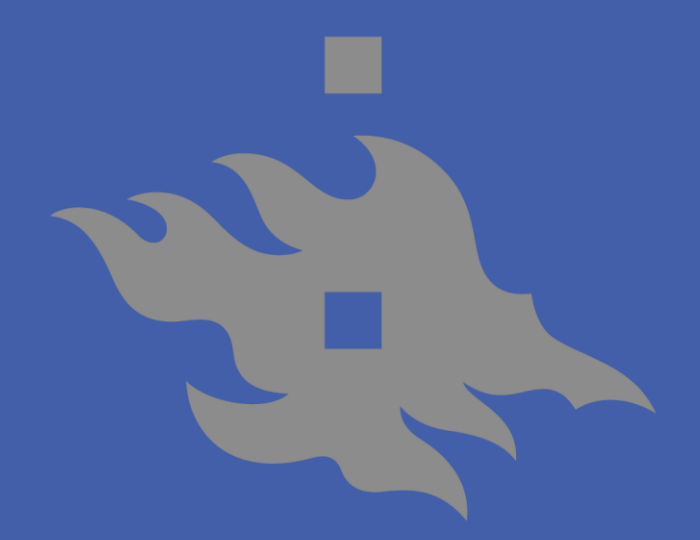


Light electric vehicles: substitution and future uses

Kaarina Hyvönen, Petteri Repo and Minna Lammi

University of Helsinki, Consumer Society Research Centre

kaarina.hyvonen@helsinki.fi



UNIVERSITY OF HELSINKI

ABSTRACT

Light electric vehicles may challenge established forms of transport in the near future. This paper looks at how different kinds of consumers assess the future uses of light electric vehicles. Such uses are further characterized by examining how they could substitute the current uses of existing modes of transport such as cycling, car driving and public transport. The paper approaches the take-up of light electric vehicles from the vantage point of technological niches which have the potential to transit to sociotechnical regimes (Schot and Geels, 2008; Geels, 2002). Data from a representative survey of 1030 Finns are used to analyze and characterize future uses of light electric vehicles.

INTRODUCTION

Rapid technological developments have made light electric vehicles such as electric bicycles, 3- and 4-wheelers, skateboards and the Segway viable alternatives for conventional forms of transport especially in cities (Pictures 1-3). It is hoped that they will address challenges relating to transport, the environment and human health.



Picture 1, left. Electric bicycle. Photo: Meine Heimat [Chiemgau], CC BY-ND 2.0.

Picture 2, middle. Electric four-wheeler. Photo: Les Chatfield, CC BY 2.0.

Picture 3, right. Segway. Photo: Chris Brown, CC BY 2.0.

OBJECTIVES AND THEORETICAL APPROACH

This paper assesses the opportunities of light electric vehicles to enter the transport system against the background of sociotechnical change as proposed by Geels (2002). The approach emphasizes the existence of competing technologies, i.e. various types of light electric vehicles, and the uncertainty of their success in making the transition from technological niches to parts of an established sociotechnical regime (see Schot and Geels, 2008; cf. Rogers, 1995). This paper investigates how consumers perceive light electric vehicles in their everyday transport as well as looks at the kinds of transport that they would substitute.

MATERIALS AND METHODS

The study is based on the statistical analysis of responses to an internet survey representative of the Finnish population in terms of gender, age, place of residence and household size. The survey's 1030 respondents were selected from a pool of 40,000 Finns recruited by the Finnish market research company Taloustutkimus Oy. 14% of the respondents had used or tried light electric vehicles.

The responses were analysed statistically through the use of variance analysis, t-tests and cross tabulations. The significance of the differences between variables was examined with the F-test for variance and the chi-square (χ^2) test at the $p=.01$ and $p=.001$ levels. The results can be generalized to the population of Finland in respect to gender, age, place of residence and household size.

RESULTS

Interest in light electric vehicles

Light electric vehicles were seen more as potential modes of future transport than as current forms of transport. The electric bicycle and the Segway attracted most interest in future use (Table 1). 62% of respondents stated that they were either going to continue using the electric bicycle, planned to purchase and use one or would like to try one in the future, and 43% had similar attitudes towards the Segway.

Table 1. Interest in future use of light electric vehicles (% of respondents, N=1030).

	Using, will continue to use	Plan to purchase, use in the near future	Might purchase, use later	Would like to try to assess features	Do not want to use
Electric bicycle	1	1	28	32	38
Segway	0	0,3	8	35	57
Electric 3- and 4-wheelers	0,1	0	13	7	80
Electric moped	0	0,1	6	13	81
Electric skateboard	0,2	0,1	2	15	83
Electric microcar	0,2	0	3	10	87

The respondents' gender, age, household type and income explained differences in intentions of purchasing and using. Men were more interested than women in using the electric bicycle***, moped*** and the Segway**, young and middle-aged people the skateboard**, middle-aged the bicycle*** and the elderly the 3- and 4-wheelers***. Respondents without children were more interested in using the 3- and 4-wheelers***. Those with a high income were more interested in using the Segway** and those with a middle income the 3- and 4-wheelers**. (***) $p<.001$, ** $p<.01$

Purposes of light electric vehicle use

The electric bicycle, electric moped and electric microcar were described as vehicles of a general character. According to the respondents, they were suitable for transport to work, school and college, shopping and running errands, leisure activities, and supporting independent mobility (Table 2). The Segway and the electric skateboard were seen mostly to belong in the domain of leisure activities, but were also considered useful for shopping and running errands as well as for commuting to work, school and college. Electric 3- and 4-wheelers were mainly seen as vehicles that supported the independent mobility of the physically challenged and the elderly, thereby enabling activities such as shopping and running errands, which constituted the most popular purposes for using light electric vehicles.

Table 2. Purposes of light electric vehicle use (% of respondents).

	Work, school and college	Shopping and running errands	Leisure activities	Supporting independent mobility
Electric bicycle (n=553)	53	68	47	30
Electric moped (n=196)	47	70	40	32
Electric microcar (n=134)	30	68	37	37
Segway (n=440)	23	44	61	14
Electric skateboard (n=165)	31	50	66	11
Electric 3- and 4-wheelers (n=201)	5	40	12	67

The respondents' age, household type, income, place of residence, access to a car and distance to work, school and college explained differences in the described purposes of light electric vehicle use. For work, school and college-related journeys, respondents aged under 35 years more frequently considered the electric bicycle***, moped***, microcar*** and skateboard***, and those aged 25-49 years the Segway***. Respondents belonging to single households or households with children considered bicycle*** and microcar***. Those with incomes of under 40,000 euros and city-dwellers considered bicycle***. Those without access to a car considered bicycle*** and microcar**, while those with a journey of less than 10 km considered bicycle***, the Segway*** and skateboard***, and those with 3-30 km distances considered moped*** and microcar***. For supporting independent mobility, respondents aged 50 and above more frequently considered electric bicycle***, moped*** and the Segway***, those belonged to households without children bicycle***, and those with a middle income bicycle**. For shopping and running errands such differences were not observed at the $p<.01$ level. Concerning leisure activities, only access to car explained consideration of electric bicycle***. (***) $p<.001$, ** $p<.01$

Substitution for existing forms of transport

The survey results show that light electric vehicles were primarily considered to substitute for riding bicycles, walking and driving cars (Table 3). To some extent, they also were considered to substitute for public transport and use of their non-electric counterparts. The electric bicycle and moped substituted for regular bicycles and cars while the electric microcar substituted for cars and public transport. The Segway, electric skateboard and 3- and 4-wheelers substituted for walking and cycling.

Table 3. Forms of transport that light electric vehicles substitute in the future (% of respondents).

	Bicycle	Car	Public transport	Moped, scooter	Walking
Electric bicycle (n=553)	81	38	32	9	29
Electric moped (n=196)	58	44	35	26	26
Electric microcar (n=134)	31	57	42	23	26
Segway (n=440)	45	15	15	8	69
Electric skateboard (n=165)	54	13	18	7	74
Electric 3- and 4-wheelers (n=201)	38	35	11	9	46

The respondents' age, place of residence, access to a car and distance to work, school and college explained differences in forms of transport they would substitute with light electric vehicles. Those with cars accessible would substitute cars more frequently with electric bicycle***, moped***, the Segway*** and 3- and 4-wheelers***, while the respondents aged 35 and above with microcar*** and respondents aged 35-64 years with the Segway**. Respondents aged under 35 years would substitute public transport more frequently with electric bicycle*** and those aged 25-64 years with skateboard**, city-dwellers with electric bicycle***, moped***, the Segway*** and microcar**, the carless with electric bicycle***, moped***, and microcar***, those with 3-30 km distance to work, school or college with electric bicycle***, microcar*** and the Segway**, and those with distances up to 30 km with moped***. Walking would be substituted with electric moped*** by the carless and with the Segway** by the respondents aged under 35 years. (***) $p<.001$, ** $p<.01$

CONCLUSIONS

Consumer responses indicate that the different types of light electric vehicles have their own special characters, and have distinct uses and users. Consumers appear to carefully consider how light electric vehicles could substitute for regular vehicles, i.e. provide a competitive advantage to enable technological niches to transit to sociotechnical regimes. Electric bicycles form a focal point for approaching future light electric vehicles.

REFERENCES

- Geels, F.W., 2002. Technological transitions as evolutionary reconfiguration processes: a multi-level perspective and a case-study, Research Policy, 31(8-9), 1257-1274.
- Rogers, E.M., 1995. Diffusion of Innovations. Fourth Edition. New York: New Press.
- Schot, J., Geels, F.W., 2008. Strategic niche management and sustainable innovation journeys: theory, findings, research agenda, and policy, Technology Analysis and Strategic Management, 20(5), 537-554.