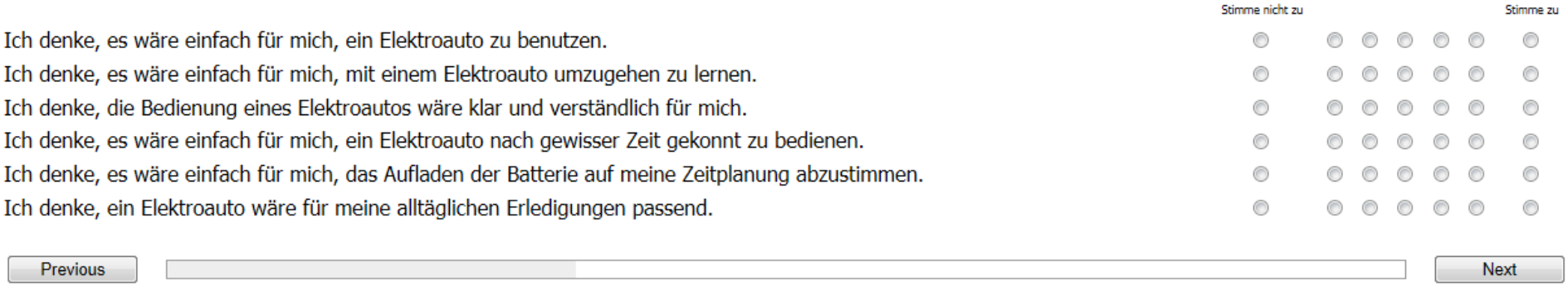
- (•) Ja
- ( ) Nein

Previous

Q2: Bitte bewerten Sie die folgenden Aussagen:



Q3: Bitte bewerten Sie die folgenden Aussagen:



Q4: Bitte bewerten Sie die folgenden Aussagen:

Ich fände die Benutzung eines Elektroautos ...	Uninteressant	Interessant
Ich fände die Benutzung eines Elektroautos ...	Unangenehm	Angenehm
Ich fände die Benutzung eines Elektroautos ...	Unerfreulich	Erfreulich
Ich fände die Benutzung eines Elektroautos ...	Langweilig	Aufregend

Previous Next

Q5: Bitte bewerten Sie die folgenden Aussagen:

Ich habe eine positive Einstellung gegenüber der Benutzung eines Elektroautos.	Stimme nicht zu	Stimme zu
Ich fände die Benutzung eines Elektroautos wünschenswert.	Stimme nicht zu	Stimme zu
Mir gefällt die Idee, ein Elektroauto zu benutzen.	Stimme nicht zu	Stimme zu
Ich sehe die Benutzung eines Elektroautos als etwas Positives.	Stimme nicht zu	Stimme zu

Previous Next

Q6: Anm.: Die Benutzung eines Elektroautos kostet ca. €4,80 pro 100km, die Benutzung eines herkömmlichen Autos kostet ca. €11,50 pro 100km.

Bitte bewerten Sie nun folgende Aussagen über Ihre persönliche Preisakzeptanz bei Elektroautos:

	Stimme nicht zu						Stimme zu
Der Kaufpreis eines Elektroautos erscheint vernünftig (z.B. ein Opel Ampera kostet ca. €46.000).	○	○	○	○	○	○	○
Für ein Elektroauto einen Aufpreis von ca. €5.000 zu bezahlen wäre für mich akzeptabel.	○	○	○	○	○	○	○
Für die Batterie eines Elektroautos ca. €12.000 zu bezahlen, wäre akzeptabel für mich.	○	○	○	○	○	○	○

Q7: Wie hoch wäre der maximale Aufpreis, den Sie für ein Elektroauto bezahlen würden (in %)?

Previous Next

Q8: Wie wichtig sind Ihnen die folgenden Eigenschaften beim Kauf eines Autos?

	Sehr unwichtig						Sehr wichtig
Kaufpreis	○	○	○	○	○	○	○
Fahrreichweite	○	○	○	○	○	○	○
Dauer des Lade-/Tankvorgangs	○	○	○	○	○	○	○
Beschleunigungsleistung	○	○	○	○	○	○	○
Höchstgeschwindigkeit	○	○	○	○	○	○	○
Wartungskosten	○	○	○	○	○	○	○
Abhängigkeit von Treibstoffen	○	○	○	○	○	○	○
Umweltfreundlichkeit	○	○	○	○	○	○	○
Marken- und Modellvielfalt	○	○	○	○	○	○	○
Ladestation-/Tankstelleninfrastruktur	○	○	○	○	○	○	○

Previous Next

Q9: Im Vergleich zu herkömmlichen Autos, wie empfinden Sie die folgenden Eigenschaften eines Elektroautos (z.B. der Kaufpreis eines Elektroautos ist geringer/höher als der eines herkömmlichen Autos)?

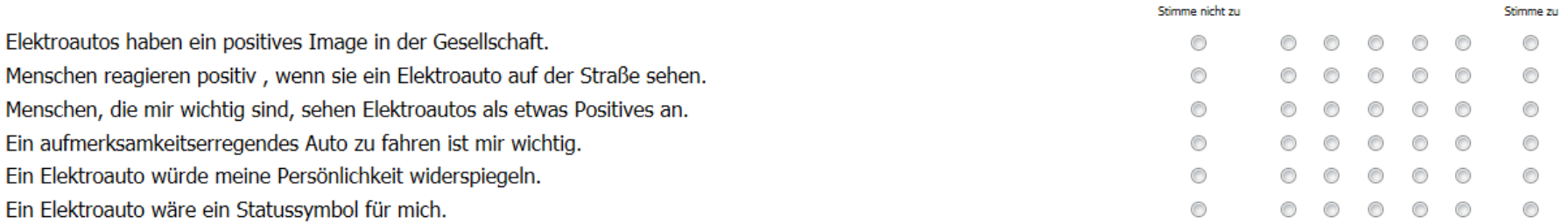
Q10: Von diesen zuvor genannten 10 Eigenschaften, welche wäre der Hauptgrund für Sie, ein Elektroauto zu kaufen? Bitte wählen Sie nur eine Eigenschaft aus!

- Kaufpreis
- Fahrreichweite
- Dauer des Ladevorgangs
- Beschleunigungsleistung
- Höchstgeschwindigkeit
- Wartungskosten
- Abhängigkeit von Treibstoffen
- Umweltfreundlichkeit
- Marken- und Modellvielfalt
- Ladestationinfrastruktur

Q11: Von diesen zuvor genannten 10 Eigenschaften, welche wäre der Hauptgrund für Sie, **KEIN** Elektroauto zu kaufen? Bitte wählen Sie nur eine Eigenschaft aus!

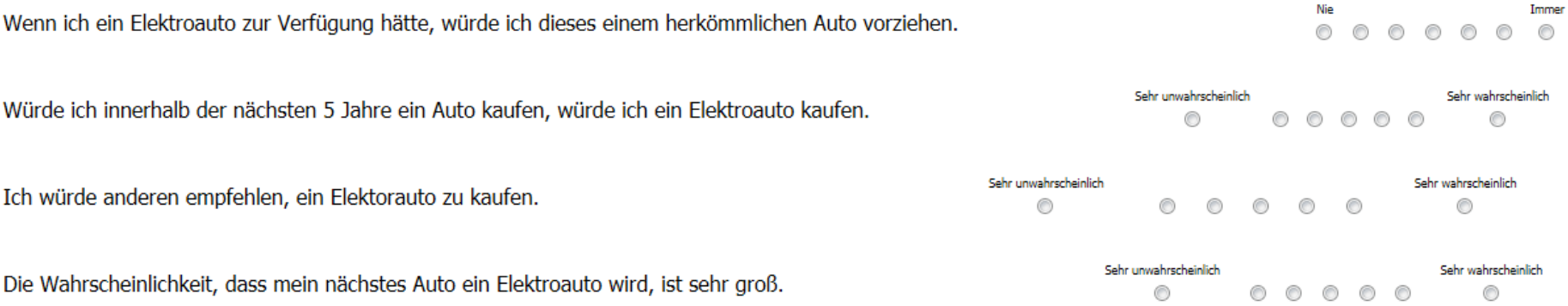
- Kaufpreis
- Fahrreichweite
- Dauer des Ladevorgangs
- Beschleunigungsleistung
- Höchstgeschwindigkeit
- Wartungskosten
- Abhängigkeit von Treibstoffen
- Umweltfreundlichkeit
- Marken- und Modellvielfalt
- Ladestationinfrastruktur

Q12: Bitte bewerten Sie die folgenden Aussagen:



Previous Next

Q13: Bitte bewerten Sie die folgenden Aussagen:



Previous Next

Q14: Geschlecht

- Männlich
- Weiblich

Q15: Alter

- 18-25
- 26-30
- 31-40
- 41-50
- 51-60
- 61-70
- 70-80
- Über 80

Q16: Familienstatus

- Single
- In einer Beziehung
- Verheiratet
- Ich habe Kinder

Q21: Ich lebe

- in der Stadt (über 20.000 Einwohner)
- auf dem Land (weniger als 20.000 Einwohner)

Previous

Q17: Welche Ausbildung haben Sie absolviert?

- Keine Ausbildung abgeschlossen
- Matura oder Ähnliches
- Bachelor oder Ähnliches
- Magister, Master oder Ähnliches
- Dr., PhD, oder Ähnliches

Q18: Beschäftigungsstatus: Sind Sie derzeit ...?

- Angestellt
- Selbständig
- ohne Beschäftigung
- Student/-in
- Haushalt
- Pensioniert

Q19: Monatliches Haushaltsnettoeinkommen (in €):

- Bis 2.000
- 2.000 – 3.000
- 3.000 – 4.000
- 4.000 – 5.000
- Ohne Angabe

Q20: Wie viele Kilometer legen Sie pro Tag durchschnittlich mit dem Auto zurück?

Appendix B – Questionnaire Denmark

Dear participant,

I am a Marketing student at Aarhus School of Business and Social Sciences and the following survey is part of my Master's thesis.

I would highly appreciate it if you took about 5-7 minutes of your time to answer a few questions.

The survey is in English and deals with the acceptance of Electric Vehicles (abbr.: "EV"). Therefore, I would like your honest thoughts about the use of EVs.

All the information you provide within this survey is strictly confidential and will only be used for this particular research.

Thank you for taking part in this survey, your help is highly appreciated!

Best regards
Eva Emsenhuber

Q1: I currently live in Denmark.

- (•) Yes
- ( ) No

Q2: With regards to the usefulness of EVs, to what extent do you agree to the following statements?							
	Highly disagree						Highly agree
Using an EV would increase the quality of my life.	◉	○	○	○	○	○	○
Using an EV would be useful for me.	◉	○	○	○	○	○	○
Using an EV would be beneficial for me.	◉	○	○	○	○	○	○
Using an EV would be convenient for me.	◉	○	○	○	○	○	○
Using an EV would be advantageous for me.	◉	○	○	○	○	○	○
I would consider an EV a useful means of transport.	◉	○	○	○	○	○	○

Q3: With regards to the ease of use of EVs, to what extent do you agree with the following statements?							
	Highly disagree						Highly agree
I believe an EV would be easy for me to use.	◉	○	○	○	○	○	○
I believe learning to operate an EV would be easy for me.	◉	○	○	○	○	○	○
I believe the operation of an EV would be clear and understandable for me.	◉	○	○	○	○	○	○
I believe it would be easy for me to become skillful at using an EV.	◉	○	○	○	○	○	○
I believe it would be easy for me to schedule battery re-charging with my time planning.	◉	○	○	○	○	○	○
I believe an EV would be well-suited to carry out my daily tasks.	◉	○	○	○	○	○	○

Q4: With regards to enjoyment of EVs, how would you rate the following statements?							
I would find using an EV ...	Uninteresting						Interesting
I would find using an EV ...	Unenjoyable						Enjoyable
I would find using an EV ...	Unpleasant						Pleasant
I would find using an EV ...	Unexciting						Exciting

Q5: With regards to your attitude towards using an EV, to what extent do you agree with the following statements?							
	Highly disagree						Highly agree
I have a positive attitude towards using an EV.							
I would find using an EV desirable.							
I like the idea of using an EV.							
I find using an EV is something positive.							

Q6: Note: Driving an EV costs about 35 DKK per 100km, while driving a conventional vehicle costs about 85 DKK per 100km. In the following, please rate your price acceptance for EVs.

	Highly disagree						Highly agree
The purchase price of an EV seems reasonable to me (e.g. a Opel Ampera costs about 650,000 DKK).	○	○	○	○	○	○	○
To pay a price premium (-> to pay about 28,000 DKK extra) for an EV would be acceptable for me.	○	○	○	○	○	○	○
The battery price of an EV (up to 90,000 DKK) would be acceptable for me.	○	○	○	○	○	○	○

Q7: How high a price premium (-> a price higher than that of conventional vehicles) would you pay for an EV (in %)?

Q8: With regards to relative advantage, when purchasing a vehicle, of how great importance would the following characteristics be to you?

	Extremely unimportant						Extremely important
Purchase price	○	○	○	○	○	○	○
Driving range	○	○	○	○	○	○	○
Charging/refueling time	○	○	○	○	○	○	○
Acceleration performance	○	○	○	○	○	○	○
Maximum speed	○	○	○	○	○	○	○
Maintenance costs	○	○	○	○	○	○	○
Dependency on fuels	○	○	○	○	○	○	○
Environmental friendliness	○	○	○	○	○	○	○
Variety of brands and models	○	○	○	○	○	○	○
Charging/gas station infrastructure	○	○	○	○	○	○	○

Q9: When comparing to a conventional vehicle, how would you rate the following 10 characteristics of an EV (e.g. purchase price of an EV is lower than the purchase price of a conventional vehicle)?

The purchase price of an EV is ...	Lower						Higher
The driving range of an EV is ...	Shorter						Longer
The charging/refueling process of an EV is ...	Shorter						Longer
The acceleration performance of an EV is ...	Lower						Higher
The maximum speed of an EV is ...	Lower						Higher
The maintenance costs of an EV are ...	Lower						Higher
The dependency of an EV on fuels is ...	Lower						Higher
The environmental friendliness of an EV is ...	Lower						Higher

	Smaller						Bigger
The variety of brands and models of an EV is ...	○	○	○	○	○	○	○

	Worse						Better
The charging/gas station infrastructure for EVs is ...	○	○	○	○	○	○	○

Q10:Of those 10 characteristics, which one would be the main reason for you to buy an EV? Please select one characteristic!

- ○ Purchase price
- ○ Driving range
- ○ Charging time
- ○ Acceleration performance
- ○ Maximum speed
- ○ Maintenance costs
- ○ Dependency on fuels
- ○ Environmental friendliness
- ○ Variety of brands and models
- ○ Charging station infrastructure

Q11: Of those 10 characteristics, which one would be the main reason for you NOT to buy an EV? Please select one characteristic!

- ○ Purchase price
- ○ Driving range
- ○ Charging time
- ○ Acceleration performance
- ○ Maximum speed
- ○ Maintenance costs
- ○ Dependency on fuels
- ○ Environmental friendliness
- ○ Variety of brands and models
- ○ Charging station infrastructure

Q12: With regards to your social life, to what extent do you agree with the following statements?

	Highly disagree						Highly agree
EVs have a positive image in society.	○	○	○	○	○	○	○
People react positively when they see an EV on the road.	○	○	○	○	○	○	○
People whose opinions are important to me find EVs good.	○	○	○	○	○	○	○
Driving a vehicle that attracts others' attention is important to me.	○	○	○	○	○	○	○
An EV would reflect my personality.	○	○	○	○	○	○	○
An EV would be a status symbol for me.	○	○	○	○	○	○	○

Q13: With regards to your intention to use an EV, to what extent do you agree with the following statements?

	Very unlikely						Very likely
If I had an EV available, I would favor driving it rather than a traditional vehicle.	○	○	○	○	○	○	○
If I were to purchase a vehicle within the next 5 years, I would purchase an EV.	○	○	○	○	○	○	○
I would recommend others to purchase an EV.	○	○	○	○	○	○	○
There is a high probability that my next vehicle will be an EV.	○	○	○	○	○	○	○

Q14: Gender

- ○ Male
- ○ Female

Q15: Age

- ○ 18-25 years
- ○ 26-30 years
- ○ 31-40 years
- ○ 41-50 years
- ○ 51-60 years
- ○ 61-70 years
- ○ 70-80 years
- ○ Over 80 years

Q16: Family status

- ☐ Single
- ☐ In a relationship
- ☐ Married
- ☐ Children

Q17: Education - What is the highest degree or level of school you have completed?

- ○ No school completed
- ○ High school or similar
- ○ Bachelor or similar
- ○ Master or similar
- ○ PhD or similar

Q18: Employment Status - Are you currently ...?

- ○ Employed
- ○ Self-employed
- ○ Unemployed
- ○ A student
- ○ A housekeeper
- ○ Retired
- ○ Unable to work

Q19: Income - Your monthly Household Income after tax (in DKK) amounts to ...?

- ○ Up to 15,000
- ○ 16,000 – 25,000
- ○ 26,000 – 35,000
- ○ 36,000 – 45,000
- ○ 46,000 – 50,000
- ○ More than 50,000
- ○ Not stated

Q20: On average, how many kilometers do you cover per day by car?

Q21: Where do you live?

- ○ In a city (more than 20,000 inhabitants)
- ○ In the countryside (less than 20,000 inhabitants)