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Who is the EV customer? 'Early adopter' customer segmentation.

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Executive Summary

As more people adopt plug-in electric vehicles (EVs), new markets are emerging for EV charging products and services. A key challenge that companies entering this market face is understanding the customer; Current EV customers- the 'innovators' - are not necessarily representative of the EV customers coming in the next five years, i.e. the 'early adopters'. Delta Energy & Environment (Delta-ee) carried out market research to help understand charging preferences of the 'early adopters' using an online survey with conjoint analysis. Of the 1,001 responses received from those expected to be 'early adopters' in the UK, Delta-ee found that 61% of charging sessions would be carried out at home, with only 8% happening at public charging locations. Delta-ee identified three EV customer segments: the Suburban Commuters; the Mix-And-Matchers; and the Home Dwellers. Each have different preferences and demographics that match different EV charging products and services.

1 Introduction

Over the past three years, the transition of the road transport sector to electrification moved from a question of 'if' to a question of 'when'. Automotive Original Equipment Manufacturers (OEMs) are announcing more plug-in electric vehicle (EV) models every year targeted at markets across Europe. With this development, auxiliary markets emerge for products and services that support the charging of EVs.

A key challenge for any emerging market is to understand their prospective customers. The EV supply equipment (EVSE) market is no different. While sales of EV continues to grow across Europe, it is important to note it represents a very small portion of the overall vehicle market. At the end of 2018, EVs accounted for 0.3% of all passenger vehicles in use across Europe [1]. The customers of these EVs may not be representative of the remaining 99.7%. When a company brings a new product or service to the EVSE market, it is difficult to know whether the future customers will behave in the same way to existing customers.

One way to demonstrate this is the technology adoption curve, Figure 1. As labelled, the level of adoption across Europe in 2018 could be considered within the 'Innovators' stage. The speed of acceleration will vary from country to country, but broadly, most markets will enter the 'Early adopter' stage by 2025. The EVSE market is looking to understand the 'Early adopter' to market its products.

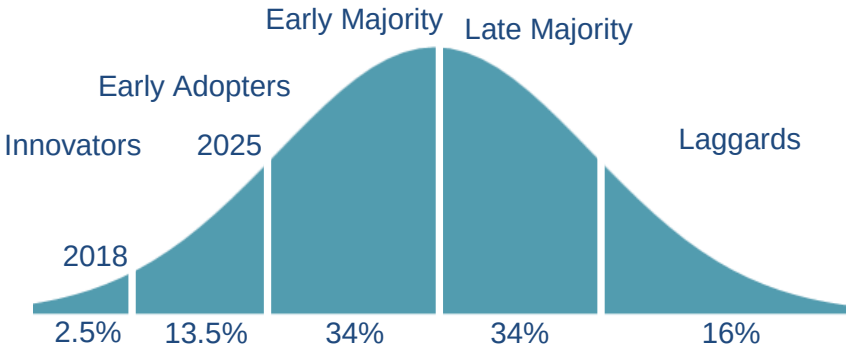

Figure 1: Technology adoption curve for EV adoption. The x axis accounts for the proportion of adoptors from 0% of adoption on the left, through to 100% on the right. The adoption rate can be broken down into five stages.

1.1 Experience Bias

Anticipating customer preferences of new technologies can be a difficult task; consumers do not know exactly how they will value and use something they have not experienced before. Market research can, therefore, be limited by an experience bias; findings are limited by the lack of experience of the participants. Delta Energy & Environment (Delta-ee) carries out market research to help overcome this barrier and improve the understanding of what the 'Early adopter' EV customers are likely to adopt.

2 Methodology

Delta-ee carried out market research in March 2018 to understand the likely charging preferences of 'Early adopter' EV customers. The focus was the UK market. 'Early adopters' were classified as those likely to privately buy or lease an EV within the following five years (before 2025). An online survey was used with a choice experiment and conjoint analysis approach.

2.1 Online Survey

An online survey was conducted with 1,001 completed responses. The survey formed several groups of questions. Participants were initially filtered for quality and to select those who fitted a profile that was likely to become an 'Early adopter' EV customer. These questions included asking about the likelihood of replacing their current vehicle within this time period, the likelihood of purchase of a new or nearly new vehicle and the openness to considering EV.

A further series of descriptive questions were asked to collect demographic information and travel behaviours about the participants. Example questions include *'How many single car journeys did you make in the last week?'* and *'In a typical month how many times would you visit a petrol station to refuel your car?'*. This series of questions help build up the characteristics of the overall survey population as well as add definition to the customer segmentation later in the research.

Following this, a series of 10 scenario questions were asked in order to conduct a choice experiment with.

Finally, consumer preference questions were asked to understand key behaviours and attitudes that can be synchronised with the results of the choice experiment and add discussion during the customer segmentation.

2.2 Conjoint Analysis and Choice Experiment

To overcome experience bias, a conjoint analysis approach was adopted. Instead of asking individuals '*how will you charge your EV?*', the survey conducted a choice experiment. This involved a series of questions presenting pairs of different charging scenarios. Each scenario was broken down into three key factors:

- The location of the charging session:
  - At home;
  - At work;
  - At a destination (defined as a location visited primarily for an alternative purpose, the use of the chargepoint is secondary; such as a supermarket or cinema);
  - At a public location (defined as a location visited primarily for use of the chargepoint; such as a fuel station or charging hub).
- The time taken to carry out the charging session;
- The cost to the customer for conducting the charging session.

Each scenario was designed to reflect realistic charging scenarios in the near future, including forthcoming charging speeds and battery capacities expected between present day and 2025. In the survey, the participant was asked to choose between two scenarios for each question.

	Alternative 1	Alternative 2
Location	Home	Public
Time to fully charge	6 hours	15 minutes
Price per full charge	£4	£11

Choice:

	Alternative 1	Alternative 2
Location	Destination	Home
Time to fully charge	1h 30min	6 hours
Price per full charge	£4	£8

Choice:

Figure 2: Examples of questions asked in the online survey, demonstrating the choice experiment.

While the participants are not expected to have had the experience of EV charging, they do have separate experiences of the three factors. Through the combination of these three factors, the participant is better prepared to offer an informed opinion, and, thus, offer more beneficial insights on future behaviour patterns.

For conjoint analysis of the choice experiment responses, a logistic regression model was constructed. All of the analysis was conducted using the R-studio software and publicly available statistical packages (i.e.. mlogit and choicemodelr package).

A logistic regression is often used to analyse choice experiment responses and is used in cases where the variable we are interested in has more than two outcome categories – in our case which charging option the participant chose. In simplest terms, the model looks to understand how much each of the variables are influencing participants choices in the choice experiment.

In our choice experiment there were two continuous variables of charging speed and price and one categorical variable of charging location.

Mathematically, the estimated model can be expressed as:

$$logit\,(Choice) = B_1 * ChargingSpeed + B_2 * ChargingPrice + B_3 * LocationHome + B_4 * LocationWorkplace + B_5 LocationDestination \quad (1)$$

2.3 Customer Segmentation

While the statistical analysis itself yielded overall results, a further segmentation of the participants responses was conducted. For this, the importance of each of these variables was estimated to identify groups of customers whose choices are impacted by different factors and, thus, have different preferences for charging locations. The segmentation was based on algorithmic clustering methods and was conducted with R-studio and publicly available statistical packages.

Reassessing the responses to demographic and consumer preference questions on each of these customer segments allowed Delta-ee to predict some broad assumptions about how they are likely to behave. These d

3 Findings

3.1 Overall Findings

The demographic of those expected to become "early adopters" was established from the filtered results. The ages of the participants varied considerably, but the most populous age brackets were middle-aged (50-64 years old: 29% of participants; 35-49 years old: 26% of participants). The most common location for the home property was suburban (47% of participants). Significantly, the vast majority of participants (85% of total) reported having access to off-street parking for their vehicles. This proportion dropped for urban-located homes but remained the majority.

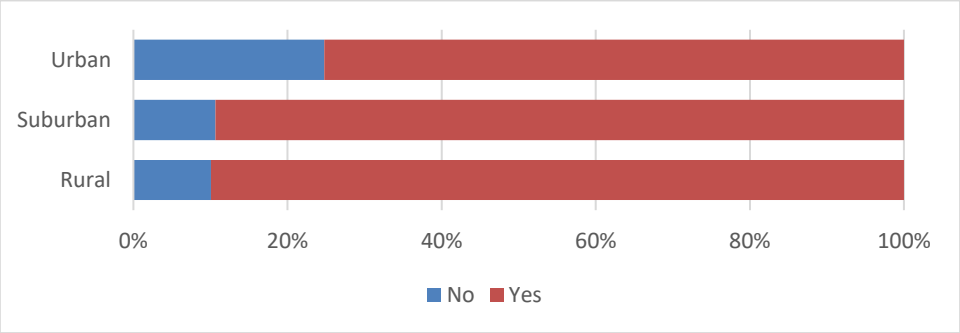

Figure 3: Responses to question 'Do you have access to off-street parking at home (such as a garage or drive where you park)?', split by location of home.

61% of participants reported owning one vehicle, with 33% owning two. In terms of replacement of the current vehicle, 31% expected to replace within 12 months of the survey, 54% within 36 months of the survey. Furthermore, when the vehicle is replaced, it is most likely to be new – 55% of participants' responses.

The survey asked a series of questions around individuals' travel behaviour. 85% of participants agreed with the statement that their vehicle usage was predictable and regular. On this, participants were asked to consider the distance and reason for journeys over the past week. Figure 4 shows that vehicles were most commonly used for leisure or other non-work related purposes. 66% agreed with the statement that they typically combine refuelling with a trip to the shops.

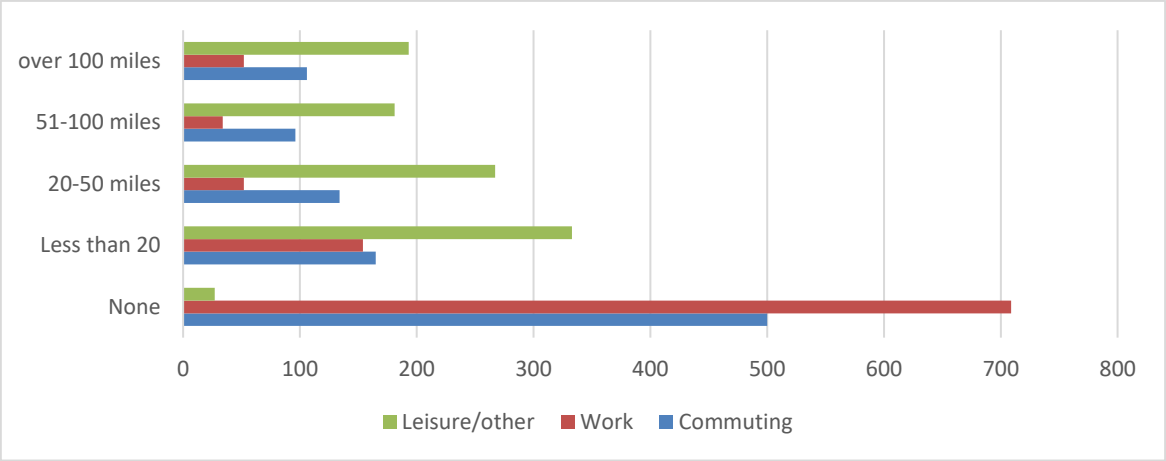

Figure 4: Responses to question: 'how many miles have you driven in the last week for the following purposes. Please enter the approximate number of miles for each purpose.'

1.1.1 Charging Preferences

Customer preference among "early adopters" will be for charging at home. From the statistical analysis, assuming all options were available to the UK public, the estimated preferred charging mix was considered as follows:

- 61% of charging sessions would be expected to be carried out at home;
- 21% at work;
- 10% at destinations;
- 8% at public locations.

Significantly, of the three key factors, location of the charging session was the most important to the early adopters. This is highlighted in Figure 5, below.

Figure 5: Statistical analysis of the relative importance of choice experiment factors for charging sessions: location; price; time.

Using the survey analysis, Delta-ee developed three customer segments that can be applied to ‘early adopter’ EV customers, each with some distinct characteristics. These are described and discussed in the following sections.

4 Customer Segmentation

4.1 The Suburban Commuters

Estimated preferred charging mix:

- 65% at home;
- 25% at work;
- 4% at destinations;
- 6% at public locations.

This segment was the largest, accounting for 50% of the ‘early adopters’. These customers were typically middle-aged living in the suburbs with access to off-street parking.They are likely to have families with children living at home. The car is used for daily commuting, likely for work and school, so the vast majority of charging would be done at home or at the workplace, if charging was available. The Suburban Commuter is most likely to be a multiple car owner, of the three segments, and is the wealthiest too.

Convenience is particularly key to this segment due to a busy home and work life. Because of this, the Suburban Commuter is less likely to choose to go elsewhere for charging, using a public or destination opportunity. Workplace charging solutions will be important to them and solutions offering home and work are likely to be beneficial.

4.2 The Mix-And-Matchers

Estimated preferred charging mix:

- 47% at home;
- 24% at work;
- 17% at destinations;
- 12% at public locations.

This segment accounted for 29% of the ‘early adopters’. The Mix-and-Matcher was dominantly living in cities and very driven by price as well as being driven to be green. Of all segments, they are the most likely to use public charging and use a wide network of charging solutions. This correlates with the more limited access to off-street parking of those living in urban areas. The Mix-and-Matcher was also the youngest segment and most likely to be renting accommodation.

With high influences of financial and environmental factors, the Mix-and-Matcher is likely to value solutions that link EV charging with renewables, such as smart chargers connected with domestic PV for the greenest and cheapest charging. These two factors may conflict in decision making on how to charge. For public charging, smart phone-based solutions, such as EV charging apps, the Mix-and-Matcher is likely to be well suited, due to high levels of technology literacy.

4.3 The Home Dwellers

Estimated preferred charging mix:

- 83% at home;
- 0% at work;
- 10% at destinations;
- 7% at public locations.

This segment accounted for 21% of the ‘early adopters’. These customers represent late-middle-aged and elderly EV customers thaty are likely to be retired and spend extended periods at home during the day.

Journeys are typically short and longer journeys are well outside their normal travel behaviour. As a result, the vast majority of charging in the preference mix was domestic.

The Home Dweller considered themselves to be financially comfortable yet not at all knowledgable about new technology. This is interesting as the segment is least likely to consider adopting the EV in the first place, but will enjoy the convenience of the EV when they do have it, and may be willing to purchase a more expensive vehicle than other segments. Support throughout the buying process and simple charging solutions are likely to appeal.

5 Conclusions

This research conducted a survey with 1,001 people in the UK who are considered likely 'early adopters' of EVs. By using a conjoint analysis on a choice experiment conducted within the survey, Delta-ee has been able to understand likely charging preferences of this population. Further statistical analysis has created three separate customer segments.

It is evident to note that home charging will be key for the EV charging market over the coming five years, as the 'early adopter' is likely to choose this over other charging locations. It is possible to differentiate between different segments of customer. While this is just one study on one population, it is clear that preferences vary within the market. Companies looking to gain presence within this market would benefit from considering how to build propositions for different segments.

References

[1] ACEA, https://www.acea.be/statistics/tag/category/key-figures, accessed on 2018-12-01

Authors

Alexander joined Delta Energy & Environment in 2018 to develop and manage the 'Electric Vehicles & Electricity' research service. Alexander is an electric vehicles specialist who has been researching the decarbonisation of transport for over five years. Before joining, Alexander worked at the UK's Energy Saving Trust delivering a number of projects to support electric vehicle adoption. He has led electric vehicle trials and delivered research on barriers to adoption and charge point network requirements.

Matti leads and manages Delta-ee's research in the 'Connected Home energy' space providing high quality research to help clients understand the dynamics and opportunities within this market. He works closely with a wide range of international organisations, from small start-ups to some of the world's largest energy suppliers and heating appliance manufacturers. Matti also provides expert support to bespoke consultancy projects on various low-carbon technologies and markets. Prior to joining Delta-ee he worked for PwC Finland providing consultancy support on Corporate Social Responsibility reporting and the Greenhouse Gas (GHG) Protocol.

John developed Delta-ee's Distributed Power Service (DPS), providing global market insight in the fields of gas engines and gas turbines used within stationary power. In addition to the DPS, he leads Delta-ee's business development for electric vehicles research across Europe and Japan.

Prior to joining Delta-ee, John spent 4 years with E.ON New Build & Technology during which he worked on developing new-build biomass plants and commercialising innovative community energy solutions including anaerobic digestion, bio-fuels and advanced combustion technologies.