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Bachelor Thesis Urban, Port & Transport

The influential factors to consumers buying an electric car

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Abstract

This thesis researches the factors that influence the decision of consumers to buy an electric car. The topic is essential because of the emerging electric car market. The transition to electric cars will be more effective with more research. The research is composed of a literature review and a survey. The results will be divided into descriptive statistics, single regressions, and multiple regressions that are executed in SPSS. The result of the study is that respondents who do not have a car are open to buying an electric car in the next five years if they live in a detached or row house. They are also more open to buying an electric car if there is room to install a charging station at home and an available charging station at work. Respondents with an internal combustion engine car who are open to switching to electric cars live in an owner-occupied, detached, or row house. They are also more open to switching to an electric car if a charging station is available at work. The main reason for not switching to an electric car is that their car is not ready for replacement yet, followed by range, charging infrastructure, purchase price, habit, and knowledge of electric cars. Charging speed is the most frequently chosen improvement factor of the charging infrastructure, followed by availability, location, and accessibility. All respondents with an electric car live in an owner-occupied house and are, on average older than the other respondents. All respondents with an electric car are more satisfied with the fuel infrastructure than the charging infrastructure. Respondents with an electric car chose the same improvement factors of the charging infrastructure as respondents with an internal combustion engine car. Ease of use and electricity costs are not essential factors.

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1. Introduction

According to the survey of the Global Electrical Vehicle Outlook in The United States in 2022 (*Trends in electric light-duty vehicles – Global EV Outlook 2022 – Analysis - IEA*, 2022), the market for electric cars is experiencing a significant increase worldwide, with sales of electric cars reaching record highs in 2021. Despite the COVID-19 pandemic and associated supply chain challenges, this record was achieved. Around 120,000 electric cars were sold worldwide in 2012, compared to a weekly sale of 120,000 in 2021. As of 2021, electric cars account for 9% of the total car market in the world. China is the market leader, followed by Europe. China and Europe account for 85% of the electric car sales market share. Electric car sales growth in China is mainly due to the decarbonization plan, achieved through government subsidies and subnational regulations. In Europe, the plan to reduce CO2 emissions drives electric car sales growth, achieved through purchase subsidies and tax benefits, like in China and other larger economies, such as Brazil, India, and Indonesia, the growth of the electric car market remained low until 2021, with the lack of government regulations and an accessible charging infrastructure hindering market growth in emerging and developing economies. Worldwide, consumer spending on electric cars has increased eightfold in the last five years, and government spending on purchase subsidies and tax benefits has doubled in the last five years.

1.1 Problem statement

Despite the growing electric car market, as described above, it is necessary to investigate what factors affect consumers' choice to buy an electric car. Knowing which factors matter will allow automakers, policymakers, and other stakeholders to promote electric cars. Effective action can be taken to ease the adaption of electric cars. The transition to a more sustainable transportation system will thus be more easily achieved.

1.2 Aim of the thesis

The aim of this thesis is to gather valuable insights and recommendations to advance the process of further developing the adoption of electric cars. More development is achieved by investigating and analyzing which factors significantly contribute to consumers' buying an electric car. This research can provide practical insights into the electric car industry.

1.3 Research Question

To investigate the problem and achieve the goal of the thesis, the following research question is formulated:

What factors influence the decision of consumers to buy an electric car?

1.4 Abbreviations and Definitions

This study will abbreviate an internal combustion engine car to an ICE car. In addition, the following definitions will be used:

Charging infrastructure: This term refers to the network of charging points for charging electric cars and the required facilities. Examples include home chargers and public chargers.
Fuel infrastructure: This term refers to the network of facilities needed to refuel cars with internal combustion engines. With a fueling station as an example.

2. Literature Review

2.1 Buying factors

There are multiple buying factors that consumers consider to be important when buying an electric car. According to Mies et al. (2018), consumers consider it essential that the location of charging stations is close to their destination. Also, ease of use and the availability of parking spaces at charging stations are essential factors. Consumers also prefer charging stations with low costs and high charging speeds. Considering these factors, the transition to sustainable mobility can be stimulated. Another study (*Trends in electric light-duty vehicles – Global EV Outlook 2022 – Analysis - IEA*, 2022) shows that there has been an increase in the number of models in the electric car market, making the supply more attractive to consumers. In addition to the number of models, there has been a rise in the range that an electric car can travel when fully charged, resulting from the availability of models with larger batteries and lower CO2 emissions.

Automakers are attempting to increase the range as much as possible to boost sales, but larger batteries require increased resources and, therefore, higher prices. According to the survey conducted by EVX in The United States in 2022 (*2022 U.S. Electric Vehicle Consideration (EVC) Study*, 2022) among 10,030 consumers with and without an electric car, the new models are leading to more consideration for buying an electric car. Consumers are changing their sceptical view of electric cars to one of increasing consideration. Consumers who own a home are more likely to consider buying an electric car than those who rent because homeowners place more value on the investment of a charging station at home. Consumers who do not consider buying an electric car say in 34% of cases that this is due to a lack of access to charge their electric car. Consumers who use their cars daily and therefore face high gasoline prices are increasingly interested in switching to an electric car. In contrast, people who use their cars less frequently are less likely to consider switching to an electric car. Consumers see more benefits of electric cars the more they use their cars. There is a significant market share to be gained for people who have never owned a car. Many consumers also need more information about electric cars and want to be better informed about their use and benefits when purchasing one. The survey by EVX in The United States in 2023 (*2023 U.S. Electric Vehicle Experience (EVX) Ownership Study*, 2023), which included 7,073 electric car consumers, reveals that consumer preferences for electric cars are shifting towards quality and style. However, the mass market for electric cars is growing faster than the market of premium brands. New consumers buying an electric car for the first time primarily look for quality, reliability, driving pleasure, safety, and technological features. The main reason these new consumers purchased an electric car was primarily the expected lower running costs and tax incentives. The tax incentive was

also a consideration for consumers in the survey of EVX in The United States a year before (*Trends in electric light-duty vehicles – Global EV Outlook 2022 – Analysis - IEA*, 2022). In conclusion, the factors that are important for consumers when purchasing an electric car include quality, reliability, service, technological features, interior and styling, safety, battery range and accuracy, availability of public charging stations, cost of ownership, driving pleasure, and ease of charging at home.

2.2 Availability of charging stations

According to the Global Electrical Vehicle Outlook survey in The United States in 2022 (*Trends in charging infrastructure – Global EV Outlook 2022 – Analysis - IEA*, 2022), the market for electric vehicles is on the rise. This means that access to public charging stations for electric cars must also increase to meet the demand. Today, most people charge their electric cars at home or work. However, electric car consumers will increasingly expect to receive the same services as gasoline cars in the future. Worldwide, there has been a growth of 45% in public charging stations in 2020 and 37% in 2021. Between 2015 and 2019, charging stations had an average annual growth of 50%. The more public fast chargers there are, the longer the range. This solves the problem where consumers fear buying an electric car because they suffer from range anxiety. Therefore, the number of public fast chargers is currently growing faster than the number of public slow chargers. The growth in the scale of fast chargers' production leads to a cost reduction of 67% in the production of fast chargers between 2016 and 2019. The growth of slow chargers is much slower during the pandemic than in previous years. Between 2015 and 2020, there was an average growth worldwide of 60%. The Netherlands has the highest number of slow chargers in Europe, followed by France and Germany. Various factors contribute to the appropriate number of electric cars per charging station, including the average distance and population density. The study of Metais et al. (2022) examined options for modelling the charging infrastructure for electric vehicles. It is a complex process due to considering all the factors, such as the growth in the number of electric vehicles, travel patterns, available energy, and charging station locations. To model the charging infrastructure, data and historical information can be used in which demand can be considered. The analysis can focus on individual behaviour or an entire network. There is growing interest in planning and expanding the charging infrastructure, but there are still challenges regarding funding and implementation.

There is still a significant disparity in the availability and accessibility of public charging stations worldwide, according to Brink et al. (2016). There are several challenges associated with the development of public charging stations. Firstly, unlike conventional vehicles, there is a lack of standardization of different charging stations. Additionally, installation costs are still high. Finally,

there is considerable uncertainty about the future of electric vehicles. One solution to these problems could be to improve cooperation between countries and stakeholders. This could involve jointly deciding on a standard, uniform charging station. Collaboration could lead to innovations and cost benefits. However, according to the Global Electrical Vehicle Outlook survey in The United States in 2023 (*2023 U.S. Electric Vehicle Experience (EVX) Ownership Study*, 2023), there is a difference in satisfaction with public charging points between consumers who own an electric car. Consumers who own a premium electric car are much more satisfied with the availability of public charging stations than consumers with a mass-produced electric car. According to the EVX study conducted in The United States in 2022 (*2022 U.S. Electric Vehicle Experience (EVX) Public Charging Study*, 2022) among 11,554 consumers with an electric car, it was found that consumers believe that there are too few public charging stations. The number of electric cars is growing faster than the ratio of public charging stations. However, consumers are satisfied with the ease of use of public charging stations.

In the study by Wolbertus and Van Den Hoed (2017), the phenomenon called "charging station hogging" is investigated. This phenomenon occurs at public charging stations for electric vehicles. Drivers of their electric vehicles leave their cars at a charging station for a prolonged period, occupying the charging station while their electric vehicle is already charged. Other drivers need access to this charging station if it is occupied. In Amsterdam, 20% of all charging sessions result in electric vehicles being charged for more than 4 hours, and sometimes charging sessions last 12 hours. In 50% of all charging sessions, electric vehicle batteries are fully charged within 2 hours. Most "charging station hogging" occurs at popular locations such as airports and shopping centres. There is a need for regulation against "charging station hogging" to maintain accessibility to charging stations for all electric vehicle drivers. The current regulations need to be revised to counteract this phenomenon. This can cause inconvenience and frustration for electric vehicle drivers. One solution could be price differentiation. Enforcement and additional regulations could also be implemented to prevent this problem.

According to the survey conducted by EVX in The United States in 2023 (*2023 U.S. Electric Vehicle Experience (EVX) Home Charging Study*, 2023) among 13,860 consumers with an electric car, it appears that 35% of consumers always schedule when they charge their electric car at home. In contrast, 49% of consumers never use scheduling. Satisfaction with a home charging station is measured based on the following factors: fairness of price, length of charging cable, size of charger, ease of cable management, charging speed, ease of use, reliability, and cost of charging.

2.3 Charging speed

There are three different ways to charge an electric vehicle, according to Arter (2023). The first type is slow charging. This is the slowest way to charge an electric car, and it can take up to 18 hours to fully charge. This type is often found at home and sometimes at workplaces where there has yet to be much investment in electric cars. There is also fast charging, often at public charging points such as supermarkets and car parks. In some cases, this type is installed at home. Fast charging is three times faster than slow charging, taking 4 to 6 hours to charge an electric car fully. Fast chargers are also safer regarding fire safety and have lower electricity costs. However, purchasing a fast charger is more expensive than a slow charger. The fastest way to charge an electric car is through rapid charging. These charging stations are often found next to highways. On average, it takes about an hour to charge an electric car with rapid charging fully. However, many electric car batteries are not designed to handle the charging speed of rapid chargers, and using this charging regularly can be harmful. It is not possible to install a rapid charger at home.

The study by Sun et al. (2016) examines the choice behaviour of electric vehicle drivers in choosing fast charging stations to understand their preferences better. The main finding is that the distance between the driver's home location and the fast-charging station should be as small as possible. The preference lies in familiar locations where the electric car can be charged, such as a gas station. Next, the charging speed is the most essential factor for the driver. Once drivers have chosen a fast-charging station, the price of fast charging no longer plays a significant role in the decision to charge the electric car. Therefore, operators of fast charging stations should focus on location and charging speed, as these are the most critical factors. The network of fast charging stations can be expanded, and the charging speeds should be increased. The article by Anderson et al. (2018) found that users of electric vehicles prefer fast chargers with a charging time of 30 minutes or less. The preference is for stations near highways and available in major urban areas. The fast chargers should be reliable and user-friendly, with clear instructions. Once again, price is only one of the important factors when people use a charging station. Fast chargers remain essential, but there is also a need for more charging stations in parking lots.

According to Hardman et al. (2018), the convenience for consumers is increased by high charging speed, which reduces travel time. If the charging process takes less time than currently, it can encourage consumers to choose an electric car. A fast-charging station requires higher power than a regular charging station, which affects the location, as there needs to be a more significant investment in infrastructure and distribution networks.

Consumers who own an electric car are less satisfied with the charging speed of electric cars from 2022 and 2023 than with models from 2020 and 2021 (*2023 U.S. Electric Vehicle Experience (EVX) Home Charging Study*, 2023). According to Schroeder and Traber (2012), the cost of fast-charging infrastructure is very high compared to regular charging stations. The problems lie mainly in the high costs of building a fast-charging station and the need for more suitable locations. These problems can be solved by collaboration between policymakers and the industry. The costs of the technology can be reduced in this way. This outcome can play an essential role in reducing the number of consumers who experience limited-range anxiety, thus increasing the acceptance of electric vehicles. The number of stakeholders is large enough to take on the challenge. Consumers, automakers, network operators, and government agencies are interested in this issue. Therefore, it is essential to stimulate the mobility of electric vehicles. The need for fast charging points is greatest along the highways. The economic feasibility of this problem depends mainly on investment costs, operating costs, consumer usage frequency, and electricity costs.

2.4 Electricity costs

According to a survey conducted by EVX in The United States in 2023 (*2023 U.S. Electric Vehicle Experience (EVX) Home Charging Study*, 2023), there is lower satisfaction among consumers who charge their electric cars at home due to rising electricity costs. The electricity costs have increased due to the inflation period. Satisfaction with home charging has decreased by 12 percentage points in The United States in one year. Electricity costs play a significant role in consumers' decisions to purchase an electric car. Research by Brink et al. (2016) shows that consumers prefer a fixed electricity price. Consumers attach great importance to the predictability of their charging costs. They appear concerned about uncertain costs and prefer certainty over overpaying based on usage. Another study by Sierzchula et al. (2015) concludes that financial incentives have a positive effect on the sales of electric cars. This mainly concerns benefits such as subsidies and tax advantages, but electricity costs also play a role. However, it is emphasized that the financial benefits for consumers must be applied long-term and consistently to have a positive effect. This reflects consumers' importance to certainty, as shown in the Brink et al. (2016) study.

Although there is inflation, the long-term cost of electricity must also be considered. According to the International Energy Agency's World Energy Outlook 2022 (Key findings - World Energy Outlook 2022 - Analysis - IEA, 2022), electricity demand continues to grow. It is estimated that more than 60% of global energy use will come from renewable sources by 2050. Solar and wind power are expected to become the most essential sources. The cost of renewables continues to decline. Solar energy is

already the cheapest form of power generation in some countries. In addition to inflation, other factors that determine the price of electricity include fuel prices, investment in energy infrastructure, policy measures and the development of new technologies. Thus, the high energy prices currently in play are expected to be replaced by lower prices. There is a spike in prices now, but according to long-term predictions, prices will start to fall again at some point.

In the Muratori et al. (2019) study, the rates for fast charging of electric vehicles are compared to the average household electricity consumption costs. These rates vary around the world and between different suppliers in a country. Uniform rates could increase the acceptance of the use of fast charging. The rates for fast charging an electric car are more expensive than the usual electricity costs. As the current costs of fast-charging electric vehicles are high, this could jeopardize their viability. Cost-effectiveness can be improved by varying rates based on the time of day. This could also result in less strain on the cost network. Therefore, consistency is needed to promote the integration of renewable energy sources.

By examining charging patterns, the electricity demand can be predicted according to Moon et al. (2018). This can reveal patterns to develop models that meet the needs and predict the future electricity demand for electric vehicles. The charging behaviour of consumers varies widely and depends on various factors, such as the type of electric vehicle, the location where the vehicle is charged, and the time it is charged. There is a distinction between consumers who charge at night and during the day and between regular and fast chargers. Energy suppliers can use this information to plan and manage the electricity grid. This can minimize the load on the electricity grid and provide more certainty about electricity costs for consumers.

The study by Zhou et al. (2016) focuses on home energy planning. Intelligent home energy management systems can be used for this purpose. These systems can reduce energy consumption in the home, increasing energy efficiency. The first advantage of a home energy management system is reducing energy consumption. Energy is also allocated efficiently, resulting in energy savings during peak hours and allowing to take advantage of variable energy rates. With this system, it is possible to monitor and manage energy consumption from all house devices. The demand and supply of energy can now be more accurately determined and actively managed. These are all advantages to efficiently incorporating renewable energy sources into households, but limitations exist. These intelligent energy systems, intended to reduce energy costs in the home, are expensive to purchase, install, and maintain. The use of monitoring for user energy consumption could also pose privacy problems. It could also be complex for users to configure and set up the systems and ensure interoperability

between the various devices. Finally, a fixed energy management system must be in place to address unexpected system failures; otherwise, an entire house will be without power. Most limitations can be overcome through further development of home energy management systems. The high costs are the biggest challenge for quickly integrating systems.

2.5 Factors

To answer the main research question, Table 1 lists the factors influencing consumers buying an electric car and the related themes. Among the themes of 'Buying Factors', there is a primary focus on aspects of the electric car itself. The themes that can be used to answer the research question are home chargers, location and Availability of public charging stations, ease of use, electricity costs, charging speed, and parking spaces at public charging stations. General themes to filter survey respondents are housing situation, frequency of car use, and new car owners. There are also themes to focus on when looking at the 'Availability of charging stations' factor. These are home and work chargers, Availability and accessibility of public chargers, public fast and slow chargers, ease of use, electric cars per charging point and charging station hogging. The 'Charging Speed' themes are relevant in slow, fast, and fast charging, home distance to public fast chargers and travel time reduction. Last, we can look at the theme of 'Electricity costs', such as the difference in electricity costs at different charging points. The rest of the themes of this factor mainly focus on electricity costs and have no contribution to improving the charging infrastructure.

Table 1

Buying Factors of Consumers to Buy an Electric Car with Associated Important Themes.

Factors	Most important themes
Buying factors	Price of the electric car
	Quality, Interior and Style
	Safety and Reliability
	Driving pleasure
	Technological features and Models
	Driving (battery) range and Accuracy
	Service
	Subsidies, Tax benefits and Regulations
	Home charger
	Location public charging stations
	Availability of public charging stations

	Ease of use of charging stations
	Parking spaces at public charging stations
	Electricity costs of charging
	Charging speed of (public) charging stations
	Housing situation
	Amount of car use
	New car owners
Availability of charging stations	Chargers at home and work
	Availability public chargers: average distance
	Accessibility public chargers: locations
	Public fast and slow chargers: range anxiety
	Ease of use
	Installation costs of (public) charging stations
	Lack of standardization
	Electric cars per charging station
	Population density
	Travel patterns
	Available energy
	Charging station hogging
Charging speed	Slow charging: home or workplace
	Fast charging: public charging points or home
	Rapid charging: highways
	Home distance to public fast chargers
	Reducing travel time
Electricity costs	Inflation period and Long-term trends
	Consumer satisfaction
	Electricity demand
	Fixed electricity prices: predictability
	Uniform rates between suppliers
	Positive effect of financial incentives
	Renewable electricity sources
	Home energy management system

3. Methodology

A mixed-methods study is being conducted in this research, examining what factors influence consumers' choice to buy an electric car. This is expressed in words and figures. The mixed-method method was chosen because a more profound understanding was needed to gain information about consumer behaviour regarding the purchase of an electric car by using both qualitative and quantitative data. The literature review provides a basis for the qualitative data and context for the qualitative data from the survey. In this way, the survey provides statistical information about trends and relationships between different chosen variables. The literature review helps explore existing theories and research. The literature review has collected papers through Google Scholar and news articles. This provides the theoretical basis for further research. Survey research was chosen because it offers the possibility of collecting quantitative data from respondents. From the responses, behaviour related to consumer behaviour around electric cars can be measured.

The survey from Appendix 1 consists of general questions to differentiate between different groups of respondents between people without a car, with an ICE car and with an electric car. Different relevant factors can then be examined per group. The basic general demographic questions include age, gender, living situation, housing type and whether respondents have a car. Respondents without a car are asked whether they plan to buy an electric car and whether there is space at home for a charging station. They are also asked about available charging stations at work, their perception of charging infrastructure, and what keeps people from buying an electric car. The same is asked of people with an ICE car. They are also asked if they have ever considered buying an electric car. The same questions are asked of people who own an electric car. They are also asked if they have ever experienced ‘charging station hogging’.

Only fully completed survey responses were included in the data to increase the reliability and quality of the survey and data. This reduces the risk of bias. Only the 103 fully completed responses from the survey were included. A Dutch survey was chosen to increase the reach among my acquaintances. Increasing accessibility can ensure a more significant response rate, and thus more perspectives can be offered within the chosen sample. There will also be differences between respondents from different countries because here, there are social, cultural, and infrastructural differences with the Dutch consumers' perceptions of electric cars.

A combination of described statistics, single regressions, and multiple regressions was chosen for the data analysis. The data were processed in SPSS. This combination of descriptive statistics was chosen

to identify as many statistical relationships as possible. In this, using SPSS provides a reliable and standardized method for such analysis. The survey results can be divided into five categories. First, we can look at the complete data set of all respondents. Second, to all respondents without a car. Third, we can look at all respondents with a car. The respondents with a car can then be divided into those with an internal combustion engine (ICE) or an electric car. There are 103 usable responses with a 100% progression rate. The respondents are divided into 33 males and 70 females. The distribution of age is shown in Table 2. There are no respondents older than 65 years, and the average age of all respondents lies between 18 and 35 years. The sample consists mainly of younger respondents.

Table 2

Age Distribution of All Respondents.

	Age Group	**Frequency**	**Percent**
Valid	< 18	1	1.00%
	18 - 25	64	62.10%
	26 – 35	11	10.70%
	36 - 45	5	4.90%
	46 – 55	15	14.60%
	56 – 65	7	6.80%
	Total	103	100.0%

The distribution of living situations is shown in Table 3. Most of the respondents live in a rented property. If we analyze the housing type, 44 respondents live in a flat or apartment, 21 live in a detached house, and 32 live in a row house. In addition, six respondents indicated living in another type of housing.

Table 3

Housing Situation Distribution of All Respondents.

	Housing Situation	**Frequency**	**Percent**
Valid	Rental property	45	43.70%
	Owner-occupied home	33	32.00%
	Living at home	25	24.30%
	Total	103	100.0%

4. Results

4.1 All respondents

A total of 53 respondents owns a car, and 50 respondents do not own a car. Of the 53 respondents with a car, eight have an electric car, and 45 have an internal combustion engine car. Table 4 shows the relationship between age and living situation. It shows that 84,40% of the rental housing comes from respondents aged 18 to 25 years. The same age group contains 88.00% of respondents who live at home. Respondents with owner-occupied housing come for 45.50% of the age group 46 to 55 years. Among respondents, the living situation mainly depends on the respondents' age.

Table 4

Relationship between Age and Living Situation of All Respondents.

	Age Group	Rental property	Owner-occupied home	Living at home	Total
Valid	< 18	0.00%	3.00%	0.00%	1.00%
	18 - 25	84.40%	12.10%	88.00%	62.10%
	26 – 35	8.90%	12.10%	12.00%	10.70%
	36 - 45	4.40%	9.10%	0.00%	4.90%
	46 – 55	0.00%	45.50%	0.00%	14.60%
	56 - 65	2.20%	18.20%	0.00%	6.80%
	Total	100.00%	100.00%	100.00%	100.00%

A single regression model with car ownership as the dependent variable and age as the explanatory variable is significant, $F(1.101) = 41.251$, $p < .001$. Car ownership is for 29.00% explained by the variable age according to the R-square value with a correlation coefficient of 0.539. The value of the regression coefficient is -0.196 with a constant of 2.053, and both values are significant because of the p-values that are both less than 0.01. The explanatory variables gender ($p = .091$), living situation ($p= .296$) and type of housing ($p = 0.504$) have no significant linear relationship with the dependent variable car ownership. In addition, we can analyze the type of car as a dependent variable. The explanatory variables age ($p = .312$), gender ($p = .897$), living situation ($p = .609$), and type of housing ($p = .229$) also show no significant linear relationship with respondents' type of car.

Age ($p = .423$) is also not a significant explanatory variable for the housing situation of the respondents as a dependent variable. A single regression model with the housing situation of the respondents as the dependent variable and housing type as an explanatory variable is significant,

F(1.101) = 32.245, $p < .001$. The housing situation is explained 24.20% by the variable housing type according to the R-square value with a correlation coefficient of 0.492. The regression coefficient is 0.400 with a constant of 1.006, and both values are significant because of the p-values that are both less than 0.01.

A multiple regression was used to test car ownership as the dependent variable, with age, gender, living situation, and type of housing as the independent variables, as shown in Table 5. These variables significantly predict car ownership, F(4.98) = 12.136, p < .001. The independent variables forecast the dependent variable for 33.10% according to the adjusted R-square value with a correlation coefficient of 0.576. The value of the constant is 8.195, and the regression coefficient of age is -6.607. Both values are significant, $p < .001$. The regression coefficient of gender (p = .239) is 1.185, living situation (p = . 158) is -1.422, and housing type (p = .041) is 2.073, but the last three independent variables are not significant.

Table 5

Correlation Matrix for Age, Gender, Living Situation, and Housing Type as Independent Variables for the Dependent Variable Car Ownership of All Respondents.

Variable	1	2	3
Constant	8.195**	9.784**	11.964**
1. Age	-6.607**	-6.238**	
2. Gender	1.185	1.211	
3. Living Situation	-1.422		-.97
4. Housing Type	2.073		.136

Note. N = 102

* Correlation is significant at the 0.05 level (2-tailed)

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

A multiple regression with the type of car as a dependent variable and age, gender, living situation, and type of home (p = .766) as independent variables is not significant, as shown in Table 6. Also, the combinations of age and housing situation (p = .541), age and gender (p = .593), age and housing type

(p = .412), gender and living situation (p = .847), gender and housing type (p = .363), and housing type and living situation (p = .360) are not significant as independent variables in the multiple regression.

Table 6

Correlation Matrix for Age, Gender, Living Situation, and Housing Type as Independent Variables for the Dependent Variable Type of Car of All Respondents.

Variable	1	2	3
Constant	3.109*	4.633**	6.344**
1. Age	.572	1.020	
2. Gender	.307	.181	
3. Living Situation	.061		-.118
4. Housing Type	.728		1.096

Note. N = 52

* Correlation is significant at the 0.05 level (2-tailed)

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

4.2 Respondents without a car

A total of 50 respondents who do not own a car responded to the survey. Of these respondents, 12 are male, and 38 are female. The average age of these respondents lies between the age group of 18 and 25 years. As shown in Table 7, this age group represents 90.00% of the respondents without a car.

Table 7

Age Distribution of Respondents Without a Car.

	Age Group	**Frequency**	**Percent**
Valid	< 18	1	2.00%
	18 - 25	45	90.00%
	26 - 35	2	4.00%
	46 - 55	2	4.00%
	Total	50	100.00%

Most respondents without a car currently own a rental property. Thirty respondents own a rental property, compared to 4 respondents with owner-occupied homes and 16 who live at home. A total of 29 respondents live in a flat or apartment, three live in a detached house, and 15 live in a row house. Besides these housing types, two respondents live in a semi-detached house, and one lives in a chalet. As shown in Table 8, 22 respondents without a car plan to buy a car in the next five years and are open to considering an electric car. This is a crucial audience to inform about the purchase of an electric car.

Table 8

Distribution of Respondents Without a Car Planning to Buy a Car in the Next 5 Years and are Open to Considering an Electric Car.

	Buy a Car in 5 Years	**Frequency**	**Percent**
Valid	Yes	22	44.00%
	No	14	28.00%
	I don't know	14	28.00%
	Total	50	100.0%

Of all respondents, three do not know what charging infrastructure means, and 47 do not understand the definition. Of the 47 respondents who understand the definition of the charging infrastructure, 17 respondents have space for a charging station at home, and 30 respondents do not have space for a charging station at home because, for example, they do not have a garage or driveway. Of all respondents, 38 have a job, and 12 are without one. Of the 38 respondents who are currently employed, 11 respondents have an available charging station at their workplace. In addition, 18 respondents do not have an available charging station at their workplace, and nine do not know if one is available.

In addition, the relationship between respondents planning to buy a car in the next five years and being open to an electric car can be analyzed compared to other variables. Table 9 shows the relationship between the housing type. No clear conclusion can be drawn for respondents who live in a flat or apartment and whether they are open to an electric car. Respondents in a detached house and a row house have a higher percentage who are open to considering an electric car if they buy one in the next five years. So, it is expected that more respondents will be open to considering an electric car if they plan to buy a car in the next five years and if they do not live in a flat or apartment but in a detached house or a row house.

Table 9

Respondents Without a Car who Plan to Buy a Car in the Next 5 Years and are Open to Considering an Electric Car in Relationship to their Housing Type.

		Housing Type				
	Consideration Electric Car	**Flat or Apartement**	**Detached House**	**Row House**	**Other**	**Total**
Valid	Yes	29.60%	100.00%	60.00%	40.00%	44.00%
	No	44.40%	0.00%	6.70%	20.00%	28.00%
	I don't know	25.90%	0.00%	33.30%	40.00%	28.00%
	Total	100.00%	100.00%	100.00&	100.00%	100.0%

The relationship with space at home to install a charging station is shown in Table 10. As shown, 76.50% of the respondents who would have space for a charging station at home applies that they plan to buy a car within the next five years and are open to considering an electric car. Respondents not open to considering buying an electric car are more likely to say that there is no room for a charging station at home or that they do not know if there is room for a charging station at home.

Table 10

Respondents Without a Car who Plan to Buy a Car in the Next 5 Years and are Open to Considering an Electric Car in Relationship to the Space at Home to Install a Charging Station.

		Space at Home		
	Consideration Electric Car	**Yes**	**No**	**Total**
Valid	Yes	76.50%	23.30%	42.60%
	No	17.60%	36.70%	29.80%
	I don't know	5.90%	40.00%	27.70%
	Total	100%	100.00%	100.0%

Table 11 shows that 70% of the respondents with an available charging station at their workplace answered that they would consider an electric car. Respondents who do not know if there is an available charging station at their workplace also do not know if they will consider an electric car if they buy a car within five years, for 55.60%.

Table 11

Respondents Without a Car who Plan to Buy a Car in the Next 5 Years and are Open to Considering an Electric Car in Relationship with the Availability of a Charging Station at their Workplace.

		Availability at Workplace			
	Consideration Electric Car	**Yes**	**No**	**I don't know**	**Total**
Valid	Yes	70.00%	41.20%	22.20%	44.40%
	No	10.00%	41.20%	22.20%	27.80%
	I don't know	20.00%	17.60%	55.60%	27.80%
	Total	100.00%	100.00%	100.00%	100.0%

No relationship can be discovered between respondents considering an electric car if they buy one in the next five years and whether they are currently employed.

As a dependent variable in a single regression, we can look at the variable in which respondents plan to buy a car within the next five years and are open to an electric car when buying a new car. The explanatory variables age (p = .413), gender (p = .144), living situation (p = .091) and type of housing show (p = .621) no significant effect. Also, whether the respondent is familiar with the definition of charging infrastructure (p= .717), whether respondents are currently employed (p = .975) and whether there is an available charging station at their workplace (p = .031) do not show a significant linear relationship.

A single regression model with whether respondents plan to buy a car within the next five years and are open to an electric car when they are buying a new car as the dependent variable and whether they have space for a charging station at home as explanatory variables are significant, $F(1.45) = 15.689$, $p < .001$. The variable of whether respondents plan to buy a car within the next five years and are open to an electric car when they are buying a new car is 25.90% explained by the variable whether they have space for a charging station at home according to the R-square value with a correlation coefficient of 0.508. The regression coefficient is 0.873 with a constant of 0.422, and both values are significant because of the p-values that are both less than 0.01.

A multiple regression was used to test respondents' plan to buy an electric car within five years and thereby be open to an electric car as the dependent variable, with space at home for a charging station and availability of a charging station at work as the independent variables as shown in Table 12. These variables do not significantly predict respondents' plans to buy an electric car within five

years and thereby be open to an electric car, F(2.33) = 5.966, p = .006. The independent variables predict 26.60% of the dependent variable according to the adjusted R-square value with a correlation coefficient of 0.515. The value of the regression coefficient of the space for a charging station at home (p = .0.19) is 2.474, and the availability of a charging station at work (p = .117) is 1.611 with a constant of 0.423. However, both independent variables are thus not significant. A multiple regression with space at home for a charging station, availability of a charging station at work, age, gender, living situation and type of home (p = .072) as independent variables is also not significant.

Table 12

Correlation Matrix for the Age, Gender, Living Situation, Housing Type, Space at Home and Availability at Work for a Charging Station as Independent Variables for the Dependent Variable if Respondents Plan to Buy an Electric Car in the Next 5 Years of Respondents Without a Car.

Variable	1	2	3
Constant	-.010	1.284	.423
1. Age	-.205	.754	
2. Gender	.539	1.837	
3. Living Situation	-1.023	-1.396	
4. Type of Housing	1.139	.334	
5. Space at Home	2.070		2.474
6. Availability at Work	1.311		1.611

Note. N = 35

* Correlation is significant at the 0.05 level (2-tailed)

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

A multiple regression with age and gender (p = .091), age and living situation (p = .828), age and housing type (p = .849), gender and living situation (p = .050), gender and housing type (p = .824), housing type and living situation (p = .833) are not significant. A multiple regression with age, gender, living situation and type of home (p = .147) as independent variables is also not significant.

4.3 Respondents with a car

Fifty-three respondents own a car. Of these respondents, 45 respondents have a car with an internal combustion engine, and eight respondents have an electric car. The respondents with a car consist of 21 males and 32 females. These respondents are divided into those with an electric car and those with a combustion engine car. Table 13 shows the distribution of ages. On average, the respondents with a car are 26 to 45 years old. There are no respondents under 18 years and no respondents over 65 years.

Table 13

Age Distribution of Respondents with a Car.

	Age Group	Frequency	Percent
Valid	18 - 25	19	35.80%
	26 - 36	9	17.00%
	36 - 45	5	9.40%
	46 - 55	13	24.50%
	56 - 65	7	13.20%
	Total	53	100.00%

Table 14 shows the distribution of living situations of respondents who own a car. A total of 75.70% of respondents with a car own a home, of which 32.00% own an owner-occupied home. The distribution of housing types is similar. Namely, 17 respondents live in a flat or apartment, 18 live in a detached house, 17 live in a row house, and one live in a semi-detached house.

Table 14

Distribution of Living Situations of Respondents with a Car.

	Living Situation	Frequency	Percent
Valid	Rental property	45	43.70%
	Owner-occupied home	33	32.00%
	Living at home	25	24.30%
	Total	103	100.00%

Table 15 shows the relationship between the respondent's type of car and their housing type. Of respondents living in a flat or apartment, 88.20% own a car with an internal combustion engine. Most respondents with an electric car live in a row house.

Table 15

Relationship between Respondents' Car Type and Housing Type of Respondents with a Car.

		Housing Type				
	Car Type	**Flat or Apartment**	**Detached House**	**Row House**	**Other**	**Total**
Valid	ICE Car	88.20%	94.40%	70.60%	100.00%	84.90%
	Electric Car	11.80%	5.60%	29.40%	0.00%	15.10%
	Total	100.00%	100.00%	100.00%	100.00%	100.00%

Table 16 shows that no respondent lives in a rental property or lives at home and has an electric car. Among respondents with owner-occupied housing, there are 27.60% of respondents with an electric car. Thus, only respondents who live in an owner-occupied home own an electric car. This is consistent with the expectation that people will only invest in an electric car if they own an owner-occupied home.

Table 16

Relationship between Respondents' Car Type and Housing Situation of Respondents with a Car.

		Housing Situation			
	Car Type	**Rental Property**	**Owner-Occupied Home**	**Living at Home**	**Total**
Valid	ICE Car	100.00%	72.40%	100.00%	84.90%
	Electric Car	0.00%	27.60%	0.00%	15.10%
	Total	100.00%	100.00%	100.00%	100.00%

4.4 Respondents with an internal combustion engine car (ICE)

A total of 45 respondents own a car with an internal combustion engine. Of these respondents, 18 are male, and 27 are female. Regarding their housing situation, 15 respondents live in a rental property, 21 own an owner-occupied house, and nine live at home. Of the respondents with an internal combustion engine car, 15 live in a flat or apartment, 17 live in a detached house, 12 live in a row house, and one live in a semi-detached house. The age distribution is shown in Table 17. No respondents are under 18 years, and no one is older than 65. The average age is between 26 years old and 45 years old.

Table 17

Age Distribution of Respondents with an ICE Car

	Age Group	Frequency	Percent
Valid	18 - 25	18	40.00%
	26 - 36	7	15.60%
	36 - 45	4	8.90%
	46 - 55	10	22.20%
	56 - 65	6	13.30%
	Total	45	100.00%

Of these respondents, 17 have ever considered switching to an electric car, and 28 have never considered switching to an electric car. Of the 17 respondents who have ever considered switching to an electric car, six respondents plan to do so in the next five years, two respondents do not plan to do so in the next five years, and nine respondents do not know if they will switch in the next five years. Of all the respondents, 43 respondents understand what the definition of charging infrastructure means, and two respondents do understand the definition.

Respondents were then asked what factors stop them from buying an electric car. This question was addressed to respondents who have never considered switching to an electric car and those who do not plan to switch in the next five years or do not know if they will switch in the next five years. In total, 20 respondents indicated that their car is not yet ready to be replaced, 11 respondents chose the purchase price as the restraining factor, 16 respondents chose the range, 14 respondents chose the charging infrastructure, and nine respondents chose the factors of habit and indicated that they do not have enough knowledge about electric cars. In addition, three respondents indicated other factors that stopped them from switching to an electric car. For example, an electric car would break down faster and have more expensive maintenance, an electric car is incapable of towing a caravan, and one respondent wondered what we would do in 10 years with all the broken batteries. The 14 respondents who chose charging infrastructure as a factor holding them back from buying an electric car were asked further which factor of charging infrastructure is holding them back. The results of each factor of the charging infrastructure are shown in Table 18. Charging speed is the most frequently chosen factor. The factors of availability and location, and accessibility follow this.

Table 18

Charging Infrastructure Factors that Stop Respondents with an ICE Car from Buying an Electric Car.

	Charging Infrastructure Factors	Frequency	Percent
Valid	Charging speed	10	31.25%
	Electricity costs	2	6.25%
	Availability	8	25.00%
	Location and accessibility	8	25.00%
	Ease of use	4	12.50%
	Total	32	100.00%

Of all respondents with an internal combustion engine car, 30 have space at home to install a charging station. In addition, 12 respondents do not have space for a charging station at home, and one respondent does not know if there is space at home. The remaining two missing answers come from the respondents who do not understand the definition of charging infrastructure. When the survey was taken, 41 respondents were employed, and four were not. Of the respondents who have a job and understand the definition of charging infrastructure, 15 respondents have an available charging station at their workplace, 20 do not, and four do not know if there is an available charging station at their workplace.

Table 19 shows no clear relationship between respondents who plan to switch to an electric car in the next five years and whether they have space to install a charging station at home. As shown, 34.30% of respondents have space at home to install a charging station and are considering switching to an electric car in the next five years.

Table 19

Respondents with an ICE Car who Plan to Switch to an Electric Car in the Next 5 Years in Relationship to the Space at Home to Install a Charging Station

		Space at Home		
	Switch to an Electric Car	**Yes**	**No**	**Total**
Valid	Yes	34.30%	33.30%	35.30%
	No	9.10%	16.70%	11.80%
	I don't know	54.50%	50.00%	52.90%
	Total	100.00%	100.00%	100.0%

Table 20 shows that 67.70% of the respondents are open to switching to an electric car within the next five years in an owner-occupied home. Respondents living at home indicated they would not switch to an electric car in the next five years. Similarly, most respondents in a rental home indicate they are not open to switching to an electric car within five years.

Table 20

Respondents with an ICE Car who Plan to Switch to an Electric Car in the Next 5 Years in Relationship their Housing Situation.

		Housing Situation			
	Switch to an Electric Car	**Rental Property**	**Owner-Occupied Home**	**Living at Home**	**Total**
Valid	Yes	33.30%	67.70%	0.00%	100.00%
	No	50.00%	50.00%	0.00%	100.00%
	I don't know	33.30%	55.60%	11.10%	100.00%
	Total	35.30%	58.80%	5.90%	100.0%

Table 21 shows that 66.70% of the respondents who plan to switch to an electric car in the next five years have access to a charging station at their workplace. However, this relationship is unclear because all respondents who do not switch to an electric car in 5 years also have access to an available charging station at their workplace.

Table 21

Respondents with an ICE Car who Plan to Switch to an Electric Car in the Next 5 Years in Relationship to the Availability of a Charging Station at their Workplace.

		Availability at Workplace			
	Switch to an Electric Car	**Yes**	**No**	**I don't know**	**Total**
Valid	Yes	66.70%	33.30%	0.00%	100.00%
	No	100.00%	0.00%	0.00%	100.00%
	I don't know	33.30%	44.40%	22.20%	100.00%
	Total	52.90%	35.30%	11.80%	100.00%

Table 22 shows respondents who plan to buy an electric car in the next five years live mainly in a detached or row house. Here, 50.00% of respondents planning to switch to an electric car live in a row house. The other 33.30% of the respondents live in a detached house. Most respondents who

live in a flat or apartment tent answered that they would not switch to an electric car within five years or do not know yet.

Table 22

Respondents with an ICE Car who Plan to Switch to an Electric Car in the Next 5 Years in Relationship to the Housing Type.

		Housing Type			
	Switch to an Electric Car	**Flat or Apartment**	**Detached House**	**Row House**	**Total**
Valid	Yes	16.70%	33.30%	50.00%	100.0%
	No	50.00%	0.00%	50.00%	100.0%
	I don't know	55.60%	33.30%	11.10%	100.0%
	Total	41.20%	29.40%	29.40%	100.0%

Looking at whether respondents have ever considered switching to an electric car as a dependent variable in a single regression, the variables age (p = .833), gender (p = 6.25), living situation (p = .252), and type of housing (p = .558) are not significant explanatory variables. The availability of a charging station at respondents' workplace (p = .277) and whether there is space at home for a charging station (p = .785) are also not significant explanatory variables. In addition, all factors that prevent respondents from buying an electric car are not significant explanatory variables. There are also no significant factors of the charging infrastructure that can explain whether respondents plan to switch to an electric car.

Age (p =.786), gender (p = .446), living situation (p = .706), and type of housing (p = .083) are not significant explanatory variables for whether respondents plan to switch to an electric car in the next five years as a dependent variable in a single regression. Space at home to install a charging station (p = .976) and whether there is an available charging station at the respondents' workplace (p = .121) are also not significant explanatory variables. There are also no significant explanatory variables of factors of electric cars and charging infrastructure that prevent respondents from switching to an electric car within five years.

A multiple regression was used to test the respondents' plan to switch to an electric car as the dependent variable, with age, gender, living situation, and type of housing as the independent variables, as shown in Table 23. These variables significantly predict car ownership, F(4.12) = 11.139, $p < .001$. The independent variables predict 78.80% of the dependent variable according to

the adjusted R-square value with a correlation coefficient of 0.888. The value of gender is 5.297 and is significant, $p < .001$. The constant (p = .624) is 0.502, the regression coefficient of age (p = .483) is 0.724, the living situation (p = . 900) is 0.128, and housing type (p = .025) is -2.555. However, the constant and the last three independent variables are not significant.

Table 23

Correlation Matrix for the Age, Gender, Living Situation, Housing Type, Space at Home, and Availability at Work for a Charging Station as Independent Variables for the Dependent Variable if Respondents with an ICE Car plan to Switch to an Electric Car in the Next 5 Years.

Variable	1	2	3
Constant	-.338	.502	1.751
1. Age	1.012	.724	
2. Gender	4.701**	5.297**	
3. Living Situation	.200	.128	
4. Type of Housing	-2.496	-2.555	
5. Space at Home	.870		-.166
6. Availability at Work	.698		1.598

Note. N = 16

* Correlation is significant at the 0.05 level (2-tailed)

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

Also, a multiple regression with the respondents' plan to switch to an electric car as a dependent variable and housing type and living situation (p = .309) as independent variables are not significant.

A multiple regression with the respondents' plan to switch to an electric car as a dependent variable and replacement of their current car, range, purchase price, charging infrastructure, insufficient knowledge, and habit (p = .669) as independent variables are not significant. All other combinations of these factors to buy an electric car also show no significant results. A multiple regression with the question of respondents' plan to switch to an electric car as a dependent variable and all factors of the charging infrastructure (p = .873) as independent variables is not significant. All other

combinations of the factors of charging speed, electricity cost, availability, location and accessibility, and ease of use do not result in a significant result.

4.5 Respondents with an electric car

A total of 8 respondents own an electric car. The average age of these respondents lies between 36 years and 55 years. The minimum age in this group is 18 years, and the maximum is 65 years. Of the eight respondents with an electric car, three are male, and five are female. All respondents with an electric car have an owner-occupied home. The housing type of the two respondents is a flat or apartment. Another respondent lives in a detached house, and the other five live in a row house.

All respondents with an electric car have owned an internal combustion engine car in the past. When asked about satisfaction with the charging infrastructure and fuel infrastructure, one respondent answered that they were more satisfied with the charging infrastructure. The other seven respondents were more satisfied with the fuel infrastructure. In addition, five respondents indicated that they have their charging station at home, compared to 2 respondents who have a shared charging station nearby and to 1 respondent who does not have a charging station at home. All respondents occasionally use a public charging station with an average of 6.25 times per month.

All respondents with an electric car answered that there are possible improvements to the charging infrastructure. Charging speed, location, and accessibility are mentioned four times as points for improvement. The availability of public charging stations is mentioned the most with six times. Electricity costs occur one time. The ease of use of the charging stations is not mentioned once. One of the respondents commented that repairing defective public charging stations takes too long and that there is a desire for cable tiling for private charging stations. Also, all respondents are familiar with the term ‘charging station hogging’ and have all experienced the phenomenon. In total, three respondents rarely experience ‘charging station hogging’, compared to 3 respondents who sometimes experience this and two respondents who often experience this.

All respondents with an electric car are currently employed. Of these respondents, seven have an available charging station at their workplace, and one respondent does not know if one is available. If the respondents use public charging stations more, they have a bigger chance of not having a charging station at home or not sharing one in their residential area.

5. Conclusion

5.1 Research question

Based on the literature and data from the survey, the following research question can now be answered: *What factors influence consumers' decision to buy an electric car?*

Housing type and living situation affect consumer behaviour toward buying an electric car. Respondents without a car who lives in a flat or apartment are less open to buying an electric car in the next five years than those with more spacious housing types, such as detached or row houses, who are more open to buying an electric car. Most respondents with an ICE car who are open to switching to an electric car live in an owner-occupied home. Similarly, most respondents with an ICE car who lives in a rental property indicated that they are not open to switching to an electric car within five years. Respondents with an ICE car willing to switch to an electric car within five years usually live in a detached or row house rather than a flat or apartment. However, no significant relationship between housing type and living situation and whether respondents with an ICE car would consider switching to an electric car could be found. Respondents with an electric car all live in owner-occupied housing. Previous research (2022 U.S. Electric Vehicle Consideration (EVC) Study, 2022) showed that owner-occupied consumers are more likely to consider buying an electric car than those living in rental housing.

Having a car is determined by 29.00% of the age of respondents. The combination of age, gender, living situation, and type of house predict having a car for 33.10%. Car type or whether respondents with an ICE car plan to switch to an electric car within five years have no significant relationship with these variables.

Another factor is charging infrastructure. Respondents without a car and space at home for a charging station are more open to buying an electric car in the next five years than respondents who do not have space at home to install a charging station. However, this relationship is not significant for respondents with an ICE car. The availability of public charging stations also plays a role in the charging infrastructure and influences respondents' openness to buying an electric car, but no significant relationship is found here. Respondents without a car with an available charging station at work are more open to an electric car if they were to buy a car in the next five years than respondents without an available charging station at work. However, the single regression model found no significant relationship with this. This also holds for respondents with an ICE car.

Respondents with an ICE car mainly mentioned that their car is not ready for replacement. So, this is an important reason why respondents do not consider buying an electric car. The choice not to switch to an electric car is also influenced by range, charging infrastructure, purchase price, habit, and knowledge of electric cars. These factors play a role in consumers' choices, although they are not significantly related to buying an electric car.

All respondents with electric cars indicated they were more satisfied with the fuel infrastructure than the charging infrastructure. Consequently, the most frequently mentioned areas for improvement are charging speed, location and availability, and accessibility. The range was previously demonstrated in a study (Trends in electric light-duty vehicles - Global EV Outlook 2022 - Analysis - IEA, 2022) as an important factor for consumers considering an electric car. Here, the availability of public charging points was also demonstrated as an essential factor. The importance of the location of public charging stations and charging speed were also previously shown in the study by Mies et al. (2018). However, ease of use and electricity costs appear less important among respondents in this study than previously predicted. Electricity costs and ease of use were not often chosen as improvement points by respondents with an ICE car. This contrasts with the study (2023 U.S. Electric Vehicle Experience (EVX) Home Charging Study, 2023) that found that electricity costs play a significant role in consumers' decision to purchase an electric car. Previous research (2022 U.S. Electric Vehicle Experience (EVX) Public Charging Study, 2022) found that consumers are already satisfied with the convenience of public charging stations.

Moreover, all respondents with an electric car were familiar with the term "charging station hogging. Wolbertus and Van Den Hoed's (2017) study also found that regulations on charging station hogging are needed.

5.2 Limitations

The main limitations of this survey are sampling limitations. For example, there are many young respondents since many friends filled out this survey. Thus, this study may not be representative of a larger population. There is a bias toward younger respondents, so generalization cannot occur for an entire population. In addition, there need to be more respondents with an electric car to conclude that target group. Again, there needs to be a generalization to make a statement about the factors that influence the choice of the entire population of consumers with electric cars. This study also has research limitations because there are limitations regarding available literature and survey questions. Other relevant factors may have been excluded, so not all consumer decisions were captured.

5.3 Recommendations

Great benefit could be gained from a larger dataset with more respondents to ensure better representation and diversity of all consumers. That way, generalizability can increase, and more general conclusions can be drawn. Multiple methods, such as focus groups on people with electric cars, could also be combined. It can also focus on changes in consumer behaviour over time. In this way, trends can be analyzed. In addition, an expansion of factors that further influence consumer decisions can be explored. These could include government policies, technological factors, and marketing.

6. Appendix

Appendix 1: Survey

Start of Block: Introductie

Bedankt voor uw interesse in mijn onderzoek!

In deze enquête stel ik vragen om mijn scriptieonderzoek uit te kunnen voeren. Hierin onderzoek ik hoe het gebruik van elektrische auto's gestimuleerd kan worden. De focus ligt op de oplaadinfrastructuur. Voor dit onderzoek zal ik uw antwoorden op mijn vragen verzamelen. De data die ik verwerk zullen door mij behouden worden tot na afloop van mijn scriptie waarvoor ik dit onderzoek verricht. Na die periode, zal ik de persoonlijke informatie veilig verwijderen. Als u vragen of klachten heeft, neem dan graag contact op met mij via: *531138sh@student.eur.nl*

In deze enquête worden de volgende concepten behandeld:

Oplaadinfrastructuur: Deze term verwijst naar het netwerk van oplaadpunten voor het opladen van elektrische auto's en de voorzieningen die hierbij nodig zijn. Denk hierbij aan een thuislader en publieke laders.

Brandstofinfrastructuur: Deze term verwijst naar het netwerk van faciliteiten die nodig zijn om auto's met verbrandingsmotoren te tanken. Denk hierbij aan een tankstation.

Start of Block: Filtervraag

Q1 Heeft u een eigen auto?

- Ja (1)
- Nee (2)

Display This Question: If Heeft u een eigen auto? = Ja

Q2 Wat voor soort auto heeft u?

- Een auto met een verbrandingsmotor (1)
- Een elektrische auto (2)

Start of Block: Respondenten zonder auto

Display This Question: If Heeft u een eigen auto? = Nee

Q1 Bent u van plan in de komende 5 jaar een auto te kopen?

- Ja (1)
- Nee (2)
- Weet ik niet (3)

Display This Question: If Heeft u een eigen auto? = Nee

And If Bent u van plan in de komende 5 jaar een auto te kopen? = Ja

And Bent u van plan in de komende 5 jaar een auto te kopen? = Weet ik niet

Q2 Zou u een elektrische auto meenemen in de overweging bij het kopen van een auto?

- Ja (1)
- Nee (2)
- Weet ik niet (3)

Display This Question: If Heeft u een eigen auto? = Nee

Q3 Snapt u wat de definitie van de oplaadinfrastructuur betekent?
Oplaadinfrastructuur: Deze term verwijst naar het netwerk van oplaadpunten voor het opladen van elektrische auto's en de voorzieningen die hierbij nodig zijn. Denk hierbij aan een thuislader en publieke laders.

- Ja (1)
- Nee (2)

Display This Question: If Heeft u een eigen auto? = Nee

And Snapt u wat de definitie van de oplaadinfrastructuur betekent? = Ja

And If Zou u een elektrische auto meenemen in de overweging bij het kopen van een auto? = Nee

And Zou u een elektrische auto meenemen in de overweging bij het kopen van een auto? = Weet ik niet

Q4 Welke van de onderstaande factoren houden u tegen om een elektrische auto mee te nemen in uw overweging bij het kopen van een auto? **U kan meerdere factoren kiezen.**

- Aankoopprijs (1)
- Actieradius (2)
- Oplaadinfrastructuur (3)
- Onvoldoende kennis (4)
- Gewoonte (5)
- Weet ik niet (6)
- Anders, namelijk (7) _____

Display This Question: If Heeft u een eigen auto? = Nee

And Welke van de onderstaande factoren houden u tegen om een elektrische auto mee te nemen in uw over... = Oplaadinfrastructuur

Q5 Welke factoren van de oplaadinfrastructuur van elektrische auto's houden u tegen om een elektrische auto mee te nemen in uw overweging bij het kopen van een auto? **U kan meerdere factoren kiezen.**

- Laadsnelheid (1)
- Elektriciteitskosten (2)
- Beschikbaarheid (3)
- Locaties en bereikbaarheid (4)
- Gebruiksgemak (5)
- Weet ik niet (6)
- Anders, namelijk (7) _____

Display This Question: If Heeft u een eigen auto? = Nee

And Snapt u wat de definitie van de oplaadinfrastructuur betekent? = Ja

Q6 Heeft u thuis ruimte om een laadpaal te plaatsen? Bijvoorbeeld op een oprit of garage.

- Ja (1)
- Nee (2)
- Weet ik niet (3)

Display This Question: If Heeft u een eigen auto? = Nee

Q7 Heeft u op dit moment werk?

- Ja (1)
- Nee (2)

Display This Question: If Heeft u een eigen auto? = Nee

And Snapt u wat de definitie van de oplaadinfrastructuur betekent? = Ja

And Heeft u op dit moment werk? = Ja

Q8 Is er een beschikbare laadpaal op uw werk om een elektrische auto op te laden?

- Ja (1)
- Nee (2)
- Weet ik niet (3)

Start of Block: Respondenten met een auto met een verbrandingsmotor

Display This Question: If Heeft u een eigen auto? = Ja

And Wat voor soort auto heeft u? = Een auto met een verbrandingsmotor

Q1 Heeft u weleens overwogen om over te stappen naar een elektrische auto?

- Ja (1)
- Nee (2)

Display This Question: If Heeft u een eigen auto? = Ja

And Wat voor soort auto heeft u? = Een auto met een verbrandingsmotor

And Heeft u weleens overwogen om over te stappen naar een elektrische auto? = Ja

Q2 Bent u van plan in de komende 5 jaar over te stappen naar een elektrische auto?

- Ja (1)
- Nee (2)
- Weet ik niet (3)

Display This Question: If Heeft u een eigen auto? = Ja

And Wat voor soort auto heeft u? = Een auto met een verbrandingsmotor

Q3 Snapt u wat de definitie van de oplaadinfrastructuur betekent?
Oplaadinfrastructuur: Deze term verwijst naar het netwerk van oplaadpunten voor het opladen van elektrische auto's en de voorzieningen die hierbij nodig zijn. Denk hierbij aan een thuislader en publieke laders.

- Ja (1)
- Nee (2)

Display This Question: If Heeft u een eigen auto? = Ja
And Wat voor soort auto heeft u? = Een auto met een verbrandingsmotor
And Snapt u wat de definitie van de oplaadinfrastructuur betekent? = Ja
And If Heeft u weleens overwogen om over te stappen naar een elektrische auto? = Nee
Or Bent u van plan in de komende 5 jaar over te stappen naar een elektrische auto? = Nee
Or Bent u van plan in de komende 5 jaar over te stappen naar een elektrische auto? = Weet ik niet

Q4 Welke van de onderstaande factoren houden u tegen om een elektrische auto mee te nemen in uw overweging bij het kopen van een auto? **U kan meerdere factoren kiezen.**

- Mijn eigen auto is nog niet aan vervanging toe (1)
- Aankoopprijs (2)
- Actieradius (3)
- Oplaadinfrastructuur (4)
- Onvoldoende kennis (5)
- Gewoonte (6)
- Weet ik niet (7)
- Anders, namelijk (8) _____

Display This Question: If Heeft u een eigen auto? = Ja
And Wat voor soort auto heeft u? = Een auto met een verbrandingsmotor
And If Welke van de onderstaande factoren houden u tegen om ... = Oplaadinfrastructuur

Q5 Welke factoren van de oplaadinfrastructuur van elektrische auto's houden u tegen om een elektrische auto mee te nemen in uw overweging bij het kopen van een auto? **U kan meerdere factoren kiezen.**

- Laadsnelheid (1)
- Elektriciteitskosten (2)
- Beschikbaarheid (3)
- Locatie en bereikbaarheid (4)
- Gebruiksgemak (5)
- Weet ik niet (6)
- Anders, namelijk (7) _____

Display This Question: If Heeft u een eigen auto? = Ja
And Wat voor soort auto heeft u? = Een auto met een verbrandingsmotor
And If Snapt u wat de definitie van de oplaadinfrastructuur betekent? = Ja

Q6 Heeft u thuis ruimte om een laadpaal te plaatsen? Bijvoorbeeld op een oprit of garage.

- Ja (1)
- Nee (2)
- Weet ik niet (3)

Display This Question: If Heeft u een eigen auto? = Ja

And Wat voor soort auto heeft u? = Een auto met een verbrandingsmotor

Q7 Heeft u op dit moment werk?

- Ja (1)
- Nee (2)

Display This Question: If Heeft u een eigen auto? = Ja

And Wat voor soort auto heeft u? = Een auto met een verbrandingsmotor

And If Snapt u wat de definitie van de oplaadinfrastructuur betekent? = Ja

And Heeft u op dit moment werk? = Ja

Q8 Is er een beschikbare laadpaal op uw werk om een elektrische auto op te laden?

- Ja (1)
- Nee (2)
- Weet ik niet (3)

Start of Block: Respondenten met een elektrische auto

Display This Question: If Heeft u een eigen auto? = Ja

And Wat voor soort auto heeft u? = Een elektrische auto

Q1 Heeft u in het verleden een auto met een verbrandingsmotor gehad?

- Ja (1)
- Nee (2)

Display This Question:If Heeft u een eigen auto? = Ja

And Wat voor soort auto heeft u? = Een elektrische auto

And Heeft u in het verleden een auto met een verbrandingsmotor gehad? = Ja

Q2 Bent u over het algemeen tevredener over de oplaadinfrastructuur van uw elektrische auto of met de brandstofinfrastructuur van uw auto met een verbrandingsmotor?

Oplaadinfrastructuur: Deze term verwijst naar het netwerk van oplaadpunten voor het opladen van elektrische auto's en de voorzieningen die hierbij nodig zijn. Denk hierbij aan een thuislader en publieke laders.
Brandstofinfrastructuur: Deze term verwijst naar het netwerk van faciliteiten die nodig zijn om auto's met verbrandingsmotoren te tanken. Denk hierbij aan een tankstation.

- Oplaadinfrastructuur (1)
- Brandstofinfrastructuur (2)
- Weet ik niet (3)

Display This Question: If Heeft u een eigen auto? = Ja

And Wat voor soort auto heeft u? = Een elektrische auto

Q3 Heeft u thuis een eigen laadpaal om uw elektrische auto op te laden?

- Ja (1)
- Nee (2)
- Nee, maar ik heb toegang tot een gedeelde laadpaal in mijn woongebied. (3)

Display This Question: If Heeft u een eigen auto? = Ja

And Wat voor soort auto heeft u? = Een elektrische auto

Q4 Vindt u dat er verbeterpunten zijn voor de huidige oplaadinfrastructuur van elektrische auto's?

Oplaadinfrastructuur: Deze term verwijst naar het netwerk van oplaadpunten voor het opladen van elektrische auto's en de voorzieningen die hierbij nodig zijn. Denk hierbij aan een thuislader en publieke laders.

- Ja (1)
- Nee (2)
- Weet ik niet (3)

Display This Question: If Heeft u een eigen auto? = Ja

And Wat voor soort auto heeft u? = Een elektrische auto

And If Vindt u dat er verbeterpunten zijn voor de huidige oplaadinfrastructuur? = Ja

Or Vindt u dat er verbeterpunten zijn voor de huidige oplaadinfrastructuur? = Weet ik niet

Q5 Wat zijn volgens u verbeterpunten voor de huidige oplaadinfrastructuur van elektrische auto's? **U kan meerdere factoren kiezen.**

- Laadsnelheid (1)
- Elektriciteitskosten (2)
- Beschikbaarheid (3)
- Locatie en bereikbaarheid (4)
- Gebruiksgemak (5)
- Weet ik niet (6)
- Anders, namelijk (7) _____

Display This Question: If Heeft u een eigen auto? = Ja

And Wat voor soort auto heeft u? = Een elektrische auto

Q6 Laadt u uw elektrische auto weleens op bij een publieke laadpaal?

- Ja (1)
- Nee (2)

Display This Question: If Heeft u een eigen auto? = Ja

And Wat voor soort auto heeft u? = Een elektrische auto

And Laadt u uw elektrische auto weleens op bij een publieke laadpaal? = Ja

Q7 Hoe vaak per maand laadt u uw elektrische auto gemiddeld op bij een publieke laadpaal?

Display This Question: If Heeft u een eigen auto? = Ja

And Wat voor soort auto heeft u? = Een elektrische auto

Q8 Heeft u weleens last van 'laadpaalkleven'? **Laadpaalkleven** betekent dat auto's voor een langere tijd een publieke laadpaal bezet houden, terwijl de auto al volgeladen is.

- Nooit (1)
- Zelden (2)
- Soms (3)
- Vaak (4)
- Heel vaak (5)

Display This Question: If Heeft u een eigen auto? = Ja

And Wat voor soort auto heeft u? = Een elektrische auto

Q9 Heeft u op dit moment werk?

- Ja (1)
- Nee (2)

Display This Question: If Heeft u een eigen auto? = Ja

And Wat voor soort auto heeft u? = Een elektrische auto

And Heeft u op dit moment werk? = Ja

Q10 Is er een beschikbare laadpaal op uw werk om uw elektrische auto op te laden?

- Ja (1)
- Nee (2)
- Weet ik niet (3)

Start of Block: Algemene vragen

Q1 Wat is uw leeftijd?

- < 18 (1)
- 18 - 25 (2)
- 26 - 35 (3)
- 36 - 45 (4)
- 46 - 55 (5)
- 56 - 65 (6)
- 66 - 75 (7)
- > 75 (8)

Q2 Met welk geslacht identificeert u zich het meest?

- Man (1)
- Vrouw (2)
- Non-binair (3)
- Zeg ik liever niet (4)

Q3 Wat is uw huidige woonsituatie?

- Huurwoning (1)
- Koopwoning (2)
- Geen eigen woning (3)

Q4 Welk type huis beschrijft uw huidige woning het best?

- Flat of appartement (1)
- Vrijstaand huis (2)
- Rijtjeshuis (3)
- Anders, namelijk (4) _____

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