Energy Research & Social Science 44 (2018) 17–30

Contents lists available at ScienceDirect

Energy Research & Social Science

journal homepage: www.elsevier.com/locate/erss

Original research article

What drives the Pioneers? Applying lifestyle theory to early electric vehicle buyers in Canada

Jonn Axsen*, Josh Cairns, Nichole Dusyk, Suzanne Goldberg

School of Resource and Environmental Management, Simon Fraser University, 8888 University Drive, Burnaby, B.C. V5A 1S6, Canada

ARTICLE INFO

Keywords:
Plug-in electric vehicles
Early adopter
Lifestyle theory
Consumer behaviour
Interviews

ABSTRACT

Lifestyles can play an important role in shaping consumer behaviour regarding novel low-carbon technologies. In this study, we develop a conceptual framework based on lifestyle theory, which defines lifestyle as engagement in several related practices that inform and convey self-identity. We apply this theory to the case of plug-in electric vehicle (PEV) technologies by conducting 17 semi-structured interviews with PEV-owning households in or near Vancouver, Canada. We categorize participants based on their engagement in technology-oriented or pro-environmental lifestyles. We explore participants' functional, symbolic and societal motivations relating to PEV purchase, driving patterns, public charging usage, and interest in a controlled charging program. Some patterns are consistent across lifestyle segments, where most participants emphasized the practicality of PEVs, the improved driving experience and overall interest in environmental protection. However, motivations varied, some corresponding with participants' lifestyle engagement; for example, participants that engaged in pro-environmental lifestyles were more likely to emphasize the environmental aspects of PEV usage. Together, these findings suggest that policymakers and researchers ought to consider the variety of motivations that may influence purchase and use of PEV—even among Pioneers—which may relate to a variety of benefits such as cost savings, environmental protection and symbolic value.

"Among our friend group, we are the pioneers [and] the only ones that have an electric car."

Chris Campbell (Nissan Leaf owner)

"I'm looking for guilt-free driving … I love [being able to] go where I want to go when I want to go … without feeling like I'm wrecking the environment."

Brian Smith (Tesla Model S owner)

1. Introduction

Despite the potential for plug-in electric vehicle (PEV) technology to reduce greenhouse gas emissions in the passenger vehicle sector, their success depends in part on consumer behaviour. In this study, we explore what motivates consumer purchase and use of PEV technologies, which we refer to as "PEV-related behaviours". We utilize a conceptual framework from lifestyle theory, which draws from Giddens work on modernity and self-identity [1], to examine how motivations and PEV-related behaviours vary by, and align with, individual lifestyle. To do so, we conducted semi-structured interviews with 17 PEV owners (what we call "Pioneers") in the region of Vancouver, Canada in 2015.

Researchers and stakeholders commonly use several terms to represent different consumer adopter categories, including "early adopters", "current users", "relatively new users" and "future users"—often without definition or consistency [2]. Presently, we use a simple, descriptive dichotomy to separate the PEV "Pioneers"—those that owned a PEV at the time data were collected—from the "Mainstream" consumers that own conventional, gasoline-powered vehicles. We collected interview data from Pioneers in 2015, when PEVs made up less than 1% of new vehicle market share in Canada.

Note that our dichotomy intentionally avoids the terms used in Rogers' Diffusion of Innovations framework [3], i.e. Innovators, Early Adopters, Early/Late Mainstream and Laggards. Although commonly used, Rogers' categories tend to conflate observed adoption behaviour (e.g. purchasing a PEV) with the supposed motivation (scoring high on the trait of "innovativeness"). Accordingly, the first buyers (what Rogers called Innovators), are considered to be a homogenous group that score highest on innovativeness. We refer readers to numerous sources for further critiques of Rogers' theory, including its pro-innovation bias and often simplistic assumption of consumer motives [4–6]. Here we use the Pioneer-Mainstream dichotomy as a neutral starting point in a qualitative approach that allows for inductive insights. We look for

* Corresponding author.
E-mail address: jaxsen@sfu.ca (J. Axsen).

https://doi.org/10.1016/j.erss.2018.04.015
Received 2 November 2017; Received in revised form 16 March 2018; Accepted 8 April 2018

patterns of perceptions and motivations which may or may not align with frameworks by Rogers and others, including the potential for substantial heterogeneity within a given adopter category.

While it is known that PEV Pioneers tend to be unusually enthusiastic about their vehicle (which is typically why they bought it so early) [7,8], there are a number of reasons to explore these consumer's perceptions and motivations in further depth. First is to counter the often simplistic assumptions noted above; stakeholders often believe that Pioneer enthusiasm is driven solely by their high-technology orientation, while Mainstream buyers care only or mostly about cost savings [2]. However, both groups may have substantial heterogeneity. For example, research with Pioneer hybrid vehicle buyers uncovered a wide range of social meanings and symbols related to purchase and usage [9], where different buyers associated their vehicles with themes of environmental preservation, innovation, national pride or intelligence. Second, the actions and perceptions of these Pioneers may set the tone for later buyers, where Pioneers may help to set up symbolic associations with particular vehicle types or models that persist in social consciousness—even among Mainstream buyers with different motives. The diversity of perceptions and motivations among Pioneers can give a sense of the range of perceptions and meanings that could drive later Mainstream buyers. Third, a number of studies have demonstrated that Mainstream PEV buyers can be influenced by those with PEV experience, especially Pioneers [10–12]—investigation of Pioneers can help to understand how such influence may occur. Finally, there is value to the fact that Pioneers have direct experience with purchasing and operating a PEV. Research shows that PEV driving experience can substantially shape preferences, leading to more positive perceptions of functional and environmental attributes, more stable preferences for PEV attributes in general [13], and decreased concerns about barriers to adoption [14]. Taking these points together, it is arguable that researchers and stakeholders will want to understand better understand Pioneers and Mainstream consumers to form a complete picture of PEV-related behaviours and contextualize a widespread transition to PEVs.

In this effort, this paper focuses on Pioneers, while our team has elsewhere published a qualitative exploration of a comparable sample of Mainstream consumers [15], as well as direct quantitative comparison of Pioneers and Mainstream consumers via survey data [8]. Similar to our Mainstream study, this Pioneer study uses semi-structured interviews to examine Pioneers' PEV-related behaviours and motivations, as well as their engagement in different lifestyle practices. While the Mainstream interview study focuses more on participant's "perceptions and misperceptions" concerning PEV technology (including the prevalence of confusion and lack of awareness), we find that Pioneer perceptions are more sophisticated and well-formed, allowing for a deeper exploration of motivations and lifestyle.

As will be explained in Section 2, we use lifestyle theory as our conceptual framework to understand how PEV purchase and usage develop along with consumer identify and lifestyle. We explain that lifestyle theory provides a comprehensive view of consumer perceptions, can account for heterogeneity in consumer motivations, and describes the potential for reflexive interaction between technology, social practices and individual identity. We use lifestyle theory to divide our sample of PEV Pioneers into different segments to characterize heterogeneity in lifestyle—including varied engagement in pro-environmental and technology-oriented lifestyles [16–18]. Next we provide more background on the PEV consumer literature as well as our conceptual framework.

2. Background and literature review

2.1. PEV technology and consumer response

First, we clarify our technology of focus. We explore the case of plug-in electric vehicles (PEVs): motor vehicles that operate on electricity drawn from the electricity grid and stored in rechargeable battery packs. Our definition includes battery electric vehicles (BEVs) that are powered solely by electricity, as well as plug-in hybrid electric vehicles (PHEVs) that can be powered by an internal combustion engine while also having a battery that can be charged from the electricity grid. Both types of PEVs can be recharged using different levels of electrical service. In North America, PEVs can potentially be recharged at home, work, or other "public" locations, using a variety of charging speeds, including standard 110/120 V outlets (sometimes called Level 1), 220/240 V outlets (called Level 2), and 480 V DC Fast charging (or Level 3)—though the latter charging speed is usually only appropriate for BEVs in non-home locations. We also explore vehicle-grid-integration, where the rechargeable battery packs of PEVs present electric utilities with an opportunity to manage the electrical grid. For example, a controlled charging program could manage PEV charging rates, charging times, or the direction of electrical flow [19], which could improve load management [20], or help to incorporate greater levels of intermittent, renewable electricity into the grid [21,22].

Consumer interest in PEVs and related technologies and practices can be motivated by a number of factors. In one framework, Axsen and Kurani [23] categorize a pro-environmental technology's attributes according to two dimensions: private versus societal, and functional versus symbolic. This framework has since been used to categorize consumer perceptions of alternative energy and alternative fuel vehicles [11,24–26]. In Table 1 we provide a simplified variation of this framework, where attributes can be functional, symbolic, or societal. Functional attributes pertain to a technology's use and operation, such as how a vehicle performs or how much it costs to own. Symbolic attributes carry unique social or emotional meaning, such as allowing an individual to express an aspect of their self-identity. PEVs also have attributes with "societal" impacts that extend beyond the user, such as reducing air pollution and greenhouse gas emissions. In this way, some researchers have argued that PEVs can represent a "mixed good" with aspects of both a private good and public (or societal) good [27,28].

Market- and economics-based PEV research has focused on how PEV interest can be motivated by the functional attributes of PEV technologies, such as driving range, recharge time, and capital and operating costs [e.g., 29–31]. However, because these studies focus on functional attributes, their conclusions tend to focus on potential functional limitations of PEVs compared to conventional vehicles. This focus on functional attributes may ignore the influence that symbolic and societal attributes can have in motivating PEV-related behaviours, an influence that has been demonstrated by a number of consumer behaviour analyses that draw from more sophisticated theories of behaviour, as noted next.

PEV-related behaviours can also be motivated by symbolic attributes that express meaning or identity [9,25,32]. Using PEVs can allow consumers to access symbolic meanings that help express who they are [33]. For example, consumers may be motivated to purchase a hybrid electric vehicle to express themselves as ethical, intelligent, or caring [9]. Similarly, they might express interest in PEVs if they perceive the

Table 1
Categorization and examples of a plug-in electric vehicle's attributes.

Attribute type	Description	Examples
Functional	Technology's use and operation	High performance (e.g. fast acceleration) Affordable (e.g. low operating costs)
Symbolic	Expression of meaning or self-identity	Represents being ethical "Looks" intelligent
Societal	Impact on society more broadly	Reduce air pollution and greenhouse gas emissions Increase energy security

Note: Table adapted from Axsen and Kurani [23].