TALLINN UNIVERSITY OF TECHNOLOGY

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NORWEGIANS' ATTITUDES TOWARDS ELECTRIC VEHICLES: MOTIVES AND INTENTION

Bachelor's thesis

Programme: International Business Administration, specialisation marketing

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I declare that I have compiled the paper independently

and all works, important standpoints and data by other authors

have been properly referenced and the same paper

have been previously been presented for grading.

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ABSTRACT

The aim of this study is to reveal Norwegians' attitudes towards electric vehicles, as well as their motives and intention to purchase an electric vehicle, for then to compare the young and the older generations. The study finds that attitudes towards electric vehicles affect the intention to purchase an electric vehicle in the future. No significant differences in attitudes or intention to purchase an electric vehicle in the future appeared between the age groups. However, the lack of significant differences between the age groups may be attributed to the limitations of the study. Although no significant differences in attitudes or intention are revealed, the study finds differences in motives and that the young age group in the sample are more likely to adopt/purchase an electric vehicle earlier compared to the older age group. The study therefore suggests the young age group is of importance when shaping Norwegian incentives for electric vehicles in the future, but that it will require further research to clearly conclude.

Keywords: electric vehicles (EVs), attitudes, motives, intention, Diffusion of Innovations, Theory of Planned Behavior (TPB).

INTRODUCTION

There is a rapidly evolving market for electric vehicles (EVs) in Norway today and one of the main reasons for this is the incentives offered to EV-owners, such as VAT exemption, free access to toll roads, and free parking. The amount of EVs on Norwegian roads has grown so rapidly that their increased market share is considered a factor in the declining per capita transport emissions in Norway, and EVs are by many viewed as part of the solution to the increasing local and global pollution. (100 000 el-biler … 2017) In order to support future and effective incentive strategies for EVs in Norway, it is reasonable to assume that we need to investigate Norwegians' attitudes towards EVs, as well as their motives and intention to purchase EVs. However, despite extensive research regarding current adult (30 years or older) consumers' attitudes, motives, and intention to purchase EVs (Figenbaum *et al* 2014; Figenbaum *et al* 2016; Fearnley *et al* 2015), we know little of the younger age group's (18 – 29-year-olds) attitudes, motives, and intention to purchase. This age group may be of particular interest in the Norwegian population not only because it is the next generation of car owners, but also because this age group has a considerably larger percentage of voters voting for 'green' parties compared to older age groups. This voting pattern may indicate a shift in attitudes and motives toward more environmental friendly solutions and innovations such as EVs. Looking into Norwegians' attitudes, motives, and intention to purchase EVs and comparing the younger and older age groups will provide results and information that will benefit both the government, being the incentive-makers, as well as car-makers and dealers. They may use the information about Norwegians' attitudes, motives, and intention to purchase EVs to create efficient incentive strategies for the future and to more effectively focus their marketing on issues relevant to the age groups respectively.

The aim of this bachelor's thesis will therefore be to uncover Norwegians' attitudes towards EVs, their motives and intention for future purchasing decisions, and finally compare the young (18 – 29 years old) and older (30 years or older) age groups. The aim will be fulfilled through answering four partial research questions:

1. What relevant theoretical framework is needed to reveal attitudes and intention, motives, and barriers?

2. What are Norwegians' attitudes towards EVs, and how do they differ between age groups?

3. What are Norwegians' motives for purchasing an EV in the future, and how do they differ between age groups?

4. What are Norwegians' intentions to purchase an EV in the future, and how does the intention differ between age groups?

In order to answer the research questions, the current study intends to conduct a literature review to establish the theoretical framework, and then perform an online questionnaire survey. After the data collection period, the results will be analysed, and the two age groups will be compared using a T-test and a Mann-Whitney U-test, as well as correlation coefficients. The results and the following discussion may be basis for further research on the topic.

In Chapter 1, the theoretical framework and perspectives needed to answer the research questions and fulfil the aim of the thesis will be presented. Background information and a short overview of previous research on attitudes towards EVs will be presented in this chapter. Amongst the theories used are the Diffusion of Innovations and the Theory of Planned Behaviour. Furthermore, the definition of attitudes, motives, and intention will be clarified in this chapter.

In Chapter 2, the methodology and the research instrument will be presented, such as the methods of the research instrument, a description of the sample and the sampling process, and the tools used for data analysis. This chapter will display a selection of the questions asked in the online questionnaire survey, their respective scales, and the sequence of the questionnaire. The full questionnaire will be presented in Appendix 1.

In Chapter 3, a thorough analysis and following discussion of the data will take place. The T-test and the U-test will be conducted in order to compare two age groups, and the findings of this thesis will be presented. Any limitations and suggestions for further research will be clarified before the author adds his opinions and makes a conclusion.

1. THEORETICAL FRAMEWORK & BACKGROUND

In order to best measure Norwegians' attitudes, motives, and intention towards EVs – and to answer the first partial research question – a few selected theories, as well as background information and a short overview of previous research, will be presented in this chapter. The two main theories presented are the Diffusion of Innovations by Everett M. Rogers and the Theory of Planned Behavior by Ajzen and Fishbein. Roger's theory on how to classify consumers in adopter groups after how quickly they adopt a new innovation is essential when looking at Norwegians' attitudes towards EVs. It may help to classify age groups in adopter categories based on how early or late they adopt or are willing to adopt EVs. The theories will be used and referred to when analysing the result of the online questionnaire. Ajzen and Fishbein's theory is concerned with individuals' attitudes and their intention to behave according to their attitude, as well as factors influencing their attitude. This theory is useful to have as a base when researching young Norwegians' attitudes towards EVs and their intention to behave in a specific way in the future. In addition to these theories, attitudes, motives, and intention are defined according to their purpose for this thesis.

1.1. Background and previous research on attitudes towards electric vehicles

At the end of 2016, the number of electric zero-emission vehicles (EVs) on Norwegian roads were 97,500. This constituted a 41 per cent increase from the previous year; an indication of a rapidly evolving market. In February the following year the number had already surpassed 100,000, and, in some counties in Norway, EVs now constitute more than 4 per cent of the total car pool (100 000 el-biler … 2017). By the end of 2017, EVs had a total market share of the national new car sales equal to 20.9 per cent (Bilsalget … 2018). In Hordaland county, 43 per cent of all new cars sold in August 2017 were EVs (Ekanger 2017). This rapidly rising number of EVs on Norwegian roads has, according to Statistics Norway, had importance for the declining emissions per kilometre driven per person (100 000 el-biler … 2017). With air pollution causing health issues and the premature death of citizens throughout the EU and Norway (Guerreiro *et al* 2017),

declining emissions due to a rising number of EVs on the road may be viewed as a positive effect of an increase in their market share.

Part of what make EVs attractive to own and drive for consumers besides zero emissions are the incentives offered to Norwegian EV owners. EVs are, to name a few, incentivised through VAT-exemption, free toll-road access, ferry discounts, access to bus lanes, and discounted or free-of-charge city parking. In December 2017, the European Free Trade Association (EFTA) Surveillance Authority authorized the Norwegian government to prolong the VAT-exemption for three more years and other incentives for six more years (EFTA Surveillance Authority 228/17/COL), ensuring the attractive incentives that has led to Norway boasting the largest market share of EVs in the world to be upheld (Figenbaum *et al* 2015). This decision was an important aid for the Norwegian parliament on their path to reach their established target for zero-emission vehicles; that all new passenger cars and light vans sold in 2025 shall be zero-emission vehicles (Norwegian Ministry of Transport and Communications 2016-2017, 30). Knowing that the government aims to have an all-electric/zero-emission new cars sale, it is surprising that most of the research conducted in Norway regarding consumers' attitudes, motives, and intention to purchasing an EV is concerned with people aged 30 and above who already own a vehicle. Although the Institute of Transport Economics have conducted research regarding current and potential users' attitudes and motives towards EVs (Figenbaum *et al* 2014; Figenbaum *et al* 2016; Fearnley *et al* 2015) the author of this bachelor's thesis found no research looking into differences between young Norwegian adults' (aged 18 – 29 years old) and the older age group's (30 years and older) attitudes towards EVs, as well as their motives and intention to purchasing an EV in the future. Although several factors may affect consumers' future attitudes and, as a result, their behaviour (Kangur *et al* 2017, 167), it is today's 20-year-olds who will consider purchasing EVs in the future. Hence it is of importance to compare the generations' attitudes, motives, and intention towards EVs. This will aid in adapting incentives and strategies to efficiently and effectively reach the goal of an all-electric/zero-emission vehicle new car sale.

The age group ranging from 18 – 29 years had for example the largest share of their votes going to the Norwegian Green Party (MDG) in the Storting (Parliament) election in 2017 compared to other age groups. In fact, 14 per cent of voters aged 18 – 29 years voted for MDG, while, in comparison, 8 per cent of voters in the age group 30 – 49 years and 4 per cent of voters in the age group 50 – 79 years voted for MDG. (Statistics Norway, table 09625) In the official School Elections held in all Norwegian Upper Secondary schools prior to the parliamentary election, the

Greens received 6.8 per cent of the total votes (Arbeiderpartiet og … 2017; The School ... 2017), which is double as much as the Greens received during the 2017 parliamentary election (Statistics Norway, table 09625). This may indicate that the younger generations will be more positively inclined towards environmental friendly solutions, such as EVs. (Hole 2017, 5) In addition, Degirmenci *et al* (2017, 256) found that environmental performance of EVs was "a stronger predictor than price value and range confidence" in their sample where more than 57 per cent of the respondents were aged 21 – 30 years. On the contrary, Figenbaum et al (2014) found that, in a sample where only 14 per cent of the participants were aged 18 – 34 years, the strongest factors influencing the purchasing decision of EVs were incentives and subsidies. This may indicate differences in attitudes and motives from the younger to the older generations.

1.2. Attitudes, motives, and the Expectancy-Value Model

Fishbein and Ajzen (1975) proposed the Expectancy-Value model as a model of how an attitude is formed. This model was presented as an equation in which "*A* is the attitude towards an object, action, or event; *b* is the beliefs about the object's attributes or about the act's consequences; and *e* is the evaluations of the attributes or consequences." (*Ibid*, 233) An 'attribute' and a 'consequence' are referred to as "any aspect of an object or behaviour, respectively – that is, to any characteristic, quality, object, concept, value, or goal associated with the object or behaviour." (*Ibid*, 223) The equation is presented in Figure 1.1. below. According to Fishbein and Ajzen, an attitude may be conceptualised "as the amount of affect for or against some object," (*Ibid,* 11) and they suggest that an attitude towards an object, action, or event is best measured on a bipolar affective or evaluative scale (*Ibid*).

$$A = \sum_{i=1}^{n} b_i e_i$$

Figure 1.1. The Expectancy-Value Model
Source: Fishbein, Ajzen (1975, 223)

This model may be used to evaluate the attitudes of Norwegians and compare the two age groups by first making a set of attributes for EVs that are evaluated on evaluative or affective semantic differential scales in a questionnaire, which are summed to provide a measure of *e* in Figure 1.1. In turn, the responders of the questionnaire may rate the probability of various statements in a

semantic differential scale, which are also summed in order to obtain *b* in Figure 1.1, i.e. the belief strength. Having found *b* and *e,* the current study could compute a numerical representation of attitudes towards EVs in order to compare the age groups. This way of estimating an attitude is accurate as, while testing the theoretical Expectancy-Value model, Fishbein found a positive correlation of 0.80 between the estimate and the direct measure of attitude. (Fishbein, Ajzen 1975, 224-225) This strong correlation is, however, also an argument for using well-established marketing research questions and scales to measure attitudes directly. Considering the scope of this thesis and the strong correlation of attitudes between the Expectancy-Value Model and measuring the attitudes directly, the current study will measure the attitudes directly. Doing so would provide a high level of accuracy while simplifying the process to be more suitable for the scope of the current study.

In regard to motives, a motive is for the purpose of the current study defined as "a reason for doing something" (Oxford Dictionaries 2018, *s.v.* motive). Examples of motives to purchase an EV in the future would then be the VAT-exemption or the lower operating costs relative to fossil-fuelled vehicles.

In the online questionnaire, attitudes and motives will be inquired about in their own separate sections. Knowing Norwegians' attitudes and motives for purchasing EVs in the future would enable both the government and car dealers to enhance motives in order to advance the adoption of EVs.

1.3. The Theory of Planned Behaviour

The basis of the Theory of Planned Behaviour (TBP) is the assumption that decisions and actions taken by individuals are based on "a rational evaluation of the probabilities and values of the outcomes associated with alternatives." (Dewberry, Jackson 2018, 102) According to the TPB, an individual's attitude and his or her intention to take action in a specific way are closely related. The theory states that the major determinant for action is an individual's intention to perform it. However, the intention to perform (or not perform) a specific action is again influenced by three components identified as a) the individual's attitude towards the behaviour (action); b) subjective norms towards an action (essentially what others' think of the behaviour and the social pressure that comes along with the expectations to behave in a specific way); and lastly c) the individual's

perceived self-control, or self-efficacy. (Ajzen, Fishbein 1975; Dewberry, Jackson 2018) Figure 1.2 below presents the TBP and the factors influencing an individual's intention to behave in a specific way. The stronger the three factors are – i.e. the more positive attitude an individual has towards a specific behaviour, the more pressure from the social norm, and the more control the individual perceives to have – the greater the intention to perform the behaviour will be. According to Ajzen, "the stronger the intention to engage in a behaviour, the more likely should be its performance." (Ajzen 1991, 181)
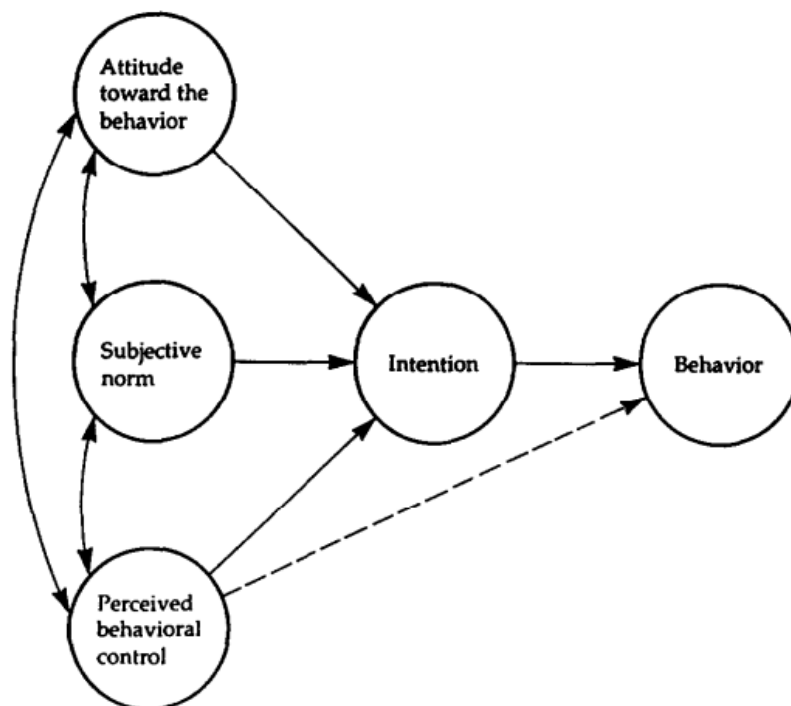

Figure 1.2. The Theory of Planned Behaviour.
Source: Ajzen (1991, 182)

Knowing this, it will be important to measure the strength of Norwegians' intention to purchase an EV in the future. In other words, just measuring Norwegians' attitudes towards EVs is not sufficient to reveal their intention. In addition, measuring their intention could be used as a factor to check their attitude. This would be most easily done by directly inquiring into respondents' intention to purchase an EV in the future, stated as the probability that a respondent will purchase an EV in the future.

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1.4. The Diffusion of Innovations

In his book *The Diffusion of Innovations* (2003)**,** Everett M. Rogers created a method of categorizing adopters of innovations in five groups based on a set of characteristics and the average time of adoption. His adopter categories are presented on a normal distribution curve, as seen in Figure 1.3. Using Rogers theory, the current study may be able to place the responders to the questionnaire in adopter categories based on their measured attitudes and beliefs towards innovations and new technology. This may in turn be useful as it can reveal differences between the age groups, in which adopter category they belong, and, as a result, their general intention to adopt an EV.
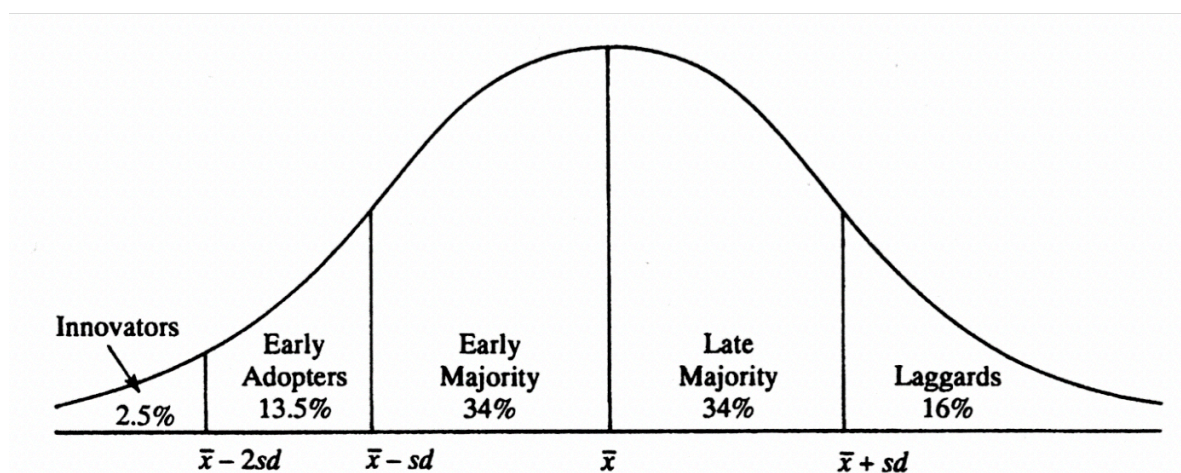
Figure 1.3. Adopter Categorization on the Basis of Innovativeness. "The innovativeness dimension, as measured by the time at which an individual adopts an innovation or innovations, is continuous. The innovativeness variable is partitioned into five adopter categories by laying off standard deviations (sd) from the average time of adoption ($\bar{x}$)." (Rogers 2003, 281)
Sources: Rogers (2003, 281); Hole (2017, 8)

Each of the adopter categories are by Rogers described as being distinct from each other, having their own and unique characteristics. In Table 1.1 on the following page a summary of the main characteristics of each group in Roger's theory are presented.

Table 1.1. Roger's five categories of adopters.

	Characteristics
The innovators	Venturesome, accept high risks and launch new innovations into a social system. Capable of managing uncertainty at a high level in the moment he or she adopts a new innovation. The innovator requires an understanding of technical knowledge on a complex level and financial resources to handle any possible losses.
The early adopters	The early adopters are "a more integrated part of the local social system than innovators." (Rogers 2003, 283) They possess the highest degree of opinion leadership, and they are held in respect by their equals. Early adopters often pose as role models and aid in triggering the critical mass by adopting an innovation.
The early majority	Members of this group adopt deliberately, that is, their decision process is relatively more far-stretched than the two previous groups. They adopt slightly before the average member of a social system.
The late majority	This group is sceptical, and they adopt after the average member. Adopting is commonly caused by financial necessity or peer pressure. "Most of the uncertainty about a new idea must be removed before the late majority feels that it is safe to adopt." (Rogers 2003, 284)
The laggards	Laggards hold strong traditions and adopt new innovations the latest. Their financial situation leaves them no choice but to be most vary in adopting innovations.

Source: Hole (2017, 9); Rogers (2003, 281-285)

It will be of particular interest to distinguish the innovators and early adopters as these two adopter groups aid in reaching a point which Rogers named "critical mass" (Hole 2017, 9). Critical mass is "the point at which enough individuals in a system have adopted an innovation such that the innovation's further rate of adoption becomes self-sustaining." (Rogers 2003, 283; 474) This would have a possible benefit for the government who make the incentive strategies in Norway as their goal is to make the market for EVs self-sustaining (Norwegian Ministry of Transport and Communications 2016-2017, 30). In addition, by revealing EVs "relative advantage," which is "the degree to which an innovation is perceived as better than the idea it supersedes" (Rogers 2003, 476) the current study may more easily establish Norwegians' attitudes, motives, and intention towards EVs and compare them to the older age groups, i.e. if the relative advantage differs between the two age groups. (Hole 2017, 9)

Knowing also that EVs have reached a 20 per cent market share of the new car sales in Norway (Bilsalget … 2017), and that EVs account for more than almost 4 per cent of the total car park (100 000 el-biler … 2017), Hole argues that "in accordance with Rogers' innovation adoption theory (2003), the adoption of EVs has just started to spread from the innovators - which account for 2.5 per cent of a social system as seen in [Figure 1.3] – to the early adopters." (2017, 9) Due

to this it would be of interest to the Norwegian government to locate the two age groups' adopter groups in order to establish whether their importance will be different in the future in order to reach the "critical mass."

However, in measuring and classifying the adopter groups, De Marez and Verleye (2004) suggest using the Product Specific Adoption Potential (PSAP) scale instead of the traditional scales such as the domain specific innovativeness (DSI) scale. The PSAP scale is a simple, three question scale. In their research, De Marez and Verleye (*Ibid*) found that the PSAP scale is more accurate than traditional scales to measure innovativeness. The current study will therefore use their three questions that are on a five-point Likert-scale, being (*Ibid,* 37-38):

1. "Suppose [EVs] were available to you now. As you have it in mind right now, up to what degree would you be interested in adopting/purchasing this?"
2. "Suppose [EVs] were available to you now, in its most optimal conditions for you: only the applications/features/services you are interested in, and at a price that isn't exceeding the price you are willing to pay for it. Up to what degree would you be interested in adopting it or subscribing to it?"
3. "Suppose [EVs] were available to you now, in only suboptimal conditions for you: a bit too expensive, or an offer that also contains applications you are not interested in. Up to what degree would you be interested in adopting it or subscribing to it?"

Each of the questions are, as mentioned, measured on a five-point Likert-scale. The possible answer the respondent may choose between are (De Marez, Verleye 2004, 37):

1. "I will subscribe/adopt immediately";
2. "Big chance I will subscribe/adopt";
3. "Let's wait and see, maybe later";
4. "I don't think I will subscribe/adopt";
5. "I certainly won't subscribe/adopt".

According to De Marez and Verleye (2004, 38), any respondent that does not answer the first PSAP question positively, will certainly be situated back in the adoption curve presented in Figure 1.3. However, if someone answers the first question positively, and in addition "stays quite sure of their intention to adopt the optimal and suboptimal offer" (*Ibid*), they will be placed at the front of the adopter category curve. Furthermore, they say that people who intend to adopt the suboptimal offer (question three in the PSAP scale) may be immediately considered innovators. If any of the

respondents answer positively (i.e. that they will adopt) on the first global question in addition to the optimal question, but at the same time not being too eager on the suboptimal offer, they may be placed somewhere in the early adopters and early majority groups as "they do not seem convinced" (De Marez, Verleye 2004, 38). "By combining all answers of every respondent on these three questions in a segmentation heuristic," De Marez and Verleye conclude, "every respondent is ranked in a gradual curving way according to their 'adoption' potential or their intention to adopt." (*Ibid*)

2. METHODOLOGY

To investigate Norwegians' attitudes towards EVs, as well as their motives and intention for purchasing an EV in the future, an online questionnaire will be used. The questionnaire will be based on Hole's (2017) questionnaire that was previously created for the purpose of measuring young Norwegians' attitudes towards EVs. Some alterations and updates will be made to take into account motives and intentions, as well as possible improvements to the questionnaire's semantics.

2.1. Methods of the research instrument

The questionnaire is "formed based on scales that may distinguish attitudes and preferences, mainly using interval scales such as the semantic differential rating scale, the Likert scale, the rating (or stated preference) scale, comparative scales, and ordinal scales." (Hole 2017, 11) In order to build trust, the questionnaire will start off using general and broad questions. This will give the respondents a feeling of ease; that the questionnaire is easy and simple. Later, the questionnaire will get increasingly focused "in order to obtain the information required to measure attitudes." (*Ibid*) Finally, demographic questions regarding e.g. age, gender, and political views will be asked. Such questions are asked in the end after building trust as they may be seen as personal and sensitive. The full description of the questionnaire's sequence and stages can be viewed in section 2.4.1. Furthermore, the questionnaire keeps a trivial, direct, and familiar vocabulary in order to avoid ambiguity, double-barrelled questions, generalisations and estimates, or any leading or loaded questions. (Malhotra 2007)

In order to avoid any possible language barriers and misinterpretations and to keep the vocabulary familiar, the questionnaire is translated to Norwegian before being sent to the participants, in accordance with Hole's recommendations (2017, 11). The questionnaire and its scales are based largely on well-established and well-researched methods found in Bruner II *et al.*'s Marketing Scaled Handbook published by the American Marketing Association. Only any open-ended questions will require a translation back to English as a structured questionnaire will be made.

The scope of this thesis does unfortunately not enable the current study to utilise a representative sample for the questionnaire. As the partial research questions are to compare the young Norwegians age group with the older age groups, the target population will be any Norwegian aged 18 or older who possess or plan to possess a driver licence. The current study will use convenience sampling in order to gather a sample of the population, and this will be done by selecting respondents because they are convenient to select. The underlying reasons for selecting a convenience sampling method is 1) the low costs involved, 2) the scope of the thesis, and 3) that the sampling units are readily accessible, relatively easy to measure, and cooperative. (Hole 2017, 13; Malhotra 2007) The convenience sample will therefore consist of people in the author's social circle and their friends, and the sample will be divided in two age groups from the age of 18 to 29 years old and 30 years old and above in order to make them comparable. In order for the questionnaire to gain traction when being shared, three random participants will be rewarded with a NOK 500 gift card – this is expected to motivate people to undertake and share the questionnaire.

In order to solve the partial research questions, and in turn the aim of the thesis, a T-test and a Mann-Whitney U-test will be conducted to statistically compare the attitudes, motives, and intention of young Norwegians to the older age groups. The two tests will be conducted in the SPSS Statistics software. For the purpose of this study, both the T-test and the Mann-Whitney U-test will have a confidence level of 0.95; $p<0.05$ to be considered significant. The correlations will have a confidence level of 0.95; $p<0.05$ to be considered significant. Other data analysis, such as compilation of charts and means will be conducted in aggregated form using Microsoft Excel. In order to find the correct correlations, some statements will be inverted. The correlations used are the Pearson correlation, as well as the Spearman correlation, both chosen for their compatibility with the semantic differential scale and the Likert-scale respectively.

2.2. The research instrument

The research instrument is an online questionnaire that is based on the questionnaire created by Hole (2017) in order to measure young Norwegians' attitudes towards EVs. The questionnaire will have alteration and additions in order to also measure motives and intention. First, the stages introduced in section 2.1. are defined and clarified. This is also named the sequence of the questionnaire. Then an overview of the main questions in the questionnaire, as well as their scales

and what they measure, are presented. The full questionnaire in English as well as the version translated to Norwegian may be found in Appendix 1 and 2 respectively.

2.2.1. Sequence

The sequence of the questionnaire is as follows:

1. Welcoming and presentation. In this first stage, the respondents are introduced to the purpose of the survey, how it should be conducted, approximate time usage, and – if applicable – what the participants will or may receive as a reward for fulfilling the survey. In addition, the author will express his gratitude towards the respondents for aiding with the research in question.

2. Broad, general, simple, and direct questions. In the second stage of the questionnaire, the questions are general and simple in order to establish rapport and give the impression that the survey is easy to complete. This second stage, which is the first to include questions, inquiries about the respondents' possession of a driver's license, whether they already own an EV, how the respondents perceive themselves, and, if applicable, if they plan to acquire a driver's license in the future. Inquiring about the driver's licence is essential in order to rule out any respondents that would not plan on having a driver's licence, and hence not be part of the population of interest; those who drive or will drive.

3. Focused questions. This stage consists of the majority of the questionnaire and it is built up of three sub-stages. The questions in this stage are concerned with, and related to, the research questions and the research aim. The sub-stages are as follows:

   3.1. Motive and barriers. This sub-stage has questions regarding the motives to purchase or own an EV, and the barriers to purchase or own an EV. The questions are asked using a five-point Likert-scale. They inquire into factors that motivate respondents to purchase an EV, and factors that are disincentives for the respondents to purchase an EV.

   3.2. Attitude. This sub-stage contains questions regarding respondents' attitude towards EVs. It is made up of multiple statements, using both a five-point Likert-scale to measure agreement and a seven-point semantic differential scale to measure affection. This sub-stage, as well as the following sub-stage, will provide most of the information needed to answer the research questions and answer the research aim.

   3.3. Intention and innovativeness. This third and last sub-stage is made up of questions which measure intention to purchase or own an EV in the future. This stage utilises questions from the PSAP scale presented in section 1.5 to measure innovativeness, as well as a seven-point semantic differential scale to measure both innovativeness and intention. This sub-stage will give the data needed to distinguish the respondents in adopter groups.

4. Demographics and sensitive data. The last stage in the questionnaire before thanking the respondents for their help are made up of questions that may be perceived sensitive. This is in accordance with Malhotra's (2007) advice regarding trust. The questions asked are concerned with age, gender, and political views. This allows the current study to make sure the respondents suit the population of interest. In addition, stage four is concerned with the participants which are not part of the population of interest, e.g. by asking those who do not plan to take the driver's licence how important EVs would have been to them if they were driving.

In order to avoid misinterpretations and other errors, each stage will also contain a clear guide on how each question and stage should be answered, in addition to an explenation of what is being measured.

2.2.2. Selected questions and their scales

A few selected questions based on Hole's (2017) questionnaire designed to measure young Norwegians' attitude towards EVs are presented in Table 2.1 on the next page. For each question, its scale items are presented in addition to the corresponding scale type. The full questionnaire contains more questions in accordance with the stages presented in section 2.4.1. The full English version of the questionnaire and all its questions, scale items, and scales may be viewed in Appendix 1, while the translated Norwegian version may be viewed in Appendix 2.

Table 2.1. Selected questions and their scales.

Questions	Scale items	Scale type
How would you rate your interest towards EVs relative to that of fossil-fuelled vehicles?	A1: No interest A2: Little interest A3: Moderate interest A4: High interest	The scale is a nominal scale which attributes unique labels to each characteristic.
Please indicate your level of agreement with the following statements:	a) EVs will take over after fossil-fuelled vehicles. b) I don't believe EVs are good for the environment. c) I would want an EV as my future car. d) Driving an EV gives you a higher status in society. e) I don't think the price of EVs is reasonable. f) EVs are good for long road trips. g) It is not possible to drive an EV through Europe. h) I am concerned about the driving range of EVs. i) Personally, for me, government incentives (such as no VAT; free toll-roads) makes EVs more attractive to own.	A five-point Likert-scale: 1: Strongly disagree 2: Partly disagree 3: Neither disagree nor agree 4: Partly agree 5: Strongly agree The scale looks as follows: :__:__:__:__:__: 1 2 3 4 5 or :__:__:__:__:__: 5 4 3 2 1 where the numbers shift from ascending to descending in order to avoid repetitive answering patterns.
Please rate the probability that you would purchase an EV in the future.	Improbable – Probable	Using a 7-point semantic differential scale to measure the intended engagement of a person to a specific behaviour. The scale looks as follows: :__:__:__:__:__:__: 1 2 3 4 5 6 7
Please rank the following attributes of EVs in terms of which appeals to you the most (1 being the most appealing and 7 being the least appealing)	a) Elimination of the use of fossil fuel b) Less maintenance c) Reduced emissions and pollution d) Looks and style e) Comfort f) Monetary incentives (free toll-roads, tax-exemption)	An ordinal scale allows the respondents to rank their responses, and it reveals which attributes are of more importance and which are of less importance relative to each other.

Source: Bruner II (2001); Egbue (2012); Hole (2017)

As displayed in Table 2.1 on the previous page, the Likert-scale will occasionally be inverted in order to avoid repetitive answering, and during data analysis these answers will then be inverted back, so that correlations and other statistical tests may be conducted. The sample of questions in the table are from the various stages in the questionnaire, looking into both attitude and intention.

2.3. Sample characteristics

The sample consists of 94 individuals aged 18 and above. The sample was collected through convenience sampling, and the main characteristics of the sample may be viewed in summarised form in table 2.2. Out of the 94 responses, 4 did not have the driver's license and, in addition, did not plan to acquire the driver's license in the future. These four respondents were not asked about their attitudes, motives, and intention as they will not be able to drive or purchase an EV in the future without a driver's license. Therefore, since they are not part of the population of interest, these respondents are not included in the analysis of the results. This makes the eligible sample consist of 90 respondents, n = 90.

Table 2.2. Main sample characteristics.

Characteristic		Number of respondents	Proportion in percent (%)
Gender, n=90	Female	51	56.7
	Male	39	43.3
Age, n=90	Younger than 18 years old	0	0.0
	18 to 29 years old	59	65.6
	30 years or older	31	34.4
Possession of driver's licence, n=90	Has the driver's licence	75	83.3
	Does not have the driver's licence, but plans to acquire it	15	16.7
Currently owning/leasing an EV, n=90	Not owning/leasing	77	85.6
	Currently owning/leasing	13	14.4
Interest in EVs compared to the interest in fossil-fuelled vehicles, n=90	No interest	2	2.2
	Little interest	19	21.1
	Moderate interest	41	45.6
	High interest	28	31.1

Source: author's own calculations

The sample consists of two age groups, the young age group that is aged 18 – 29 years old, and the older age group of everyone aged 30 years old or older. Due to the sampling method used, the

sample has a higher percentage of respondents in the young age group. There are also slightly more female respondents than male respondents, 54 versus 40 respectively. Out of the 90 respondents of interest, 13 said they currently own or lease an EV. When inquired about their interest in EVs compared to that in fossil-fuelled vehicles, 45.6 per cent of the respondents (n=90) reported a 'moderate interest' while 31.1 per cent reported a 'high interest'. The remaining reported a 'low interest' (21.2 per cent) and 'no interest' (2.2 per cent). The sample is not representative.

3. RESULTS AND DISCUSSION

The data for this thesis was collected using the online questionnaire presented in section 2. The data collection period went from the 19 April 2018 until, and including, the 24 April 2018. During these 5 days the questionnaire received 94 responses after being spread through social media and personal inquiries by the author.

3.1. Findings

While the majority of the sample did not own or lease an EV at the time they answered the questionnaire, the 13 respondents who did were asked to describe the three most important reasons they decided to purchase or lease an EV using keywords. The most common keywords were 'fees,' 'cheap to operate,' and 'incentives.' Amongst these 13 respondents, then, it appears that the economic and monetary aspect of owning or leasing an EV in Norway (such as the government incentives especially) has been the most important factor when making the decision to purchase or lease. Keywords such as 'environment,' 'comfort,' and 'due to work' were secondary to monetary incentives, implying that e.g. environmental issues were of less importance when the decision were made.

When asked to rate various bipolar statements, the respondents appear to be relatively homogenous in 1) their belief about climate change, that it is real; 2) about fossil-fuelled vehicles harming the local air quality, that it is true; 3) that local air quality is important; and 4) that more EVs instead of fossil-fuelled cars will better the local air quality. These statements had a mean of 1.53, 1.94, 1.62, and 1.93 respectively, on a scale from 1 to 7. The means for all the statements may be viewed in Figure 3.1. on the following page.
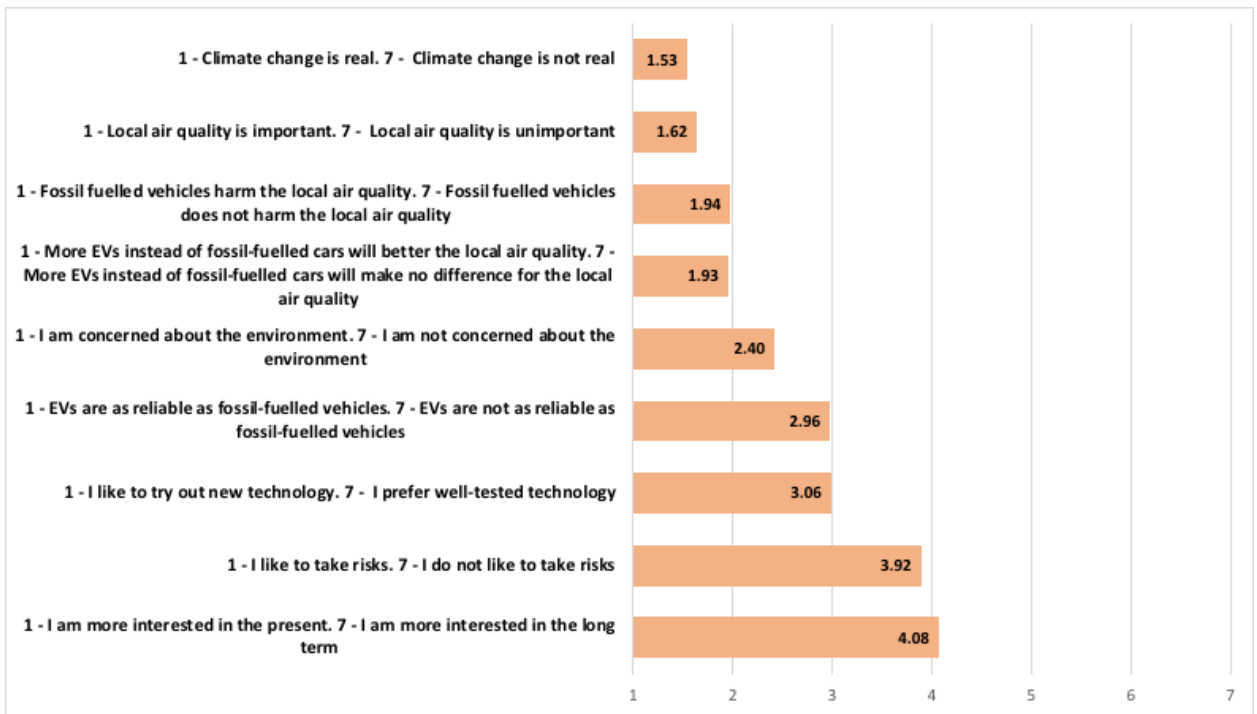
Figure 3.1. Means of bipolar statements on a 7-point scale regarding general attitudes, n=90. Source: authors own calculations.

The aforementioned statements are connected to the respondents' subjective norms and attitude towards a behaviour or action as described in the Theory of Planned Behavior (section 1.3). E.g. a person who believes fossil-fuelled vehicles harm the local air quality is prone to having a more positive attitude towards EVs, which in turn makes the person have a more positive attitude towards the behavior of purchasing an EV. This is confirmed using the Pearson Correlation between respondents' feelings (negative or positive) associated with hearing the word 'electric car' and their belief about fossil-fuelled vehicles' impact on the local air quality; these two statements have a positive correlation of 0.507, $p<0.001$. In addition, the respondents' feelings associated with hearing the word 'electric car' and their rated probability of purchasing an EV in the future have a positive correlation of 0.699, $p<0.001$. The following sub-sections will present the findings in-depth on the topics of motives, attitudes, intention, and innovativeness/adopter group classification.

3.1.1. Respondents' motives

The respondents' motives for purchasing an EV in the future were measured by ranking the level of agreement to a series of statements. The statements and their respective level of agreement may be viewed in Figure 3.2 below. The question posed to them were: "Given that your economy is not a barrier: to which degree do you agree that the following would motivate you to purchase an EV?" The respondents' motives for purchasing an EV were global climate issues, lower environmental impact, lower operating costs, and free access to toll roads, all in which 72 per cent or more of the respondents partly or strongly agreed. Lower operating costs came out as the most important motive, with 84 per cent of the respondents partly or strongly agreeing. The social status of owning an EV did not appear to be a large motive for the majority of the respondents. However, 10 per cent of the respondents partly or strongly agreed that the social status of owning an EV would be a motive. In addition, a negative correlation of -0.230, $p<0.05$, between the level of agreement to what the respondents' friends would think of them (as a barrier to purchase) and wanting an EV as a future car appeared. This indicates that the respondents may want an EV as their future car less the more they worry about what their friends would think.
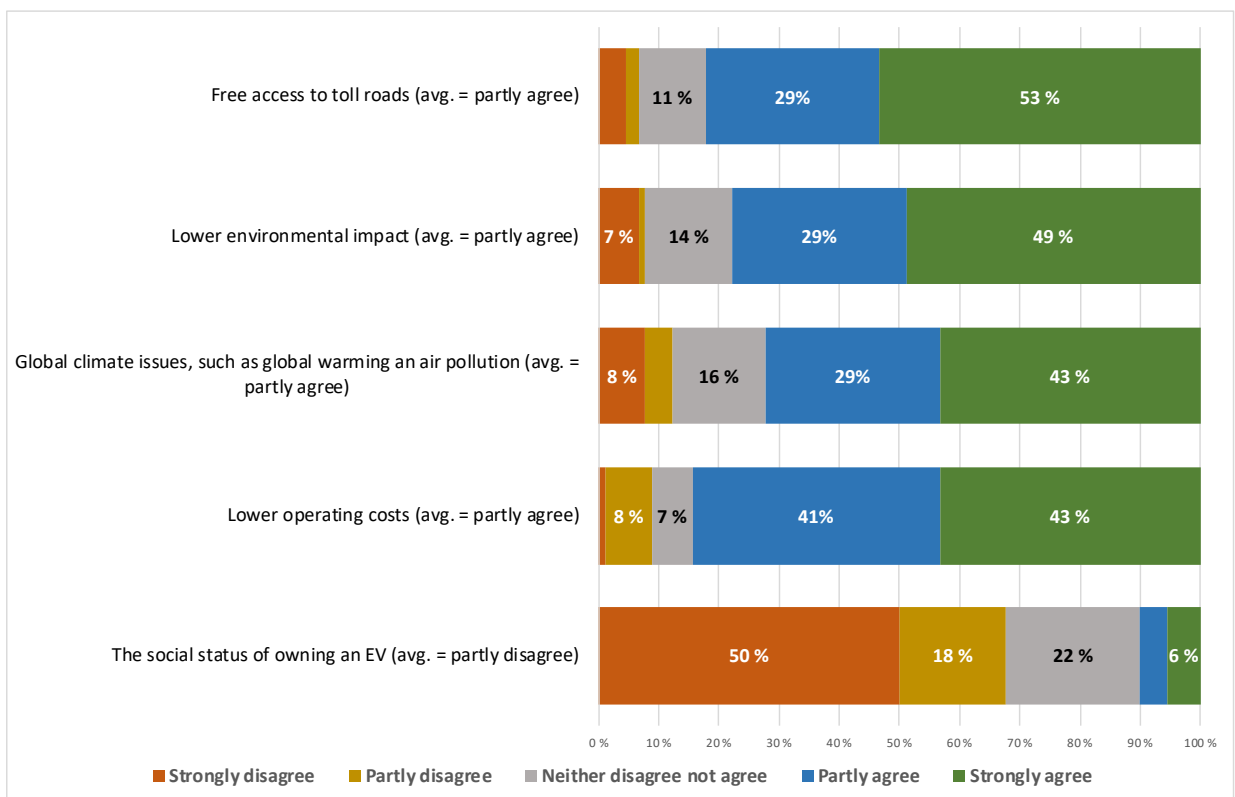

Figure 3.2. Level of agreement to statements regarding motives to purchase an EV, displayed in per cent (%), where n=90.
Source: authors own calculations.

In regards to the partial research question 3, there appeared two statistically significant difference between the young and older age groups' motives in the Mann-Whitney U-test, as shown in Table 3.2 below.

Table 3.2. Mann-Whitney U-test, motives.

Age group, n=90	18 – 29 years, n=59	30 years or older, n=31		
	Median	Median	U	Sig.
Global climate issues, such as global warming and air pollution (motive)	5	4	632.5	0.011
Free access to toll roads (motive)	5	4	696.5	0.041

Source: author's own calculations

Notes:
1. Aberrations: U-statistic (U) and 2-tailed significance (Sig.)

Both global climate issues and free access to toll roads are stronger motives for purchasing an EV in the future amongst the young age group compared to the older age group. The younger age group has a higher median answer on both of the statements. This may indicate that the young age groups is more concerned with global climate issues, or that they view EVs as stronger solution to global climate issues compared to the older age group.

3.1.2. Respondents' attitudes

The respondents' attitudes were measured using level of agreement to various statements on a five-point Likert-scale. The question posed to the respondents were "Please indicate your level of agreement with the following statements." The statements and the respondents' level of agreement may be viewed in Figure 3.3 on the next page.

The results from the sample show that the majority of the respondents thinks that government incentives makes it more attractive for them to own an EV. The respondents also display a high level of concern regarding the driving range of EVs, with 60 per cent partly or strongly agreeing that they are concerned about the driving range. There also appeared a negative correlation of -0.217, $p < 0.05$, between the concern about the driving range of EVs and the probability of purchasing an EV in the future. Furthermore, a positive correlation of 0.514, $p < 0.001$, appeared

between the respondents' attitude on whether EVs will take over after fossil-fuelled vehicles and wanting an EV as the future car, indicating that the stronger the attitude regarding EVs replacing fossil-fuelled vehicles, the more likely the respondents are to want an EV as their future car.
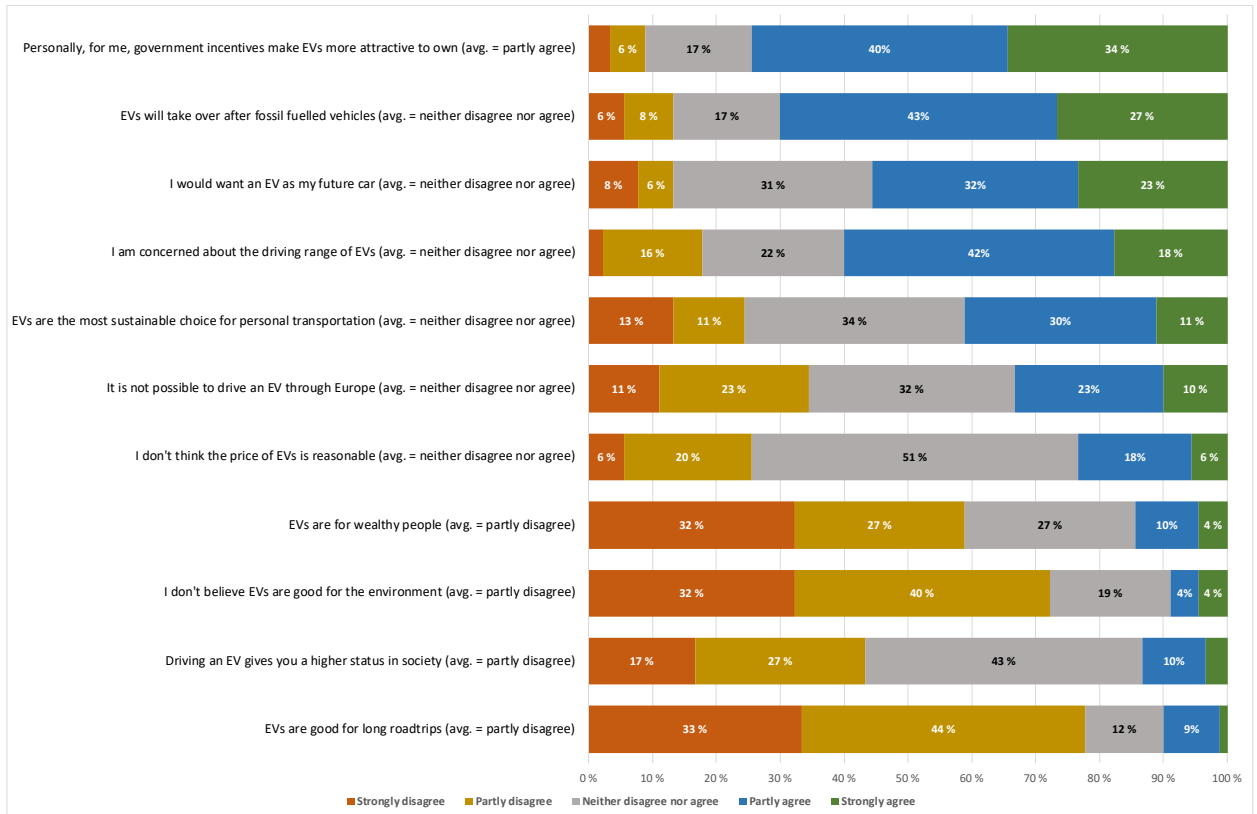

Figure 3.3. Level of agreement to statements regarding attitudes towards EVs, displayed in per cent (%), where n=90.
Source: authors own calculations.

In addition, while driving range is a clear concern to the majority of the respondents, the majority of the respondents (51 per cent) seems indifferent to the price of EVs when asked to take a stance to the statement "I don't think the price of EVs is reasonable." The rest of the respondents are spread evenly with 26 per cent on the disagree side of the scale, and 24 per cent on the agree side of the scale. Based on this it is unlikely that the majority of the respondents would have a negative attitude toward the price of EVs.

While the majority of the respondents (59 per cent) partly or strongly disagreed that EVs are for wealthy people, a negative correlation of 0.248, $p<0.05$, appeared between the respondents attitudes on electric car being for wealthy people, and wanting an EV as their future car. This indicates that the respondents who believe EVs are for wealthy people are less likely to want an EV as their future car.

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As mentioned in the start of chapter 3, there also appeared a positive correlation of 0.699, p<0.01, between the respondents' feelings associated with hearing the word 'electric car' and their rated probability of purchasing an EV in the future. This relatively strong correlation is in accordance with Fishbein and Azjen's Expectancy-Value Model (that attitude is the affection towards some object) and their Theory of Planned Behavior (that a person's subjective norms influence the person's intention to behave in a certain way) presented in section 1.2 and 1.3 respectively.

To measure the respondents' attitude, the current study also utilized bipolar statements on a 7-point semantic differential scale. The bipolar statements and their mean may be viewed in Figure 3.4 below.

A positive correlation of 0.484, p<0.01, appeared between the probability of purchasing an EV in the future and the attitude regarding EVs' reliability compared to the reliability of fossil-fulled vehicles. This indicates that the more positive a respondent is towards the reliability of EVs compared to that of fossil-fuelled vehicles, the higher intention the respondent has to purchase an EV in the future. In addition, a positive correlation of 0.585, p<0.01, appeared between the probability of purchasing an EV in the future, and the attitude towards (opinion of) people who own an electric car, i.e. whether they are wise or foolish. The same (r=0.654, p<0.01) appeared between the desirability to own an EV and the attitude (opinion) of people who own an EV.
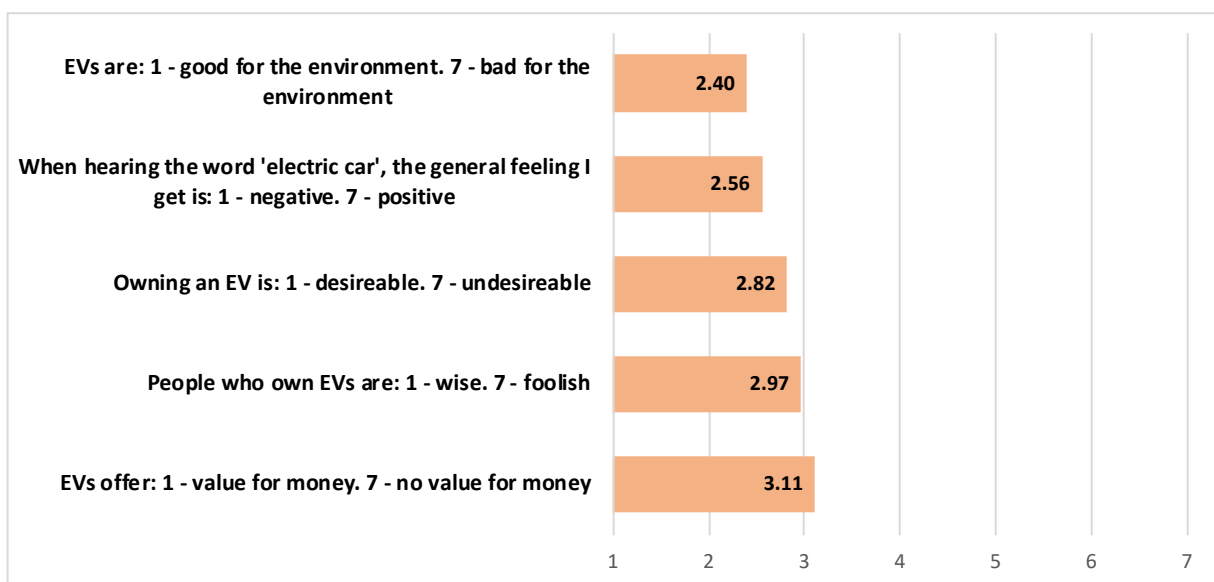

Figure 3.4. Means of bipolar statements on a 7-point scale regarding attitudes toward EVs, where n=90.
Source: authors own calculations.

In addition, a positive correlation of 0.417, $p<0.001$, appeared between how desirable the respondents found it to own an EV and their agreement to the statement "Driving an electric car gives you a higher status in society." This indicates that the higher status a respondent perceives owning an EV gives, the more desirable it is to own an EV. Related to the Theory of Planned Behavior, this is an example of a subjective norm, i.e. pressure from the society, or what others may think of a specific behavior.

In regard to the partial research question 2, there appeared no statistically significant differences between the young and older age groups' attitudes in the Mann-Whitney U-test, as shown in Table 3.3 below.

Table 3.3. Mann-Whitney U-test, attitudes.

Age group, n=90	18 – 29 years, n=59	30 years or older, n=31		
	Median	Median	U	Sig.
Personally, for me, government incentives make EVs more attractive to own	4	4	779.0	0.223
I would want an EV as my future car	4	4	825.5	0.432
I am concerned about the driving range of EVs	4	4	847.5	0.550

Source: author's own calculations

Notes:
   2.   Aberrations: U-statistic (U) and 2-tailed significance (Sig.)

In the Mann-Whitney U-test, the two age groups also had the same median for the three selected statements, indicating that even with statistically significant results, the difference would not necessarily be considerably large. In regard to the partial research question 4, the younger age group had a higher probability of purchasing an EV in the future than the older age group, but the difference was not statistical significant (see Table 3.4 on the next page), hence there is no statistically significant connection between age and the probability to purchase an EV in the sample of this study.

Table 3.4. T-test, probability to purchase an EV in the future.

Age group, n=90	18 – 29 years, n=59		30 years or older, n=31				
	M	SD	M	SD	t	df	Sig.
Probability to purchase an EV in the future	5.59	5.42	1.288	1.587	0.561	88	0.576
Respondent's inclination to take risks	4.41	1.315	3.45	1.312	3.279	61	0.002

Source: author's own calculations

Notes:
1. Aberrations: Mean (M), standard deviation (SD), t-value (t), degrees of freedom (df), and 2-tailed significance (Sig.).

Although differences in the mean appeared in the T-test shown in table 3.4, the result was not statistically significant, and it is therefore not possible to conclude on the differences with the current sample size. As seen in Table 3.4, there did however appear statistically significant differences between the two age groups in regards to risks. The younger age group appears to be more inclined to take risks as opposed to the older age group.

3.1.3. Respondents' adopter classification

In order to classify respondents in adopter groups, the PSAP scale was used. The level of agreement to each of the three questions in the PSAP scale may be viewed in Figure 3.5 on the next page. On the first 'current state' PSAP question, being "Suppose an EV were available to you now. As you have it in mind right now, up to what degree would you be interested in purchasing it?", 4 per cent of the respondents said they would purchase an EV immediately. Under optimal conditions 23 per cent of the respondents would purchase an EV immediately, while under suboptimal conditions only 1 per cent of the respondents would purchase an EV immediately.
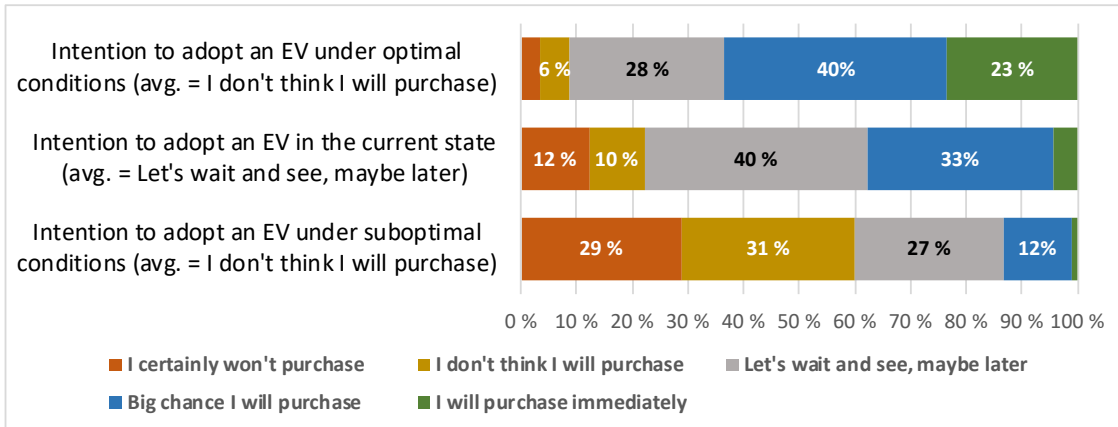
Figure 3.5. Level of agreement to the PSAP-scale questions, where n=90.
Source: authors own calculations.

In accordance with the guidelines provided with the PSAP-scale (see section 1.4) the respondents have also been placed in adopter groups in a segmentation heuristic. The adopter categorisation as well as the proportion of responders in each group may be viewed in Figure 3.6 below.
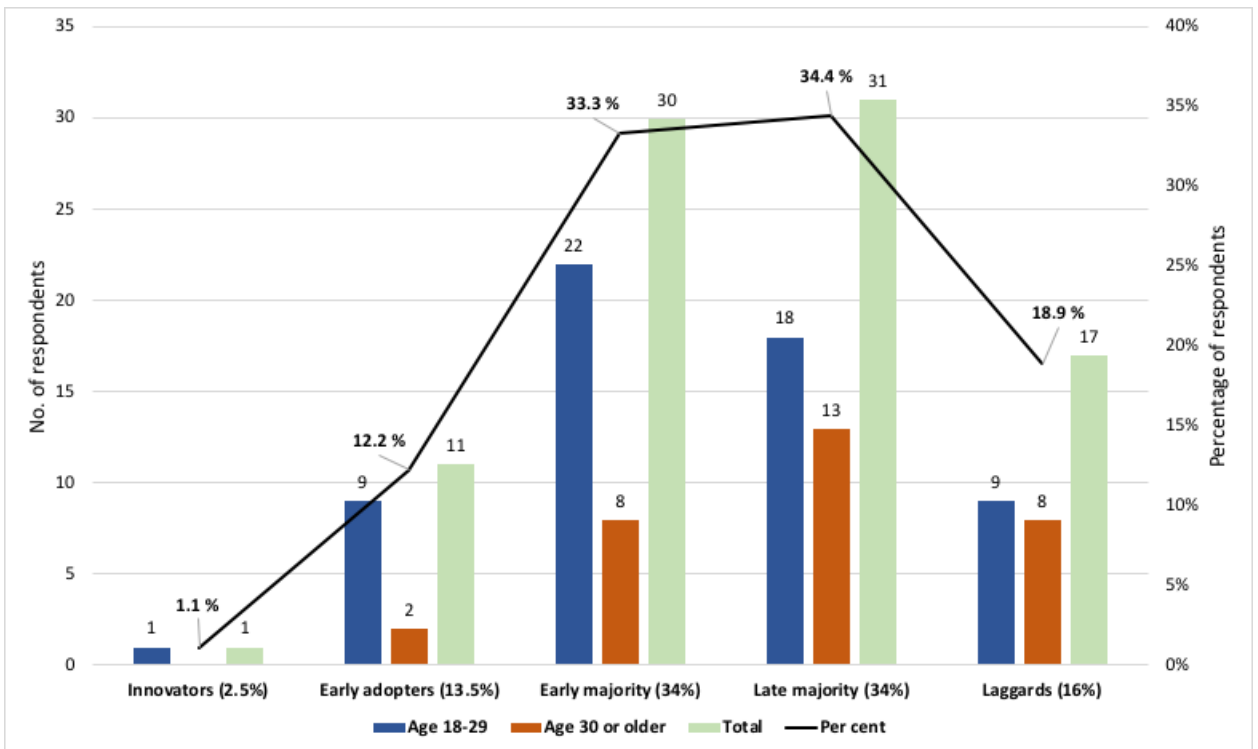

Figure 3.6. Adopter categorisation in a segmentation heuristic, where n=90.
Source: authors own calculations.

The overall adopter categorisation is fairly equal to that presented by Rogers (2003). From the graph it is also visible that the younger age group aged 18 to 29 years old have a larger proportion

of their respondents in front of the adopter curve as opposed to the older age group aged 30 or older, which have a larger proportion of their respondents in the back of the adopter curve. Most early adopters appears to belong to the younger age group, and the only person that could, according to the PSAP-scale criterias, be considered an innovator were also in the younger age group. Of the respondents in the older age group, a large proportion is placed among the late majority and the laggards. This, together with the results in Table 3.4 which showed that the younger age groups are more inclined to take risks supports the notion that the younger age group is more likely to take the risk of adopting EVs earlier compared to the older age group.

3.2. Limitations and further research

The most pressing limitations in the current study are connected to the sampling method, sample size and various groups in the sample. While the sample consists of 90 respondents, the age groups are grouped in such a manner that it is not possible to know whether the respondents in the older age group are 31 years old or 61 years old. The fewer individuals in the sample, the more this issue comes forth. When comparing the two age groups, their attitudes, motives and intention may have appeared without significant differences in the T-test and the Mann-Whitney U-test due to an uneven distribution of age in the older age group. This is most likely due to the sampling method used in the current study where the study was spread most widely and efficiently in the young age group. In addition, the grouping was conducted in the questionnaire instead of during data analysis. The current study therefore finds reason to believe that most of the respondents in the older age groups were aged under 40, hence differences in attitudes, motives, and intentions may not appear clearly. For future research, the current study recommends collecting the individual age of all respondents, for then to make groups when conducting the data analysis. In addition, the current study recommends that a larger sample will be gathered, and that more effort will be put in collecting more evenly from all relevant age groups, e.g. by using a different sampling method. The current study would then suggest that statistical significant differences between the age groups would appear as the tests displayed indication of differences, but not on a statistically significant level. This suggestion is made as a consequence of groups in the sample, such as political party, being too small to compare using a T-test, and as a result no differences could be investigated.

Although the current study has a strong limitation in sampling method, sample size and use of groups, differences between the age groups still came forth in regards to adoption of EVs and on

a few selected statements. It is recommended that further research is conducted in the differences between the younger and older age groups in order to more accurately reveal attitudes and adopter categories/intention to adopt. By doing so, future decisions regarding incentives for EVs may be made based on better and more relevant facts than by majorly focusing on older age groups. Further researching attitudes is also recommended when investigating any group's intention to purchase (adopt) an EV in the future as attitude correlate with intention, in accordance with the Theory of Planned Behavior.

Lastly, combining all answers of every respondent on the PSAP questions in a segmentation heuristic may be prone to bias as this is in the nature of heuristic approaches.

3.3. Discussion

The current study revealed no clear differences between the young and older age group in attitudes or intention to purchase an EV in the future. This may be a result of the limitations mentioned in section 3.3.

There did, however, appear a statistical significant difference between the age groups in two motives to purchase an EV in the future. Both global climate issues and free access to toll roads are stronger motives for purchasing an EV in the future amongst the young age group compared to the older age group. As suggested by previously presented theory and voting patterns, this may further indicate that the younger age groups are more concerned about the environment and that government incentives will be important to uphold in the future. In addition, a statistically significant difference between the age groups in inclination to take risks appeared. The younger age group is more inclined to take risks compared to the older age group. Although no other differences between age groups were revealed, there appeared a relatively strong positive correlation between the probability to purchase an EV in the future and the general feeling when hearing the word 'electric car.' Furthermore, other positive correlations between attitude and intention to purchase an EV (as well as desirability to own an EV) in the future were revealed. The findings also revealed that the respondents who are concerned about e.g. the driving range of an EV are less likely to purchase an EV in the future the more concerned they are. These results are seen to be in accordance with the Expectancy-Value Model and the Theory of Planned Behavior, and they confirm that those with a more positive attitude towards EVs are more likely to purchase

or adopt an EV in the future. Further researching attitudes is therefore important when investigating any group's intention to purchase (adopt) an EV in the future.

Although there were no significant differences between the age groups in attitude or intention towards EVs, it appears that the young Norwegians in the sample find incentives to be a large motive for a future purchase as well as making EVs more attractive to own. This may be viewed as an indication that it may be of importance for the Norwegian government to uphold the incentives for a longer period of time. However, a conclusion about this cannot be explicitly made as the sample is not representative. In addition, young Norwegians aged 18 to 29 years old in the current study's sample may be more important for the government in order to reach the 'Critical mass' point, in which the further rate of adoption becomes self-sustaining. This is due to their adopter categorisation as opposed to the older age group. The younger age group has a larger proportion of the respondents placed in the innovator group and the early majority group, which are the two adopter groups essential to reach the critical mass. The older age group, on the contrary, has a larger proportion placed in the late majority group and laggards group, indicating that the older age group will be slower to adopt new innovations, in this case EVs. This is backed up by the finding that the younger age groups like to take more risks compared to the older age group – a characteristic of people placed in the innovator and early adopter groups. However, a larger and representative sample would be required in order to come to an explicit conclusion.

CONCLUSION

The aim of the current study was to: 1) investigate and reveal Norwegians' attitudes towards EVs as well as their motives and the intention to purchase an EV in the future; and 2) compare two age groups' attitudes, motives and intention to purchase an EV in the future. In order to do so, the current study presented a theoretical framework for measuring attitudes, motives and intention. Then an online questionnaire was conducted. It received 90 eligible respondents.

There appeared no statistically significant ($p<0.05$) differences in attitudes towards EVs and the intention to purchase an EV in the future between the two age groups used in the study. There did, however, appear two statistically significant differences in the two age groups' motives for purchasing an EV in the future. Both global climate issues (U=632.5, $p<0.05$) and free access to toll roads (U=696.5, $p<0.05$) are stronger motives for purchasing an EV in the future amongst the young age group compared to the older age group. As the higher concern for global climate issues match with the theory and voting patterns amongst the young Norwegians (18 – 29 years old) in Norway, it may further indicate that young Norwegians are generally more concerned about environmental issues. However, due to limitations in sampling methods, sample size, and grouping, no generalized conclusion may be made.

There also appeared several correlations between attitudes (see the list below). The strongest correlation was found between the intention to purchase an EV in the future and the general feelings associated with the word 'electric car':

1. A positive correlation of 0.699, $p<0.001$, appeared between the intention to purchase an EV in the future and the general feelings associated with the word 'electric car.' This indicates a connection between the affection towards EVs, and the intention to purchase an EV in the future.
2. A positive correlation of 0.417, $p<0.001$, appeared between how desirable the respondents found it to own an EV and their agreement to the statement "Driving an electric car gives

you a higher status in society." This indicates that the higher status a respondent perceives owning an EV gives, the more desirable it is to own an EV.

3. A positive correlation of 0.585, $p<0.01$, appeared between the probability of purchasing an EV in the future, and the attitude towards (opinion of) people who own an electric car. This indicates that the more positive opinion the respondents have of people who own an EV, the more probable it is they will purchase an EV in the future.

4. A negative correlation of -0.248, $p<0.05$, appeared between the respondents attitudes on electric car being for wealthy people, and wanting an EV as their future car. This indicates that the respondents who believe EVs are for wealthy people are less likely to want an EV as their future car.

5. A negative correlation of -0.230, $p<0.05$, between the level of agreement to what the respondents' friends would think of them and wanting an EV as a future car appeared. This indicates that the respondents may want an EV as their future car less the more they worry about what their friends would think.

Incentives and attitudes towards EVs amongst the sample as a whole were largely in accordance with previous research conducted on the matter. It showed e.g. that monetary incentives are important motives for purchasing an EV, something which aligns with previous research. Differences between younger and older Norwegian age groups have not previously been researched, and the results are novel.

Based on the findings and the conclusion, the current study suggests the following proposals and recommendations:

1. Possible differences in attitudes and intention between the young Norwegians and the older age groups do not appear due to limitations in sampling methods, sample size, and grouping. It is therefore recommended for further research to utilize a different sampling method, acquiring a larger sample, and to not group the respondents before conducting data analysis.

2. Government incentives are a strong motive for purchasing an EV in the future. In addition, young Norwegians in the current study appear more likely to adopt EVs earlier than the older age group. It is therefore recommended that further representative research is conducted amongst young Norwegians on this matter, so that the Norwegian government may shape the future incentives in more efficient and effective ways. This practical

implication may be beneficial in order to reach a self-sustaining EV market and the zero-emission new car sales goal.

3. Further researching attitudes are important when investigating any group's intention to purchase (adopt) an EV in the future, and the current study suggests using the Theory of Planned Behavior when investigating attitudes and intention in further research.

The presented conclusion and proposals appear to have a strong applicability based on the methods used in the current study and the results' statistical significance. It is recommended to conduct further research on the topic as this study appears to be the first study focusing explicitly on comparing different age groups of Norwegians and their attitudes towards EVs

LIST OF REFERENCES

100 000 el-biler (2017). Statistics Norway. Accessible: https://www.ssb.no/transport-og-reiseliv/artikler-og-publikasjoner/100-000-el-biler, 17 March 2018.

Ajzen, I. (1991). The Theory of Planned Behavior – *Organizational Behavior and Human Decision Processes,* Vol. 50, 179-211.

Ajzen, I., Fishbein, M. (1975). *Belief, Attitude, Intention, and Behavior: An Introduction to Theory and Research*. 1st ed. Reasing, MA, USA: Addison-Wesley Publishing Company.

Arbeiderpartiet og Høyre tilbake I skolevalget, SV mest frem. (2017). Norsk Senter for Forskningsdata (NSD). Accessible: http://www.nsd.uib.no/article.html?a=/articles/article0052.html, 17 March 2018.

Bilsalget i 2017 (2018). Opplysningsrådet for Veitrafikken AS. Accessible: http://www.ofvas.no/bilsalget-i-2017/category751.html, 17 March 2018.

Bruner II, G. C., James, K. E., Hensel, J. P. (2001). *Marketing Scales Handbook: A compilation of Multi-Item Measures*. 3rd ed. Chicago, USA: American Marketing Association.

Court decision, 19.12.2017, Tax reductions on zero emission vehicles, EFTA Surveillance Authority, 228/17/COL, Brussels.

De Marez, L, Verleye, G. (2004) Innovation diffusion: The need for more accurate consumer insight. Illustration of the PSAP scale as a segmentation instrument – *Journal of Targeting, Measurement and Analysis for Marketing*, Vol. 13, 32-49.

Degirmenci, K., Breitner, M. H. (2017). Consumer purchase intentions for electric vehicles: Is green more important than price and range? – *Transportation Research Part D,* Vol. 51, 250-260.

Dewberry, C., J.R. Jackson, D. (2018). An application of the theory of planned behaviour to student retention – *Journal of Vocational Behavior*, Vol. 107, 100-110.

Egbue, O., Long, S. (2012). Barriers to widespread adoption of electric vehicles: an analysis of consumer attitudes and perceptions – *Energy policy*, Vol. 48. Netherlands: Elsevier, 717-729.

Ekanger, A. (2017). Ny "verdensrekord": Nesten halvparten av alle solgte nybiler var elektriske. – *Norsk Rikskringkasting*. Accessible: https://www.nrk.no/hordaland/ny-_verdensrekord__-nesten-halvparten-av-alle-solgte-nybiler-var-elektriske-1.13680189, 20 March 2018.

Fearnley, N., Pfaffenbichler, P., Figenbaum, E., Jellinek, R. (2015). E-vehicle policies and incentives – assessment and recommendations. – *TØI report* No. 1421/2015. Oslo: Institute of Transport Economics.

Figenbaum, E., Assum, T., Kolbenstvedt, M. (2015). Electromobility in Norway: Experiences and Opportunities. – *Research in Transportation Economics,* Vol. 50, 29-38.

Figenbaum, E., Kolbenstvedt, M. (2016). Learning from Norwegian Battery Electric and Plug-in Hybrid Vehicle users: Results from a survey of vehicle owners. – *TØI report* 1492/2016. Oslo: Institute of Transport Economics.

Figenbaum, E., Kolbenstvedt, M., Elvebakk, B. (2014). Electric vehicles – environmental, economic and practical aspects: As seen by current and potential users. – *TØI report* 1329/2014. Oslo: Institute of Transport Economics.

Guerreiro, C., Ortiz, A. G., de Leeuw, F. (2017). Air quality in Europe – 2017 report. – *EEA Report,* No. 13/2017. Luxembourg: Publications Office of the European Union.

Hole, H. (2017). How to measure young Norwegian's attitudes towards electric vehicles. Tallinn: Tallinn University of Technology.

Kangur, A., Jager, W., Verbrugge, R., Bockarjova, M. (2017). An agent-based model for diffusion of electric vehicles. – *Journal of Environmental Psychology,* Vol. 52, 166-182.

Malhotra, K. N. (2007). *Marketing Research: An Applied Orientation*. 5th ed. New Jersey, USA: Pearson Prentice Hall.

Norwegian Ministry of Transport and Communications. (2016-2017). Meld. St. 33 (2016-2017) Report to the Storting (white paper): National Transport Plan 2018-2029. English summary.

Oxford Dictionaries. (2018). *Motive*. Accessible: https://en.oxforddictionaries.com/definition/motive, 10 April 2018.

Rogers, E. M. (2003). *Diffusion of Innovations.* 5th ed. New York: Free Press.

Statistics Norway. (2017). Table 09625: General election. Voters, by political party and age (per cent). StatBank Norway [E-database]. Accessible: http://www.ssb.no/en/statbank/sq/10004427/

The School Elections. (2017). Norwegian Centre for Research Data (NSD). Accessible: http://www.nsd.uib.no/nsd/english/school_election.html, 17 March 2018.

APPENDICES

Appendix 1. The Questionnaire

Question	Scale items	Scale type
stage 2 – general questions		
Q1: Do you currently have the driver's licence?	A1: Yes A2: No	
Q1.1 (if Q1='No'): Do you intend to acquire the driver's licence in the future?	A1: Yes A2: No	A nominal scale that attributes unique labels to each characteristic.
Q2: How would you rate your interest towards EVs relative to that of fossil-fuelled vehicles?	A1: No interest A2: Little interest A3: Moderate interest A4: High interest	
Q3: Do you already own/lease an EV?	A1: Yes A2: No	
Q4: Please indicate to what degree you agree with the following bipolar statements.	a) I am concerned about the environment – I am not concerned about the environment b) Climate change is real – Climate change is not real c) EVs are as reliable as fossil- fuelled vehicles – EVs are not as reliable as fossil-fuelled vehicles d) Fossil-fuelled vehicles harm the local air quality – Fossil-fuelled vehicles does not harm the local air quality e) I am more interested in the present – I am more interested in the long-term f) Local air quality is important – Local air quality is unimportant g) I like to try out new technology – I prefer well- tested technology h) More EVs instead of fossil- fuelled cars will better the local air quality – More EVs instead of fossil-fuelled cars will make no difference for the local air quality i) I like to take risks – I do not like to take risks	A seven-point semantic differential scale captures how the participants view themselves and their values. The scale looks as follows, with each polar statement on the opposite sides of the scale: :__:__:__:__:__:__: 1 2 3 4 5 6 7

The table continues on the following page.

Appendix 1. The Questionnaire continued

Question	Scale items	Scale type
stage 3.1 – motives		
Q1: Please rank the following attributes of EVs in terms of which appeals to you the most (1 being the most appealing and 6 being the least appealing)	a) Less maintenance b) Reduced emissions and pollution c) Looks and style d) Comfort e) Monetary incentives (free toll-roads, tax-exemption) f) Possibility to drive in the bus lanes	An ordinal scale allows the respondents to rank their responses, and it reveals which attributes are of more importance and which are of less importance relative to each other.
Q2: Given that your economy is not a barrier: to which degree do you agree that the following would keep you from purchasing an EV?	a) The reach (how long one can drive on one charge) b) The re-charging length (how long it takes to re-charge the battery) c) The lower price due to VAT-exemption d) What my friends would think of me e) The battery-performance during winter time f) Uncertainty regarding future incentives (uncertainty regarding future free parking, allowance to drive in the bus lane, discounted road toll, etc)	A five-point Likert-scale: 1: Strongly disagree 2: Partly disagree 3: Neither disagree nor agree 4: Partly agree 5: Strongly agree The scale looks as follows: :_:_:_:_:_: 1 2 3 4 5 or :_:_:_:_:_: 5 4 3 2 1
Q3: Given that your economy is not a barrier: to which degree do you agree that the following would motivate you to purchase an EV?	a) Free access to toll roads b) Lower operating costs c) Lower environmental impact d) The social status of owning an EV e) Global climate issues, such as global warming and air pollution	where the numbers shift from ascending to descending in order to avoid repetitive answering patterns.

The table continues on the following page.

Appendix 1. The Questionnaire continued

Question	Scale items	Scale type
	Stage 3.2 – attitude	
Q1: Please indicate your level of agreement with the following statements.	a) EVs will take over after fossil-fuelled vehicles. b) I don't believe EVs are good for the environment. c) I would want an EV as my future car. d) Driving an EV gives you a higher status in society. e) I don't think the price of EVs is reasonable. f) EVs are good for long road trips. g) It is not possible to drive an EV through Europe. h) I am concerned about the driving range of EVs. i) Personally, for me, government incentives (such as no VAT; free toll-roads) makes EVs more attractive to own. j) EVs are for wealthy people. k) EVs are the most sustainable choice for personal transportation	A five-point Likert-scale: 1: Strongly disagree 2: Partly disagree 3: Neither disagree nor agree 4: Partly agree 5: Strongly agree The scale looks as follows: :__:__:__:__: 1 2 3 4 5 or :__:__:__:__: 5 4 3 2 1 where the numbers shift from ascending to descending in order to avoid repetitive answering patterns.
Q2: Please indicate to what degree you agree with the following bipolar statements about EVs.	a) Owning an EV is: desirable – undesirable b) People who own EVs are: wise – foolish c) EVs are: good for the environment – bad for the environment d) EVs offer: value for money – no value for money e) When hearing the word 'electric car', the general feeling I get is: negative – positive	A seven-point semantic differential scale captures the attitudes of the respondents. The scale looks as follows, with each polar statement on the opposite sides of the scale: :__:__:__:__:__:__: 1 2 3 4 5 6 7

The table continues on the following page.

Appendix 1. The Questionnaire continued

Question	Scale items	Scale type
stage 3.3 – intention and innovation		
Q1: Suppose an EV were available to you now. As you have it in mind right now, up to what degree would you be interested in purchasing it?	1. "I will purchase immediately"; 2. "Big chance I will purchase"; 3. "Let's wait and see, maybe later"; 4. "I don't think I will purchase"; 5. "I certainly won't purchase"	The PSAP scale by De Marez and Verleye, using a five-point Likert-scale that looks as follows: :__:__:__:__: 1 2 3 4 5
Q2: Suppose EVs were available to you now, in its most optimal conditions for you: only the applications/features/services you are interested in, and at a price that isn't exceeding the price you are willing to pay for it. Up to what degree would you be interested in purchasing it?		
Q3: Suppose an EV were available to you now, in only suboptimal conditions for you: a bit too expensive, or an offer that also contains applications you are not interested in. Up to what degree would you be interested in purchasing it?		
Q4: Please rate the probability that you would purchase an EV in the future.	Improbable – Probable	A seven-point semantic differential scale measures the behavioural intention to engage in a specific action. The scale looks as follows: :__:__:__:__:__:__: 1 2 3 4 5 6 7

The table continues on the following page.

Appendix 1. The Questionnaire continued

Question	Scale items	Scale type
stage 4 – demographics		
Q1 (if 'yes' on Q3 in stage 2): Please write, using keywords, the three main reasons for your decision to purchase or lease an EV.	1. Open text field.	A nominal scale that attributes unique labels to each characteristic.
Q2 (if 'no' on Q1.1 in stage 2): Consider for a moment that you would in fact be interested in taking the driver license. How important would it be to you to drive an EV instead of a fossil-fuelled vehicle?	Not important – Important	A seven-point semantic differential scale measures the importance of driving an EV. The scale looks as follows: :__:__:__:__:__:__: 1 2 3 4 5 6 7
Q3: What is your age?	A1: Younger than 18 A2: 18 – 29 A3: 30 or older	
Q4: What is your biological gender?	A1: Female A2: Male	
Q5: What did you vote in the last parliamentary election? (this question is optional)	A1: Arbeiderpartiet (AP) A2: Høyre (H) A3: Fremskrittspartiet (FrP) A4: Senterpartiet (SP) A5: Sosialistisk Venstreparti (SV) A6: Venstre (V) A7: Kristelig Folkeparti (KrF) A8: Miljøpartiet de Grønne (MDG) A9: Rødt (R) A10: Pensjonistpartiet A11: Partiet de Kristne A12: Annet	A nominal scale that attributes unique labels to each characteristic.

Source: Bruner II *et al* (2001); De Marez, Verleye (2004, 37); Egbue, Long (2012); Hole (2017)

Notes:
1. The questions and their sequence in their respective stage are denoted as Q1, Q2, …, Q*n*.

2. The answers and their sequence in their respective stage are denoted as A1, A2, …., A*n*.

3. Statements to rank according to agreement or affection are denoted a), b), …, z)

Appendix 2. The Online Questionnaire translated to Norwegian

The online questionnaire translated to Norwegian is long and has, according to the methodological guide for writing research papers in Tallinn University of Technolgy, been uploaded to a third-party server for viewing and downloading. The questionnaire is accessible on the following link: https://www.dropbox.com/s/5btz9bvqac1q5du/questionnaire%20in%20Norwegian.pdf?dl=0.