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Consumer innovativeness and motivations in the adoption of shared micromobility

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PHIL JUSTICE FLORES | DEPARTMENT OF BUSINESS ADMINISTRATION

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Phil Justice Flores

LUND
UNIVERSITY

DOCTORAL DISSERTATION

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Title and subtitle: Not all green innovations are created equal: Consumer innovativeness and motivations in the adoption of shared micromobility.

Abstract:

The purpose of this thesis is to understand how consumer innovativeness and motivations relate to the decision to adopt green innovations. This thesis examines two forms of green transport innovations, shared e-bikes and e-scooters, which are part of the shared micromobility phenomenon. The penetration of shared micromobility into the market is estimated to increase in the upcoming years, and increasing interest in its use has become evident. However, there are controversies surrounding its impact on society, partly due to how the vehicles are used. This raises questions concerning who the consumers are and what motivates them to use this mode of transport. I employed two cross-sectional surveys to investigate how domain-specific innovativeness and motivations influenced the decision to adopt shared e-bikes and e-scooters. I demonstrate the relevance of the use of two domain-specific innovativeness (transport innovativeness and eco-innovativeness) and four different motivations (instrumental, environmental, hedonic, and social motivations). Specifically, transport innovativeness and eco-innovativeness were positively correlated with decisions to use shared e-bikes and e-scooters. Hedonic motivations had the strongest effects, while social motivations had the weakest, if not insignificant, impact. Environmental motivations were positively significant when other motivations were not considered, but these effects became negative when instrumental and hedonic motivations were taken into account. I also show the differences in these factors between users and non-users, as well as between shared e-bike users and shared e-scooter users. As expected, users had a higher level of transport innovativeness and eco-innovativeness. Users and non-users also differed in their perceptions of the environmental, hedonic, symbolic, and instrumental benefits of shared e-bikes and e-scooters, with users being more sensitive to these benefits. Theoretically, this thesis creates a more nuanced understanding of the diffusion of innovations by showing that products are not limited to only one domain. In addition, it outlines similarities and differences in consumer motivations between two comparable and emergent innovations that are purportedly green. This thesis shows that, although shared e-bikes and e-scooters are promoted similarly, consumer motivations for their adoption can still differ. Of note, this thesis helps to explain why some green innovations could become controversial due to their users' motivations. Practically, this thesis could help to formulate short- and long-term strategies for shared micromobility providers and policies for transport agencies and city planners. It could also help to understand the environmental impact of shared micromobility and how it could potentially address transport-related environmental problems.

Key words: Consumer innovativeness, Domain-specific innovativeness, E-bikes, E-scooters, Green innovation, Motivations, Shared micromobility

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MADE IN SWEDEN

To Peter Roth

Table of Contents

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Phil/Jip-jip

Abstract

The purpose of this thesis is to understand how consumer innovativeness and motivations relate to the decision to adopt green innovations. This thesis examines two forms of green transport innovations, shared e-bikes and e-scooters, which are part of the shared micromobility phenomenon. The penetration of shared micromobility into the market is estimated to increase in the upcoming years, and increasing interest in its use has become evident. However, there are controversies surrounding its impact on society, partly due to how the vehicles are used. This raises questions concerning who the consumers are and what motivates them to use this mode of transport. I employed two cross-sectional surveys to investigate how domain-specific innovativeness and motivations influenced the decision to adopt shared e-bikes and e-scooters. I demonstrate the relevance of the use of two domain-specific innovativeness (transport innovativeness and eco-innovativeness) and four different motivations (instrumental, environmental, hedonic, and social motivations). Specifically, transport innovativeness and eco-innovativeness were positively correlated with decisions to use shared e-bikes and e-scooters. Hedonic motivations had the strongest effects, while social motivations had the weakest, if not insignificant, impact. Environmental motivations were positively significant when other motivations were not considered, but these effects became negative when instrumental and hedonic motivations were taken into account. I also show the differences in these factors between users and non-users, as well as between shared e-bike users and shared e-scooter users. As expected, users had a higher level of transport innovativeness and eco-innovativeness. Users and non-users also differed in their perceptions of the environmental, hedonic, symbolic, and instrumental benefits of shared e-bikes and e-scooters, with users being more sensitive to these benefits. Theoretically, this thesis creates a more nuanced understanding of the diffusion of innovations by showing that products are not limited to only one domain. In addition, it outlines similarities and differences in consumer motivations between two comparable and emergent innovations that are purportedly green. This thesis shows that, although shared e-bikes and e-scooters are promoted similarly, consumer motivations for their adoption can still differ. Of note, this thesis helps to explain why some green innovations could become controversial due to their users' motivations. Practically, this thesis could help to formulate short- and long-term strategies for shared micromobility providers and policies for transport agencies and city planners. It could also help to understand the environmental impact of shared micromobility and how it could potentially address transport-related environmental problems.

Populärvetenskaplig sammanfattning

Syftet med denna avhandling är att förstå hur konsumenters motivation och innovativitet – deras tendens att ta till sig nya produkter snabbare än andra konsumenter - står i relation till beslutet att anamma gröna innovationer. Avhandlingen undersöker två former av gröna transportinnovationer, nämligen delade elcyklar och elskotrar. Dessa är en del av fenomenet delad mikromobilitet.

Marknaden för delad mikromobilitet beräknas öka under de kommande åren och intresset för att använda den här typen av transportmedel har blivit allt större. Det finns dock kontroverser kring dess påverkan på samhället, delvis på grund av hur fordonen används. Detta väcker frågor om vilka konsumenterna är och vad som motiverar dem att använda dessa transportsätt. I avhandlingen används två enkäter för att undersöka konsumenternas innovativitet i specifika produktkategorier och vilka motiv som påverkade beslutet att tillägna sig delade elcyklar och elskotrar. Jag visar relevansen av att använda konsumenternas innovativitet i två produktkategorier (transport och miljövänliga produkter) och fyra olika motiv (instrumentella, miljömässiga, hedonistiska och sociala motiv). Att vara innovativ inom transport- och miljöinriktade produktkategorier var positivt korrelerat med beslutet att använda delade elcyklar och elskotrar.

Hedonistiska motiv, eller motiv relaterade till de njutbara och roliga aspekterna av användning, hade de starkaste effekterna, medan sociala motiv eller motiv kopplade till status eller imagefördelar av användning hade den svagaste, om inte obetydliga, effekten. Miljömotiv var positivt statistiskt signifikanta när andra motiv inte beaktades, men dessa effekter blev negativa när instrumentella och hedonistiska motiv beaktades.

Jag visar också skillnaderna i dessa faktorer mellan användare och icke-användare, samt mellan användare av delade elcyklar och användare av delade elskotrar. Resultaten visade att användare och icke-användare skiljde sig åt när det gällde graden av innovativitet i de två produktkategorierna. Som förväntat hade användarna en högre nivå av innovativitet, vilket belyser vikten av att fastställa konsumenternas intresse för specifika produktkategorier och deras vilja att ta risker för att prova på nya produkter inom dessa områden. Användare och icke-användare skilde sig också åt i sina uppfattningar om de miljömässiga, hedonistiska, symboliska och instrumentella fördelarna med delade elcyklar och elskotrar, där användarna var mer känsliga för dessa fördelar.

Teoretiskt skapar denna avhandling en bättre förståelse för hur innovationer sprids i en befolkning genom att visa att produkter inte är begränsade till endast en produktkategori. Dessutom beskrivs likheter och skillnader i konsumentmotivation mellan två jämförbara och framväxande innovationer som påstås vara gröna. Avhandlingen visar att även om delade elcyklar och elskotrar marknadsförs på liknande sätt, kan konsumenternas motiv för att använda dem fortfarande skilja sig åt. Avhandlingen bidrar också till att förklara varför vissa gröna innovationer kan bli kontroversiella på grund av användarnas motiv. I praktiken kan denna avhandling bidra till att formulera kort- och långsiktiga strategier för leverantörer av delad mikromobilitet och policyer för transportföretag och stadsplanerare. Avhandlingen kan också bidra till att förstå miljöpåverkan av delad mikromobilitet och hur man kan hantera transportrelaterade miljöproblem.

List of papers

Paper I

Flores, Phil Justice, and Johan Jansson. 2022. "SPICe – Determinants of consumer green innovation adoption across domains: A systematic review of marketing journals and suggestions for a research agenda". *International Journal of Consumer Studies*. DOI: 10.1111/ijcs.12810

Paper II

Flores, Phil Justice, and Johan Jansson. "The role of consumer innovativeness and green perceptions on green innovation use: The case of shared e-bikes and e-scooters". *Journal of Consumer Behaviour*. DOI: 10.1002/cb.1957

Paper III

Flores, Phil Justice, and Johan Jansson. 2022. "Being innovative, fun, and green? Hedonic and environmental motivations in the use of green innovations". *Journal of Marketing Management*. DOI: 10.1080/0267257X.2022.2062426.

Paper IV

Flores, Phil Justice. 2023. "What motivates consumers to adopt controversial green mobility innovations? The case of shared e-bikes and e-scooters" (A previous version was accepted and presented at the Australian and New Zealand Marketing Academy Conference 2022, December 2022).

Paper V

Flores, Phil Justice. 2023. "Symbolic attributes and identities in green innovation use" (Accepted and presented at the European Marketing Academy Conference 2023, May 2023).

Prologue

Before starting my Ph.D., my interests in sustainable consumption and behavior were minimal. It was not easy to determine the relevance of my actions in relation to the environment. Coming from a developing country where personal growth is prioritized, it was difficult to justify sacrificing one's convenience for the sake of others. However, moving to Sweden has led me to realize that saving the planet should not only concern authorities and pro-environmental organizations, but should involve everyone who is living on the planet and is consuming the world's natural resources.

As the Ph.D. position encouraged the study of sustainability and was funded by the Lund University Agenda 2030 Graduate School and K2, I was inspired to change my mindset to assist these organizations in understanding how sustainable mobility could be achieved. Although I am aware that sustainability consists of not only environmental but also social and economic aspects, I became more inclined to examine the environmental impact of our travel behavior. This resulted from the need to narrow my focus and the growing body of knowledge dedicated to studying pro-environmental decision making. Of note, I developed more interest in the environmental perspective of consumption, as it is most personally relevant to me. I want to know more about the environmental consequences of my own actions and how I could change my behavior to help to save the environment.

I came across the idea of studying shared e-bikes and e-scooters when I was heading to work. I saw an e-scooter parked outside the door of my office. I did not know anything about what e-scooters were or how they were used at that time. I am not generally an innovative person when it comes to trying novel ways of traveling, but I have always been fascinated by those who are willing to risk their time, money, and effort to be the first to drive the newest vehicles or to try the latest gadgets that are available on the market. Therefore, I was curious about how and why consumers used shared microvehicles. Although my initial impression was that shared e-scooters were unsafe, I knew they were convenient to use. It was due to my curiosity and reading that I was introduced to shared micromobility, which led to adopting it as the topic of my thesis.

It has been over five years since shared e-bikes and e-scooters were introduced globally, and they were still on the streets at the time of writing, which is a positive indication that I selected the correct topic for my thesis.

Definitions of key terms

- Domain-specific innovativeness – consumers are innovative in particular domains as opposed to being generally or innately innovative. This means that consumers have a tendency to adopt innovations if they fall within specific domains of interest.
- Eco-innovativeness – an individual's degree of interest in using products that help to conserve natural resources and protect the environment.
- Environmental motivations – motivations derived from the perceived environmental benefits of using a product; synonymous with green motivations.
- Green identity – how pro-environmental individuals consider themselves to be and how their actions reflect their pro-environmental values.
- Green innovation – products that are promoted as novel green alternatives to conventional products or new products that have minimal impact on the environment.
- Hedonic identity – how fun or pleasure-seeking individuals consider themselves to be and how their actions reflect their hedonic values.
- Hedonic motivations – motivations derived from the perceived emotional benefits of using a product.
- Identity – how individuals consider themselves; used synonymously with image in this thesis, although there are distinctions between them.
- Innovation – an idea, practice, or object that is perceived as being new by individuals or groups.
- Instrumental motivations – motivations derived from the perceived functional benefits of using a product, including time saving, convenience, and so forth.
- Pro-environmental behavior – actions that generally have less of an environmental impact or that aim to reduce an individual's environmental impact. It could also be referred to as green behavior or sustainable behavior.
- Rational identity – how rational individuals consider themselves to be and how their actions reflect how rational they are.

- Shared e-bike – an electrically powered bicycle that is accessed on a demand basis, usually through a smartphone app. It includes docked and dockless shared e-bikes.
- Shared e-scooter – an electric-powered dockless two-wheeled vehicle with a narrow platform for users to stand on and handlebars for steering. It is accessed on a demand basis, usually through a smartphone app.
- Shared micromobility – in some cases referred to only as micromobility, this is a shared mode of transport involving vehicles that are not owned by the user and which are used on a demand basis. It includes electric or human-powered, smaller-scale, lightweight vehicles, such as bikes, e-bikes, e-scooters, and mopeds.
- Social motivations – motivations derived from the perceived social benefits of using a product, including status, self-congruence, and self-image benefits. Not to be confused with symbolic motivations, in which the focus is mainly on improving or maintaining status.
- Transport domain-specific innovativeness – an individual's degree of interest in new transport modes and developments related to the transport industry, also referred to as transport innovativeness for simplicity.

Introduction

Can we achieve a greener future with the help of green innovations?

The answer to this question is not as straightforward as it may seem. If green innovations do indeed help us to secure a greener future, individual consumers could collectively push public and private organizations to invest in companies that develop green innovations. Not only should these green innovations require less use of natural resources and have longer product lifetimes, but they should also have positive effects on how we behave and consume. However, if they do not, we should focus on other, more productive ways of saving the planet.

This thesis regards green innovations as tools that could make it easier for individuals to minimize the effect of their consumption behaviors. Nevertheless, even if companies introduce new environmental products, no real environmental benefits could be achieved if consumers are hesitant or unwilling to try them or to use them. It is also possible that, once these innovations are adopted, their use becomes unrelated to their greenness, and such use becomes linked to other, non-environmental benefits that they offer. Consequently, this non-environmental consumption could affect the general perception of how truly green these innovations are. Thus, to better understand how green innovations can contribute to a greener future, it is necessary to determine what drives consumers to adopt them. With this understanding, policymakers, providers, and planners could align their objectives (that is, facilitate appropriate use and prevent unsustainable use), with the market demand, which could enable the diffusion of these novel green products.

Previous studies of consumers' pro-environmental behaviors, including the adoption of novel green products or green innovations in general, have frequently focused on consumer motivations and characteristics, barriers, and marketing strategies (e.g., Joshi and Rahman 2015; Pickett-Baker and Ozaki 2008; White, Habib, and Hardisty 2019). Nevertheless, despite a strong interest in innovations that could help to solve human consumption-related environmental issues, studies are scarce, and have not necessarily been

decisive about which factors are most influential in terms of the adoption of these new products (Oduro, Maccario, and De Nisco 2021).

This thesis aims to help to address this issue by identifying how a consumer's trait of being innovative and consumer motivations influence the adoption of green innovations in the transport sector. In particular, this thesis determines the significance of consumer domain-specific innovativeness (DSI) and various motivations for the adoption of shared e-bikes and e-scooters, which are part of shared micromobility, in Denmark and Sweden.

In contrast to existing research on consumer motivations in pro-environmental product adoption, this thesis focuses on the adoption of green innovations or green products that consumers consider to be new. Consumer innovativeness serves as the central concept because it has been the most dominant concept in studies involving (green) innovation adoption thus far. Studies have shown that consumer innovativeness is a significant predictor of the adoption of innovative products; however, the concept of innovativeness as a general trait is not sufficient to explain the adoption of innovations (Bartels and Reinders 2011; Roehrich 2004). Therefore, this thesis investigates consumer innovativeness from a domain-specific point of view relating to two domains of how innovative an individual is when adopting novel transport modes, referred to as transport innovativeness, and ecological products, termed eco-innovativeness. Furthermore, as various authors have pointed out (Bardhi and Eckhardt 2012; Noppers et al. 2016; Ozaki 2011; Schuitema et al. 2013; Vandecasteele and Geuens 2010), this thesis examines various motivations that have been linked to the adoption of new pro-environmental products, including instrumental, environmental, hedonic, and social motivations.

What are innovations, and what makes them green?

Innovation is defined as the "idea, practice, or object perceived as new by individuals" (Rogers 1976, 292). Innovations do not need to be products that are newly introduced to the market; instead, they are products that individuals or groups perceive as being innovative (Rogers 1976). Therefore, innovation is subjective and contextual, which means that an innovation can be an innovation in one context but possibly not in others.

Innovations could be used to improve current products or to help to solve societal issues. This thesis mainly examines green innovations; green innovations could also be termed environmental innovations, ecological

innovations, and sustainable innovations, among others (Varadarajan 2017). Green innovations[1] are referred to as a "firm's new product […] that is perceived by consumers to be innovative and eco-friendly based on their evaluation of product attributes" (Paparoidamis and Tran 2019, 1549). Green innovation adoption differs from the adoption of other forms of innovations, as it could be linked to the ecological benefits of its use, and relies on the (potential) adopter perceiving the greenness of the innovation to some extent. Therefore, green innovation adoption should be viewed differently, given that the development of green innovations is partly motivated by ecological issues caused by traditional non-green products, and partly by the demand for novel products.

Nonetheless, Geyer and Zink (2016) contended that no truly green products existed. A product's greenness can only be measured in relation to the environmental impact of alternative products. Therefore, a product could only be considered to be green if its "net green" value, or the sum of the environmental impact of a product and its effect on consumer behavior and supply and demand, is lower than is that of similar goods or services.

There are two cases in which the development and use of green products could backfire. The first is when they can increase market demand, and the second is when they can increase consumer consumption (Geyer and Zink 2016). The authors demonstrated how recycling scrap metals could increase market demand for products containing ores. Suppliers can access cheaper raw materials as a result of recycling, which effectively lowers the price of products containing metals for consumers. These lower-cost products could then drive more people to buy products containing these valuable ores. Moreover, Geyer and Zink (2016) argued that consumer consumption could increase via the rebound effect, which is when consumers save more by consuming efficient

[1] Green innovations, or innovations in general, do not necessarily have to be tangible products. Green innovations can also be in the form of services. In the existing literature, discussions about differentiating between products and services exists. In the context of shared micromobility, as in the case of shared transport services (e.g., Liu et al. 2014), it can be regarded as a product service system. One of the core components of product service systems is the provision of the use of the products instead of the sale thereof (Mont 2002), such as in shared micromobility. However, in this research, I do not examine differentiating a product from a service. Instead, I use the more general term "product" to include services, such as how some researchers have approached the dichotomy using the "assimilation approach." This approach argues that the concepts developed in a product context can be transferred to the service context because of their similarity (Nijssen et al. 2006). Furthermore, as Hirschman (1980, 283) stated, "The propensities of consumers to adopt novel products, whether they are ideas, goods, or services…" supports the argument that the term "products" can, in fact, encompass services.

products. Nevertheless, they use these savings to use more of these efficient products. For example, as cars became more efficient, people could be encouraged to drive more (Banister 2008). Thus, it is difficult to identify truly green products, and their greenness depends heavily on how consumers use them.

Apart from the challenge of identifying green products, many consumers are unwilling to adopt novel green goods and services for several reasons. One reason may be linked to the uncertainties and risks of product acquisition and use, while another may be the premium cost of numerous green products (Claudy, Peterson, and O'Driscoll 2013; Hustvedt, Ahn, and Emmel 2013). In other cases, the perceptions of inferiority in the quality and performance of green products compared to their traditional counterparts also deter some consumers from trying them (Lin and Chang 2012; Luchs and Kumar 2017; Sadiq, Adil, and Paul 2021). Some consumers also simply do not want to use green products, as this is incongruent with their self-image (Brough et al. 2016). These negative associations could help to explain the attitude-behavior gap identified in studies of green consumer behavior (Claudy, Peterson, and O'Driscoll 2013; Gleim and Lawson 2014; Joshi and Rahman 2015).

Green innovations and the transport sector

A particularly relevant industry in which green innovations are seen as key solutions to mitigate environmental issues is the transport sector. Green transport innovation research is becoming increasingly important because the transport industry is responsible for about 20% of greenhouse gas emissions globally (Ritchie 2020). Nonetheless, innovations alone cannot solve the environmental problems caused by transport. According to Banister (2008), to solve transport sustainability issues, technologies should not merely become more efficient, as individuals should also be open and willing to change their travel behaviors.

This thesis is relevant to indicate how technologies could change personal travel by examining important factors in the adoption of technologies that could drive transport sustainability. This thesis is mainly concerned with why individuals adopt green transport innovations. In particular, this thesis examines and compares the adoption of two similar and emergent transport

innovations that are promoted as being green,[2] but which can be perceived differently – shared e-bikes and e-scooters. I determine the extent to which DSI, or being innovative in areas in which consumers are interested – transport and eco-innovativeness – relates to the decision to use shared micromobility. In addition, I identify consumers' motivations to adopt these transport modes, and how consumers' motivations differ with regard to two seemingly similar innovations that are continuously developing. I investigate the motivations in relation to how these innovations are perceived as instrumental, environmental, hedonic, and social products. Contextually, this thesis focuses on the urban context, as it is in cities that these shared microvehicles are present. Focusing on urban areas affects the scope of this thesis, as it is assumed that those who use shared e-bikes and e-scooters are mainly city dwellers.

By their nature, cities are well suited to the introduction of innovations and shared products, such as shared micromobility, for two main reasons. On one hand, according to Pan et al. (2013, 6), the social tie density in cities, defined as "the density of active social ties between city residents," allows innovations to thrive. Consumers are able to interact with more people; therefore, they are able to communicate ideas to a broader audience. Furthermore, social ties have been demonstrated to correlate well with the productivity that is expected in cities. On the other hand, the sharing economy, of which shared microvehicles are part, relies on the proximity between providers and consumers that cities provide in order to function (Davidson and Infranca 2016).

Shared micromobility and its greenness

Both shared e-bikes and e-scooters are part of the shared micromobility phenomenon. Shared micromobility is a transport mode in which users use electric or human-powered, smaller-scale, lightweight vehicles, also referred to as microvehicles, that they do not own but use on a demand basis (Populus

[2] For example, Lime, a provider of both shared e-bikes and e-scooters, promotes shared micromobility as a green option; as stated on their website, "A trip with Lime uses 75% less carbon than a comparable car trip, and since every vehicle is powered by renewable energy, choosing Lime over cars is always the right choice" ('Sustainability' n.d.). Bolt, another provider of shared e-scooters, markets the microvehicles as "Safe. Affordable. Eco-friendly" ('Easy, Safe Scooter Rental' n.d.). Examples of marketing materials promoting shared e-bikes and e-scooters as being green can be found in the appendix section (Figures 1 and 2).

2018; Tice 2019). Shared micromobility is considered to be an answer to the first-and-last-mile problem, or the start or last leg of a trip that public or private transport does not serve (McKenzie 2019; Shaheen and Chan 2016). Examples of such trips are those made from the residential front door to a bus stop, from a train station to the office doorstep, and from a car parking space to a restaurant.

The question of whether shared micromobility can be considered to be green depends on the ways in which it affects how consumers travel. Based on Geyer and Zink's (2016) example of the net green impact of car sharing, shared micromobility can be green if it fulfills most of the following criteria:

1. It reduces car trips.
2. It is more energy efficient than are cars or the travel modes that would have been used had shared micromobility not been accessible.
3. It decreases the number of cars that are produced and sold, as well as the number of other transport modes, such as bicycles, which could be stolen or vandalized.
4. Finally, it does not generate trips that would otherwise not have been taken.

These four criteria are aligned with McQueen et al.'s (2021) proposed sustainability micromobility framework. The authors argued that, in order for shared e-bikes and e-scooters to become sustainable, they should reduce the greenhouse gas emissions produced by passenger transport. This could be achieved by shifting from the demand for cars because many car trips are often single-passenger journeys, and by avoiding modal shifts from public transport and walking. They should also motivate people to use more public transport.

In addition, McQueen et al. (2021) argued that shared micromobility should be reliable and equitable, which means that providers should operate using sustainable business models, increase equity and affordability programs, and provide access to their data for research, policy, and planning purposes. Finally, to become sustainable, shared micromobility should enhance the human experience through positive utility, reductions to transport barriers, and prioritizing safety.

Since its inception, the diffusion of shared micromobility has appeared to develop quite quickly. Globally, shared micromobility has been introduced to several cities, and is estimated to generate up to $90 billion in revenue in 2030 from $3 billion in 2019 (Heineke et al. 2023). However, as discussed in the

following chapter, even with optimistic forecasts, doubts concerning the future of shared micromobility remain because of its rapid uptake, how it is used, and negative perceptions related to its use. Thus, despite the increasing knowledge and research regarding shared micromobility, studies should continue to explore the motivations for its adoption. In addition, due to the emergent characteristic of shared micromobility, changes and developments are constantly being introduced to the vehicles and the policies surrounding them; thus, studies should strive to determine how these changes and developments affect consumers' motivations to use shared micromobility. Understanding how implementation changes and shared micromobility could compete with or complement existing transport systems is warranted to address whether shared micromobility could help cities to achieve a sustainable transport future.

The role of marketing in understanding shared micromobility

Scholars' and marketers' knowledge is necessary to understand the motivations for the adoption of shared micromobility, as well as how emergent innovations could diffuse over time. Marketing plays a vital role in encouraging sustainable consumption, and marketing scholars have been advocating for more research on how the field can contribute to developing sustainable consumer behavior (Pickett-Baker and Ozaki 2008; White, Habib, and Hardisty 2019). In the context of shared micromobility, marketing could assist in understanding why shared micromobility appears to thrive in order to resolve the debate surrounding the future of this transport mode, and to determine how shared micromobility could contribute to the development of other green innovations. One of the roles of marketing in understanding the increasing demand for shared micromobility is evaluating the adoption process of shared micromobility in relation to consumer traits and motivations, as well as how the adoption of these microvehicles relates to and is different from other green innovations. The relevance of this thesis lies in increasing this understanding.

From a theoretical point of view, this thesis provides a more nuanced understanding of consumer innovativeness by demonstrating that innovations are not limited to only one domain. Furthermore, this thesis shows that determining and distinguishing the motivations that influence the adoption of shared micromobility is important. In fact, studies have supported the

relevance of differentiating between the adoption of innovations that are promoted similarly but which are perceived differently, such as meat alternatives (Onwezen et al. 2021) and smart home technologies (Ferreira, Oliveira, and Neves 2022). Although shared e-bikes and e-scooters share many comparable attributes, such as cost and convenience, as well as being shared, lightweight, and electrically powered, consumers' motivations for their use and their greenness could differ (McKenzie 2019; Reck et al. 2021). Of note, the findings in this thesis concerning the considerable relevance of hedonic motivations for the use of shared e-bikes and e-scooters provide insights into why green innovations could be controversial, particularly in terms of their environmental impact, depending on what motivates consumers to use them.

In addition, this thesis could provide a framework for the study of green innovations, as the existing frameworks used for other novel green products cannot be applied directly in order to understand shared micromobility. Unlike other forms of novel green transport, shared micromobility is a transport mode that is intended for short-distance trips (Shaheen et al. 2020; Shaheen, Cohen, and Broader 2021). Depending on the substituted transport mode, shared electric micromobility could be cheaper or more expensive because it is used on a demand basis (Shaheen et al. 2020). In many cases, it is more convenient and accessible due to having dockless forms (Shaheen et al. 2020). Shared micromobility is also different from other green innovations because its use can be related directly to hedonic use (Elmashhara et al. 2022; Useche et al. 2022; McQueen et al. 2021), which has rarely been taken into consideration when investigating novel green products, and which may be completely unrelated to their environmental benefits.

In connection to the emergent characteristics of shared micromobility, another theoretical contribution of this thesis is that it provides support indicating that the purpose and motivations for the use of emergent innovations develop over time. Innovations reshape how consumers see the world, and have a profound impact on consumer behavior. The findings could help to explain how the diffusion of emergent innovations occurs, as well as its impacts on consumer behavior.

From a practical point of view, this thesis provides knowledge for investors who are investing large sums of money in shared micromobility providers, as well as policymakers and planners who are grappling with the regulation and incorporation of these shared microvehicles in their transport systems. By examining an emergent green innovation, policymakers, planners, and providers could learn how to implement products that could potentially be affected by constant changes due to rapid developments in technology or

societal demands. The results demonstrate that the promotion of emergent green innovations should not focus mainly on the environmental benefits, but rather on the instrumental and, if applicable, hedonic benefits. However, to encourage long-term use, communicating the environmental advantages should be highlighted, as discussed in the final chapter.

From an environmental perspective, a better understanding of shared micromobility use could help to increase its adoption. This could potentially help to realize the claimed environmental benefits of shared micromobility if it replaces cars. In fact, the Intergovernmental Panel on Climate Change (IPCC) (Sims et al. 2014) recommends that, in order to reduce greenhouse gas emissions due to transport, notwithstanding the strong recommendation to avoid travel, a modal shift to lower-carbon transport systems should receive attention. This thesis is also relevant to the broader issue, and contributes to achieving Agenda 2030's Goal 11 of Sustainable Cities and Communities by helping researchers and policymakers who are searching for potential solutions to problems concerning short-distance travel using cars and the provision of environmental transport modes.

The thesis consists of five papers. The first paper reviews the factors that affect consumers' adoption of green innovation. Moreover, it outlines research agendas that future researchers could address. More importantly, it serves as a guide for the direction of the subsequent papers in this thesis. The second paper considers the relevance of some factors that were identified in the literature review concerning the adoption of shared micromobility. Specifically, it investigates the role of transport DSI in the adoption of shared micromobility, and how green consumers perceive shared micromobility. In this paper, we determine whether shared micromobility could be considered to be green due to the environmental motivations of the users and the non-users. In the third paper, we examine the hedonic and environmental motivations for the use of shared micromobility, and differentiate between the hedonic and environmental motivations of shared e-bike and e-scooter users. The fourth paper examines the significance of eco-innovativeness and instrumental, environmental, hedonic, and symbolic motivations for using shared e-bikes and e-scooters. We establish the significance of eco-innovativeness and determine some motivations for the decision to use shared micromobility. Finally, the fifth paper tests how different identities, self-congruency, and self-expressive involvement could predict the use of shared micromobility. Further results, which have not been included in the papers, are presented in the results section to support the papers' findings.

The following chapters outline the research context, followed by the research background and questions, the research design and the methodologies, the results and, finally, the conclusions and implications of the findings in this thesis.

Research in context

Electrification and digitalization have introduced potential solutions for cities and communities to improve the sustainability of their transport sectors without having to modify their built environments dramatically. One of the solutions generated by these developments is shared micromobility.

Shared micromobility is a transport mode that is promoted as a green alternative to cars (Møller, Simlett, and Mugnier 2020). It uses electric or human-powered, smaller-scale, lightweight vehicles, also referred to as microvehicles, which are not owned by the users but are used on a demand basis (Populus 2018; Tice 2019). Popular examples of shared micromobility are shared bicycles, shared e-bikes, and shared e-scooters. Shared micromobility is designed for short-distance trips and to cover first-and-last mile connections, or the first and last legs of journeys that are not covered by public transport or cars (Shaheen and Chan 2016). Trips made from a docking station closest to the residential front door to a bus stop, from a train station to the office, and from a car parking space to a restaurant are examples of first-and-last mile journeys.

According to Hollingsworth et al. (2019), despite producing more greenhouse gas emissions than shared bicycles and e-bikes, shared e-scooters still have lower life-cycle emissions for a commute compared to an average car. Research has also shown that shared micromobility can effectively supplement existing public transportation systems (Abduljabbar, Liyanage, and Dia 2021; Oeschger, Carroll, and Caulfield 2020; Reck and Axhausen 2021).

Apart from the functional and environmental benefits of shared micromobility, other benefits include its social and economic aspects. Shared micromobility could help to increase the mobility of people living in areas that are underserved by existing public transport systems; in its electric forms, it could provide individuals who have physical constraints, particularly the elderly, with increased access to bicycles and scooters (Lazarus et al. 2020; Reck et al. 2021). Shared micromobility could also boost economic activities by increasing possible destination choices for consumers and by linking high- and low-density urban areas. It could also increase the number of job opportunities

available to those living in areas in which public transport is restricted, as they could provide more flexibility in terms of destinations and travel time (Lazarus et al. 2020). In addition, shared micromobility could decrease congestion in cities and decrease the demand for car trips (Fishman 2016; Gössling 2020), which could then improve the quality of people's lives. While shared micromobility offers many advantages functionally, environmentally, socially, and economically, it has more complexities than other modes of transport because many of its forms are novel. Therefore, a closer examination of how they function, how they differ from other transport modes, and the various motivations for their use is essential.

The rise of microvehicle ride sharing

The shared micromobility market is a relatively new phenomenon that began with shared bicycles. According to Shaheen, Cohen, and Broader (2021), the development of shared of shared micromobility can be divided into four phases starting with the introduction of IT-based micromobility and station-based bike sharing in the U.S. in 2007. Tulsa Townies pioneered the world's first mobile solar-powered IT station-based bike-sharing system (Shaheen, Cohen, and Broader 2021). In 2010, an estimated 101 bike-sharing programs were operating in 125 cities worldwide, with more than 139,000 shared bicycles in their fleets (Shaheen, Guzman, and Zhang 2010). Peer-to-peer sharing was introduced in 2012, and dockless geofencing technologies in 2014 (Shaheen, Cohen, and Broader 2021). These developments paved the way for the increase in dockless shared bikes and e-scooters that has been observed on the streets since 2017.

Despite being more recent, shared e-scooter adoption has increased four times faster than has the adoption of shared bicycles, with the mode extending to 626 cities in fifty-three countries (Møller, Simlett, and Mugnier 2020). Bird, the first shared e-scooter provider, introduced shared e-scooters in California in September 2017 (Chen 2021), and many shared e-scooter providers have entered the market since then. Voi, an e-scooter sharing company that is present in ten countries, has already registered over 16 million trips (Møller, Simlett, and Mugnier 2020), while Lime has reached 34 million rides with its fleet, which includes e-bikes and e-scooters (Zarif, Kelman, and Pankratz 2019). Some other providers of shared micromobility are Tier and Bolt (TECHDesign 2021). Many shared micromobility providers offer different types of vehicles, including e-bikes and e-scooters.

The continuous growth of shared micromobility accounted for approximately 128 million trips in North America in 2021, with over half of these trips involving shared bikes. The number of electric bicycle trips accounted for over a quarter of the trips on shared bikes ("North America: Number of Shared Micromobility Trips by Type of Vehicle 2021" n.d.). In Europe, although no accumulated data pertaining to shared micromobility have been reported, estimates have shown that there is an on-going increase in the number of shared micromobility trips on a daily basis ("New Fluctuo Report Says Europeans Spent €3.1 Billion on Shared Mobility Services in 2022" 2023).

In 2021, a survey in six countries regarding user willingness to use micromobility demonstrated that people were open to using the mode of transport for their daily commutes. In fact, about 40% were willing to use bicycles (both electric and traditional), and 12% were willing to use e-scooters for their daily trips (Heineke et al. 2021). These findings illustrate the potential for shared micromobility to become a normal part of our transport system.

How does shared micromobility work?

Shared micromobility works by providers placing microvehicles in different parts of an urban area. User access is mainly accomplished by installing a provider's app on a smartphone. Depending on whether the vehicle is docked or dockless, the user can then pick the microvehicle up from the designated docking station or a location suggested by GPS. Users usually pay an initial flat rate and then pay additional rates based on the duration of the trip, usually via the mobile app (McKenzie 2019; Populus 2018).

Five distinguishing features are essential in shared micromobility. First, as its name implies, it is a shared mode of transport that gives users exclusive access to available microvehicles for a limited period. In other words, microvehicle ownership is not transferred to users, users do not need to use it with others, and use is on a demand basis. Second, it is usually designed for the use of only one passenger per trip. Third, it can be used anywhere in a pre-defined location depending on the current legislation of the cities in which the microvehicles are located. Fourth, the microvehicles can mainly be accessed using smartphones and apps. Finally, the microvehicles can be used at any time (DuPuis, Griess, and Klein 2019).

Several distinctions can also be used to differentiate among the various shared microvehicles. Shared micromobility can include dockless and docked

systems, and human-powered and electric-powered vehicles (DuPuis, Griess, and Klein 2019). The dockless system does not need a station for the collection or parking of vehicles. Depending on the legislations, these types of vehicles can be left in public locations or in any other specified spaces. By contrast, the docked system requires stations for collecting and dropping off vehicles. Some shared micromobility modes are human-powered and require the user to exert effort to power the vehicle, while other, more novel forms are electrically powered, and use an installed battery to assist users to propel their vehicles forward during the trip.

Shared micromobility versus other transport modes

Shared micromobility could be used as an alternative to other transport modes. However, it is different in several key aspects from cars, owned or shared, private microvehicles, and public transport. Compared to combustion engine cars and electric cars, shared micromobility is used for short-distance trips (Shaheen and Chan 2016) and can usually only accommodate one person at a time. This transport mode also requires smaller parking spaces. On average, it also emits fewer greenhouse gas emissions than traditional combustion engine cars (Hollingsworth, Copeland, and Johnson 2019). Because shared micromobility vehicles are not owned and are less costly to use (Guidon et al. 2019), the status benefits of their use could differ from those offered by cars. However, their use is more visible than is the use of cars because they are not enclosed, and can be used in closer proximity to pedestrians and sidewalks, thus emphasizing their potential symbolic benefits.

Although shared (electric) cars and shared micromobility are both aspects of the sharing economy, the microvehicles still require physical effort during use despite some being propelled by an engine. Unlike shared (electric) cars, micromobility is designed for short-term and short-distance access. Shared micromobility is also designed not only to replace short journeys using cars, but also to complement existing transport modes (Abduljabbar, Liyanage, and Dia 2021), whereas shared cars are mainly available as an alternative to car ownership (Bardhi and Eckhardt 2012).

In contrast to private bicycles and other lightweight vehicles, in addition to the lack of ownership, shared micromobility has the advantage of users not having to collect the vehicles from a drop-off point. The existing literature has proved that the decision to use a bicycle relies on its cost-, and time-saving benefits,

as well as its well-being benefits (Claudy and Peterson 2014). Furthermore, awareness of the positive effects of cycling on the environment and health leads to users adopting it for long-distance trips (Heinen, Maat, and Wee 2011). Nevertheless, in the case of shared micromobility, financial savings and health benefits might not be the driving force for its adoption. In some cases, using shared e-bikes and e-scooters is more expensive in comparison to owning a human-propelled bicycle, or even e-bikes and e-scooters, particularly in the long term (Wertheimer 2020). Shared e-bikes and e-scooters are also electrically powered, thus requiring less effort on the part of their users. Thus, their use may not be seen as a substantial form of exercise. In addition, as electrically powered microvehicles need to be charged, they might not be perceived as being as pro-environmental as are human-powered bicycles. Compared to conventional shared bicycle schemes, which are not typically electrically powered, shared electric micromobility is more expensive but, in some cases, it is more convenient and accessible due to having dockless forms (Campbell et al. 2016; Guidon et al. 2019).

Finally, shared micromobility is different from other forms of public transport that are designed to carry many passengers at a time, and have specific routes and destinations. In fact, some of the advantages of shared micromobility are its flexibility and accessibility, as well as its potential to complement existing public transport systems (Shaheen and Chan 2016).

Due to the distinguishing attributes of shared micromobility in comparison to existing modes of transport, different factors for its adoption come into play. Considering the number of existing and upcoming forms of shared micromobility, this thesis focuses only on shared electric-powered microvehicles, electric bikes, and electric scooters, as they are the most widely available and newest forms.

The shared micromobility market

With regard to the market potential of shared micromobility, estimates indicate that micromobility can cover over 50% of motorized passenger trips made in China, the E.U., and the U.S., which are journeys of less than eight kilometers (Heineke et al. 2019). As urban commuters are increasingly recognizing the time and health benefits of shared micromobility compared to car-based trips, they are beginning to embrace this transport option. In fact, by 2030, the market is estimated to be worth about $500 billion (Heineke et al. 2019).

Globally, shared micromobility, such as shared e-scooters and e-bikes, can be observed in major urban areas, and forecasts estimate up to $90 billion in revenue in 2030 from $3 billion in 2019 (Heineke et al. 2023). In other projections, shared e-scooters are projected to make over $3.1 billion in revenue in 2027, with users expected to increase to about 135 million in number ("E-Scooter-Sharing - Worldwide | Statista Market Forecast" n.d.). By comparison, bicycle sharing is expected to attain $9.14 billion in revenue and more than 960 million users in 2027 ("Bike-Sharing - Worldwide | Statista Market Forecast" n.d.). Because of the market potential of shared micromobility and consumers' continued interest in shared transport, investors have capitalized over $2.9 billion in micromobility providers in 2021 alone, after raising about $7 billion between 2015 and 2019 and $800 million in 2020 (Heineke et al. 2022). As a result, Mobike, a dockless bike-sharing system in China, has nearly doubled accessibility for daily commuters by filling the gaps in public transport (Zarif, Kelman, and Pankratz 2019). In the U.S., investment in dockless bikes reached $290 million in 2016 and jumped to $2.6 billion in 2017 (DuPuis, Griess, and Klein 2019).

However, the COVID-19 pandemic has halted the growth of shared micromobility in many parts of the world, and some companies had to abandon certain markets (Hawkins 2020) as the demand for micromobility decreased dramatically (Heineke, Kloss, and Scurtu 2020). Nonetheless, estimates report that there will be mid- and long-term shifts toward the increasing adoption of micromobility. People and governments are beginning to realize the benefits that these microvehicles can offer, which can be attributed to the reduction in public transport services and to consumer anxiety about taking buses and trains (Nada 2020; Shankleman 2020). In fact, in the U.K., the call for transport reform caused by COVID-19 led the government to amend its laws regarding micromobility use, and to allow the trial of micromobility in its cities in the summer of 2020 (Topham 2020). Cities in the U.S. have also authorized the use of e-scooters on their streets to enable users to avoid taking public transport (Wray 2020).

Investments are also constantly flowing into shared micromobility, and some providers have reported its profitability. Voi raised $160 million in the last quarter of 2020 (Cotton 2020) and, with its continued expansion in 2021, the provider registered a growth of 140% in revenue and Earnings Before Interest, Taxes, Depreciation, and Amortization (EBITDA) profitability (Voi 2022). Bolt, a provider of shared e-bikes and e-scooters, has also planned to invest about $120 million in micromobility, and aimed to have 130,000 shared e-scooters and e-bikes in 100 European cities in 2021 (Keane 2020). Lime, which

is also a shared micromobility provider, generated $523 million in 2021 and planned to go public in 2022. Nonetheless, despite its EBITDA profitability in the third quarter of 2021, the plan to go public was put on hold due to market uncertainties as Bird, another provider, lost 90% of its share price on the New York Stock Exchange (Boudway 2022).

Shared micromobility in Denmark and Sweden

This thesis examined shared micromobility use in Denmark and Sweden. Based on the forecasts, Sweden's shared bike market is expected to increase to over $11.8 million in revenue in 2023, with an annual growth rate of 6.9%. It is projected that the market will have about half a million users by 2027, as illustrated in Figure 1, generating approximately $15.5 million in revenue and increasing market penetration from 4.6% in 2023 to 4.8% in 2027 ("Bike-Sharing - Sweden | Statista Market Forecast" n.d.). In Denmark, the shared bike market is expected to grow by 5.39% with revenue of over $1.92 million in 2023 and to have a 1.2% penetration rate; by 2027, it is expected that it will generate almost $2.4 million in revenue with about 100,000 users and a 1.2% penetration rate ("Bike-Sharing - Denmark | Statista Market Forecast" n.d.). Globally, China will have a projected revenue of almost $5,750 million in 2023 ("Bike-Sharing - Worldwide | Statista Market Forecast" n.d.).

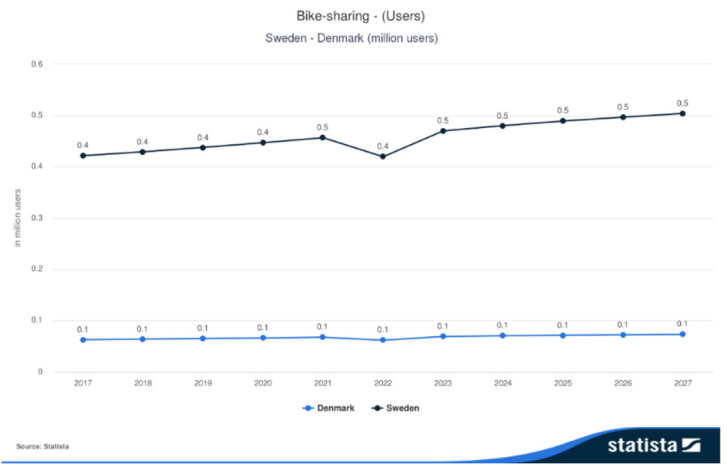

Figure 1 Projected number of shared e-bike users in Sweden and Denmark from 2017-2027

According to Matheisl (2022), Sweden has one of the highest penetration rates of shared e-scooters, with 15% in 2021, only behind Norway with a 17% penetration rate, while Denmark had an 11% shared e-scooter penetration rate. Based on Statista's projected report ("E-Scooter-Sharing - Sweden | Statista Market Forecast' n.d.; 'E-Scooter-Sharing - Denmark | Statista Market Forecast" n.d.), Sweden's revenue in the shared e-scooter market is expected to surpass $48 million in 2023 with an annual growth rate of about 5.2%, compared to Denmark's revenue projection of $15.2 million and a growth rate of 7.13%. As shown in Figure 2, the number of shared e-scooter users in Sweden is also projected to exceed 2.2 million with almost 20% user penetration, and 1.0 million in Denmark with over 16% user penetration in 2027.

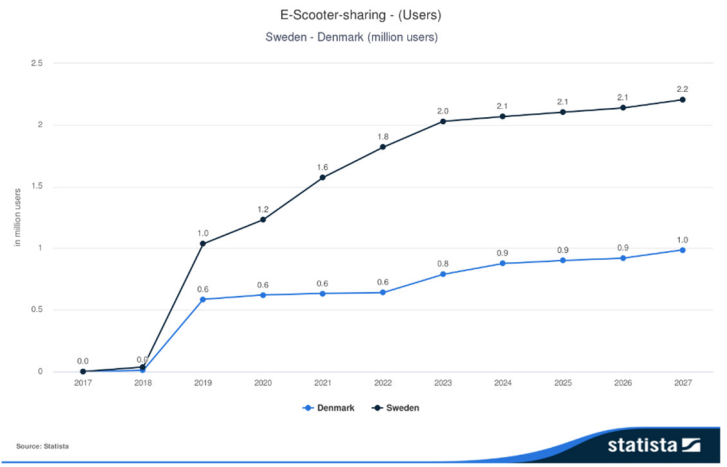

Figure 2 Projected number of shared e-scooter users in Sweden and Denmark from 2017-2027

Shared micromobility use

Shared e-bikes

Numerous studies have outlined the advantages and disadvantages of shared e-bikes (cf. Campbell et al. 2016; Fishman 2016). In general, e-bikes are believed to replace private car trips (Jones, Harms, and Heinen 2016);

according to a study in China, shared e-bikes can decrease the demand for sheltered modes of transport, such as cars (Campbell et al. 2016). However, a study in California showed that dockless shared e-bikes did not affect driving frequency (Fitch, Mohiuddin, and Handy 2021), thus undermining their potential to reduce car traffic. Furthermore, shared e-bike users who consider the environmental impact of their travel behavior would replace their transport modes with other active transport modes if shared e-bikes were not available (Fukushige, Fitch, and Handy 2021). Studies have also shown that bike-sharing systems are more likely to replace trips using public transport. A study in Switzerland demonstrated that shared e-bikes were used as substitutes for public transport more frequently, particularly at times at which buses and trains were unavailable (Guidon et al. 2019). Other research using data from shared micromobility providers revealed that shared e-bikes were used as a complement to or as a replacement for regular shared bicycles (Lazarus et al. 2020; Reck et al. 2021). Trips using shared e-bikes occur during peak commuting periods, thus suggesting they are used for commuting to work or school (Reck and Axhausen 2021). Shared e-bikes are more beneficial in hilly cities, as people appreciate the assistance provided by the battery to propel the bicycle uphill (Reck et al. 2021).

Two important barriers to shared e-bike diffusion are availability and infrastructure (Fitch, Mohiuddin, and Handy 2021). The lack of cycling infrastructure and e-bikes can prevent people from considering this mode of transport. However, two commonly cited benefits of cycling, namely convenience and health benefits, can also deter some consumers from using shared e-bikes. With regard to the availability barrier, shared e-bikes may not be available when potential users need them; thus, some people may perceive them as being inconvenient. In addition, as less effort is required to use these microvehicles, people who cycle for their health may not view shared e-bikes as a good mode of active transport.

A study in the U.S. showed that users of shared e-bikes tended to be young or middle-aged, and were not regular users (He et al. 2019). This was also supported by a study revealing that shared e-bikes attracted the younger market (Fitch, Mohiuddin, and Handy 2021). There are conflicting results concerning the educational backgrounds and incomes of people who use shared e-bikes. A study in a small city in China showed that users were more likely to be from well-educated and high-income groups (Li, Krishna Sinniah, and Li 2022), while another study in China showed that low-income and low-educated individuals preferred the e-bike-sharing system (Campbell et al. 2016). Females were more likely to use shared bicycles instead of making car trips

(Fukushige, Fitch, and Handy 2021), although more males than females used the shared system (Bieliński and Ważna 2020).

Shared e-scooters

Little is known about the users and uses of shared e-scooters (Caspi, Smart, and Noland 2020; Mitra and Hess 2021; Ziedan et al. 2021). As shared e-scooters are relatively new, there is still limited knowledge regarding what users consider to be most important when using these microvehicles, and what prevents non-users from using them. Some studies have shown that shared e-scooters are usually used for leisure trips or for trips outside of peak commuting hours (Reck et al. 2021). This is in line with a study in Austin, Texas, which demonstrated that shared e-scooters were not used for commuting (Caspi, Smart, and Noland 2020), and did not significantly affect bus rides in Kentucky (Ziedan et al. 2021).

Other studies have shown that shared e-scooters were a substitute for taxi and car ride-sharing trips, as well as for walking (James et al. 2019; Lazarus et al. 2020), while a study in Canada revealed that shared e-scooters were likely to be a substitute for walking and other forms of commuting in central areas (Mitra and Hess 2021). This has been supported by some cases in which shared e-scooter trips substituted for trips made using public transport (Laa and Leth 2020, 20; Luo et al. 2021). However, in North American cities, shared e-scooters trips replace one out of three car trips (Fearnley 2020). Shared e-scooters can also complement public transport and increase the accessibility of short-distance trips that are not served by public transport or to destinations that are too far to walk (Smith and Schwieterman 2018).

Compared to cycling, shared e-scooters do not require much physical exertion. They are also more flexible because they can be left anywhere (Caspi, Smart, and Noland 2020). On the negative side, some researchers have argued that safety and negative perceptions regarding shared e-scooters' environmental impact had an adverse effect on consumers' decisions regarding their use (Gössling 2020; James et al. 2019; Kopplin, Brand, and Reichenberger 2021). Others have also pointed out that shared e-scooters are expensive to use, and are not always readily accessible (Orozco-Fontalvo, Llerena, and Cantillo 2022).

In terms of research, studies have shown that shared e-scooter user demographics are increasing. In a study in Canada, young males who emphasized the functional, cost, health, and environmental aspects of their

trips were more open to using shared microvehicles (Mitra and Hess 2021). In Vienna, users tended to be young, male, and highly educated (Laa and Leth 2020), while shared e-scooter users in Paris were mainly young males (Latinopoulos, Patrier, and Sivakumar 2021). In general, a review of shared e-scooter studies illustrated that the users were mainly young males with high educational backgrounds who lived in urban areas (Useche et al. 2022), which undermines one of the purposes of increasing transport access to social groups that do not have access to private vehicles and increasing gender equity in transport (Dill and McNeil 2021). These results also raise the question of how gendered (transport) innovations can be, which is not the focus of this research, but could be a potential research area in the future.

Issues with shared micromobility regulations and users

Shared micromobility has encountered severe criticism since it was introduced, and shared e-scooters have been a particular target. Because many cities were unprepared for dockless micromobility, shared e-bikes and e-scooters caused chaos and confusion among policymakers and consumers alike. Limited knowledge about how they should be used and regulated did not make it easier for shared micromobility providers to increase the acceptance of or to reduce skepticism about the use of these modes of transport.

On one hand, shared micromobility supporters regard it as a green mode of transport, and have argued that shared micromobility can help cities to address dependence on cars and issues related to first-and-last-mile travel (McQueen et al. 2021). On the other hand, critics believe that uncertainties about the regulations and the battery and vehicle life cycles pose potential severe problems to allowing shared micromobility on the streets (Elmashhara et al. 2022; Orozco-Fontalvo, Llerena, and Cantillo 2022). Some people have raised concerns about the lack of infrastructure to support shared microvehicle use and the visual pollution it causes, which occurs when users dump shared e-bikes and e-scooters in the middle of streets and block pedestrians and other traffic (Møller, Simlett, and Mugnier 2020). Others are also concerned about the safety of using shared micromobility and the accidents involved, particularly in e-scooter use (Fearnley 2020). Concerns about how to encourage users to behave appropriately and safely and to follow traffic regulations are also related to safety issues.

Another significant concern about shared micromobility is its emergent characteristic. Consumer behaviors and motivations could change in accordance with the constant modifications to the policies and technologies involved in this mode of transport. In fact, improvements to the safety features of shared microvehicles or policies that restrict their use in certain areas and at certain times of the day could encourage or dissuade consumers from adopting the shared transport.

Some cities, such as Oslo, have restricted the use of microvehicles to certain times of the day to decrease accidents and the inconvenience caused to people who have visual impairments (Modijefsky 2021). Other cities have taken a more drastic approach, such as Paris, which is considering banning the use of shared e-scooters entirely (BBC News 2023). Conversely, cities such as Stockholm (City of Stockholm 2022) and the City of West Hollywood (City of West Hollywood 2022), have adopted a more proactive stance by piloting projects that could potentially help to regulate shared micromobility.

Nonetheless, the most important issue surrounding shared micromobility is the extent to which it replaces car trips, complements existing transport modes, substitutes for other sustainable options, or generates more trips (Abduljabbar, Liyanage, and Dia 2021).

Overall, these issues could be linked to the different motivations for the use of shared micromobility. Why do people use and continue to use shared micromobility? To what extent does the perceived safety of micromobility affect its use, and is the visual pollution caused by shared micromobility actually a concern for users? In order for shared micromobility to be adopted and for consumers to accept it as an alternative or even as the main mode of transport, the problems surrounding shared micromobility need to be resolved. However, most of these issues only concern the functional problems of these shared microvehicles. Other issues, including their hedonic and social value or the lack thereof, may prevent consumers from adopting shared micromobility and decrease its acceptance in society. Hence, when investigating shared micromobility, we must examine not only its functional characteristics, but also its environmental and psychological aspects.

Research questions and theoretical points of departure

The adoption of green innovations lies at the intersection of innovation and consumer behavior studies. This thesis focuses on the consumer aspect of adoption. Therefore, in the following sections, and as theoretical backgrounds, I follow and discuss the consumer behavior literature on the adoption of innovations. However, I acknowledge that consulting the literature on innovation could also prove to be useful. Consequently, I briefly touch on some key concepts in this area with the intention of providing an overview of other relevant theories that could be used in the study of shared e-bikes and e-scooters.

Behavioral classification of shared micromobility adoption

Several theories have been proposed to understand and explain the adoption of green products and novel transport modes, and many of these theories originated in the field of psychology. I will outline some of these theories in the following sections, and will discuss the extent to which they are relevant to my thesis. However, before embarking on this discussion, research on the adoption of energy conservation behaviors, such as the use of shared micromobility, has posited that it is important to differentiate between curtailment and efficiency behaviors (Abrahamse and Schuitema 2020; Gardner and Stern 2008). This differentiation assists in the identification of relevant theories in the individual adoption of energy conservation behaviors.

Curtailment behavior refers to actions that are undertaken frequently or habitually and that help to reduce energy consumption, including turning off lights and using public transportation instead of cars, while efficiency behavior involves actions that involve higher costs but fewer recurrent purchase

decisions, such as the installation of energy-efficient lamps and better building insulation. Studies have shown that efficiency behavior saves more energy than does curtailment behavior (Abrahamse and Schuitema 2020; Gardner and Stern 2008). Nevertheless, a study of U.S. households demonstrated that efficiency behaviors were not significantly related to environmental motivation, although environmental motivation could predict the adoption of curtailment behaviors (Karlin et al. 2014).

Innovation adoption is a typical efficiency behavior because it occurs once or infrequently; for example, the adoption of electric vehicles or energy-efficient appliances (Abrahamse and Schuitema 2020). However, in the case of shared micromobility, adoption cannot simply be grouped according to efficiency or curtailment behavior, as the decision to use occurs more frequently but does not necessarily involve low-cost behavior, and does not essentially entail sacrifice. It could also be less motivated by energy and cost savings.

Dietz et al. (2009) introduced a more recent classification of energy-efficient behaviors, namely Weatherization, Equipment, Maintenance, Adjustments, and Daily behavior (WEMAD). Unlike curtailment and efficiency behaviors, WEMAD distinguishes between once-off or infrequent adoptions for energy and savings (Weatherization) and adoptions that are more motivated by other product attributes, such as convenience and performance (Equipment). It also differentiates between adoption that only requires once-off behavior (Adjustments) and frequent behaviors (Daily) for their environmental impact to be realized. Dietz et al. (2009) also included Maintenance behavior, which includes actions that are infrequent and low-cost but which should be done regularly, such as car maintenance and the cleaning of air filters.

According to WEMAD, the decision to use shared micromobility can be categorized as a combination of Daily behavior and Equipment adoption, as it involves the habitual or conscious decision to use shared e-bikes and e-scooters, although this adoption could be motivated by other product attributes that are not related to energy efficiency and cost savings. Furthermore, the intended environmental impact of these microvehicles can only be realized through their consistent use. As Karlin et al. (2014) pointed out, the WEMAD categorization proposes that behavior can extend beyond the dichotomy of curtailment and efficiency behaviors. In addition, as the adoption of shared micromobility suggests, behaviors could also be a combination of different energy-efficient behavior categories. Thus, in order to understand the adoption of shared micromobility, theories that could predict recurrent behaviors and account for non-functional and environmental aspects are more appropriate. Although this thesis does not fully explore the possibility of these

combinations, it could serve as evidence and support for a more elaborate categorization of energy-efficient behaviors.

Theories in innovation and the adoption of green innovations

The innovation literature considers innovations as new products and processes being realized in practice (Fagerberg 2006). Innovations could help economies to grow and require the collaboration of many actors in society. They also explain why some companies and countries are at the forefront while others lag behind (Fagerberg 2006).

Firms are not the only sources of innovation, as innovations could also stem from individuals whose needs are not being met by the existing products on the market. Lead users are consumers who could assist firms in identifying future innovations and market trends, as they have needs that could become general needs on the market in the future (von Hippel 1986).

Despite the potential benefits of innovations and having lead users who could help to design novel products, from a firm's perspective, motivating consumers to adopt innovations can be challenging because it requires consumers to be willing to learn how to use and operate these products, as well as invest in the additional resources that are needed to use them. Most new products, including goods and services, do not progress beyond the introductory stage, partly due to the marketers' inability to understand consumers, or their "inability to conceptualize consumer innovativeness" (Kaushik and Rahman 2014, 240). This may be partly due to limited research having been conducted to understand when, how, and under which conditions consumers react to innovations (Heidenreich, Spieth, and Petschnig 2017). Consequently, questions about the relationship of consumer innovativeness, product attributes, adoption intention (Chao, Reid, and Mavondo 2012; Alzubaidi, Slade, and Dwivedi 2021), and innovative behavior remain (Bartels and Reinders 2011).

In the context of novel green products, it is possible that their adoption does not depend on their pro-environmental attributes at all, but rather on other attributes that are more closely related to hedonic and social aspects. Research on sustainable consumer behavior has pointed out many factors that could affect the adoption of pro-environmental products (Jansson, Marell, and

Nordlund 2010; Ozaki 2011); these factors are not limited to personal characteristics and values, but also include external and social factors.

The Technology Acceptance Model (TAM) has been used extensively in the study of the adoption of new technologies in innovation research: TAM considers the perceived functional benefits of technology (Lin and Filieri 2015; Min, So, and Jeong 2019). However, researchers have agreed that the lack of or the reduced functional capabilities of sustainable products could facilitate the adoption of sustainable innovations (Noppers et al. 2014). Adopting sustainable innovations relies not only on their functional attributes, but also on their symbolic and social characteristics (Noppers et al. 2014; White, Habib, and Hardisty 2019). In the field of transport, consumers may be particularly encouraged to adopt electric cars despite the limited number of charging stations or their supposed costs because of their perceived environmental benefits, as well as their symbolic traits.

Several other theories have been cited in green innovation studies, including Innovation Resistance Theory (Kushwah, Dhir, and Sagar 2019; Sadiq, Adil, and Paul 2021; Tandon et al. 2021), Expectancy-value Theory (Thøgersen and Zhou 2012), and Complexity Theory (Scarpi et al. 2021). While Innovation Resistance Theory examines the barriers to innovation adoption, Expectancy-value Theory partly explains the extent to which consumers consider that green innovations could benefit them and the environment. Complexity Theory posits that an outcome can be produced using different variables depending on the situation. Therefore, no single antecedent could completely predict whether an individual will adopt a green innovation (Scarpi et al. 2021). Some studies have recommended examining constructs according to different theories; for example, Bartels and Reinders (2010) proposed examining social identification based on cognition and emotional aspects rather than focusing solely on the cognitive approach in their study.

By applying theories such as Social Identity Theory (King, Burgess, and Harris 2019) and Social Cognitive Theory (Zhu, So, and Hudson 2017), some studies have examined the role of interpersonal influence in the adoption of green innovations. In studies that have investigated the social implications of green innovations, scholars have suggested examining the extent to which green innovations reflect identity (White and Sintov 2017), as self-perception and external perception are not necessarily the same (Seebauer 2015). Furthermore, they have recommended considering referent influence, or how consumers strive to become similar to the people whom they admire (Zhang, Chintagunta, and Kalwani 2021), and the ways in which the opinions of early innovators and their social environment are constantly changing (Seebauer 2015).

In specific contexts, social influence is linked to the intention to adopt electrically powered vehicles (Morton, Anable, and Nelson 2016; Seebauer 2015) and the perceived value of and intention to purchase organic products (Persaud and Schillo 2017). According to Noppers et al. (2015), symbolic attributes of sustainable innovations should be highlighted because they facilitate the adoption of green products.

Given the numerous theories that could assist in understanding the adoption of green innovations, there are many possible ways of examining the behavior but, based on the analyses presented in the literature review in this thesis, the most dominant theory that has been applied in the study of green innovations is the Diffusion of Innovation (DOI) Theory. The theory mainly examines how new ideas and technologies spread over time (Rogers 2003). One of the key ideas in DOI is consumer innovativeness, which argues that some consumers are more receptive to new products than are others.

Consumer innovativeness is suited to the study of shared micromobility because the adoption of shared micromobility could pose certain risks, such as the previous deficiency in terms of safety features or the lack of regulations. Moreover, innovators are usually more willing to take risks than are their peers (Venkatraman and Price 1990). There is no doubt that the application of consumer innovativeness has provided the groundwork for many researchers; however, despite the prevalent focus on consumer innovativeness in studies of green innovation adoption, it remains necessary to examine the concept and its impact on the decision to use novel pro-environmental products.

Consumer innovativeness

Many marketing scholars have investigated consumers' motivations to adopt innovations. A body of research concerning these motivations has focused on exploring a particular attribute that could drive people to adopt innovations, namely consumer innovativeness. Researchers have recommended that consumer innovativeness should receive greater emphasis in studies of adoption motivation because consumer innovativeness explains a relatively high percentage of the variance in adoption intentions (Arts, Frambach, and Bijmolt 2011; Vandecasteele and Geuens 2010; Alzubaidi, Slade, and Dwivedi 2021). Nevertheless, scholars have not arrived at a consensus regarding what consumer innovativeness means (Vandecasteele and Geuens 2010; Zhang and Hou 2017).

Consumer innovativeness originated in the DOI theory published in the book *Diffusion of Innovations* by Rogers (1962). Over the years, the theory has been applied to various fields, such as medicine and social sciences, to study how innovations disseminate within a group or in a society (Rogers 2003). Rogers (2003) defined consumer innovativeness as the time at which an individual adopts innovations relative to other people. This explicit element of the temporal concept of innovativeness has since been widely accepted; this notion views consumer innovativeness and the adoption time as being synonymous (Midgley and Dowling 1978). The theory classifies consumers as innovators, early adopters, early majority, late majority, and laggards based on the time of their adoption of an innovation. In comparison to other theories that aimed to predict consumers' adoption of new products, the distinctive element of DOI is that it proposes that consumers adopt innovations at different rates; therefore, different strategies must be applied to attract different groups of consumers.

Based on the criterion of the time of the adoption of an innovation, many consumer studies aiming to match consumers to consumer innovativeness categories have been conducted (Sood and Kumar 2017). Scholars and practitioners have agreed that firms should target innovators and the early majority when introducing new products. However, this does not mean that these segments are the most profitable (Sood and Kumar 2017), and are thus not necessarily the most important consumers of innovations.

The time adoption view that Rogers (1962) introduced is theoretically problematic for several reasons. First, it does not take the social processes that are involved in adoption into account (Midgley and Dowling 1978). Although the social system is important in the transmission of information, the time of adoption neglects the dynamic social activities that influence adoption. Second, the time of adoption, which is an observable act, is equated directly with the abstract concept of innovativeness (Midgley and Dowling 1978). Third, the time of adoption view considers being innovative as being limited to a single innovation, and does not communicate anything about how innovative an individual is in general, as the studies that have been conducted have assessed the diffusion of a single innovation at a time (Midgley and Dowling 1978).

As researchers have realized these weaknesses, some have decided to embrace more cross-sectional methods to measure consumer innovativeness (Goldsmith and Hofacker 1991). Whereas the time of adoption reveals when consumers adopt innovations, cross-sectional methods measure innovativeness based on the extent of purchasing a pre-specified list of new products during

the period of the data collection (Midgley and Dowling 1978). This method assumes that individuals have some form of innate innovativeness. Thus, consumer innovativeness is investigated as a precursor to the adoption of new products.

Despite the concept's weaknesses, consumer innovativeness continues to be widely used among scholars. The advantage of applying the concept of consumer innovativeness is that consumers are viewed as individuals who have specific traits that drive them to adopt products at different rates. As a result, targeted strategies can be used to drive adoption. Moreover, consumer innovativeness has been studied in relation to other traits of consumers who adopt new products quickly, such as attraction to novelty, risk taking, and pleasure seeking (Bartels and Reinders 2011; Roehrich 2004), thus making it more widely understood than other concepts.

According to a study of online bicycle-renting services, consumer innovativeness moderates the effect of perceived risk on pre-purchase and on-going information searches regarding innovative products (Zhang and Hou 2017). In terms of collaborative consumption, a study of millennials demonstrated how inherent innovativeness strengthened the positive effect of the hedonic benefits of collaborative consumption on attitude (Hwang and Griffiths 2017). In a study of green products, an affinity for new ideas, which is a correlate of consumer innovativeness, has been shown to mediate the relationship between attitudes toward the environment and the faster adoption of green behavior (Englis and Phillips 2013).

Domain-specific innovativeness

The view of innate innovativeness, as an ex-ante indicator, assumes that innovativeness is a trait that is shared by everyone. However, several studies have demonstrated that innovativeness is a better predictor of behavior in domain-specific contexts (Bartels and Reinders 2011; Chao, Reid, and Mavondo 2012). This domain specificity suggests that innovativeness is more appropriately linked to a person's domain of interest, and is not a general trait that can be applied across all domains of consumption.

DSI states that consumers are innovative in particular domains as opposed to being generally or innately innovative; this means that consumers have a tendency to adopt innovations if they fall within specific domains of interest (Hirunyawipada and Paswan 2006; Roehrich 2004). For example, Goldsmith,

Freiden, and Eastman (1995) found that DSI was more closely correlated with the purchasing of new clothes and electronics than was innate innovativeness; DSI has also been shown to have a direct influence on the willingness to pay in the context of smart toys (Zhang et al. 2020). Some DSI studies have focused on the attributes of innovations, such as originality, eco-friendliness, functionality, and hedonic benefits (Li, Zhang, and Wang 2015), while others have concentrated on the willingness to pay for innovations (Frank et al. 2015; Zhang et al. 2020).

However, Li et al. (2015) found no direct relationship between DSI and adoption intention across original and useful innovations. In fact, some studies have assessed DSI as a moderating variable, and have concluded that DSI has a stronger effect on intention and adoption when it is a moderator (Leicht, Chtourou, and Youssef 2018; Li, Zhang, and Wang 2015). In the context of autonomous cars, for example, DSI moderates the effect of different antecedents of adoption and purchase intentions (Leicht, Chtourou, and Youssef 2018).

Bartels and Reinders (2011) presented commonly identified correlates of DSI, which included opinion leadership, opinion seeking, the need for uniqueness, and product involvement. In their review, they argued that DSI could serve as a mediator of innate innovativeness and actual innovation adoption. In addition, they suggested other possible variables that could be better predictors of innovation adoption. Of note, they also found that demographic variables and DSI had an unclear relationship. Nevertheless, a study of millennials has shown that millennials with high-level DSI in the use of mobile technology could show deeper concerns regarding impression management or creating a suitable image among their peers (Eastman et al. 2014).

Despite the criticisms of DSI, I apply and study the concept in this thesis because transport and green behavior studies have revealed a link between DSI and innovation adoption, albeit indirectly in some cases, such as the mediating role of DSI in the case of electric vehicle adoption (Wang et al. 2022), the positive influence of DSI on the purchasing of organic food (Bartels and Reinders 2010), and the significant impact of DSI on attitudes toward rooftop photovoltaic (PV) system installation (Huang and Cheng 2022).

Because shared micromobility is considered to be a transport innovation and a green product, two types of DSI are examined in this thesis. The first is transport DSI, or simply transport innovativeness, which relates to an interest in new transport modes and developments related to the transport industry (Noppers et al. 2015). This DSI is the extent to which a person is one of the

first consumers who is willing to try new transport modes. The second DSI is eco-innovativeness; this DSI pertains to interest in using products that help to conserve natural resources and protect the environment (Gurtner and Soyez 2016). By comparing these two types of DSIs, this thesis provides a more detailed understanding of the relevance of investigating consumer innovativeness on a domain-specific level and differentiating among different DSIs. Based on these arguments, I present the first research question that I aim to answer:

Can a product belong to more than one domain, and are transport DSI and eco-innovativeness significantly related to the use of shared e-bikes and e-scooters?

As innovativeness is restricted to consumer traits as drivers for the adoption of innovations, Vandecasteele and Geuens (2010) proposed the motivated consumer innovativeness scale to address this limitation; the scale highlights the interactions of the goals and motivations of consumers and the extent to which an innovation assists consumers to attain these goals (Hwang, Kim, and Kim 2019). Vandecasteele and Geuens (2010) suggested investigating the instrumental, hedonic, symbolic, and cognitive aspects of innovations. In the context of green innovations, environmental attributes should also be included because they are often argued to be the main selling points for these products.

However, in order to understand how motivations in innovation adoption are relevant to the study of shared micromobility, it is essential to refer to existing theories that have been used to examine consumer behavior and to determine how they are related to instrumental, hedonic, symbolic, and environmental motivations. Cognitive motivations have not been explored in this thesis because there is limited evidence to suggest that shared e-bikes and e-scooters could be used to challenge and stimulate thinking.

Theories in consumer behavior

Many competing empirical theories have been developed to explain how consumers behave. Classical approaches in consumer decision making, particularly in economics, have revolved around utility maximization and the "rational-economic man" idea, according to which consumers are expected to behave in such a way as to maximize their expected returns with the least possible cost ('APA Dictionary of Psychology' n.d.). However, by acknowledging that consumers are not only limited by rational motives but

also by other normative and psychological factors, other descriptive theories involving consumers' intrinsic characteristics and motivations (Luce 2015; Peattie 2010), such as Ajzen and Fishbein's Theory of Reasoned Action (TRA) (1975) and Schwartz's Norm Activation Model (NAM) (1977) have emerged. TRA postulates that an individual's attitude toward a behavior and subjective norms predict their intention to perform the behavior; intention then predicts the performance of the behavior (Peattie 2010). On the other hand, NAM argues that personal norms determine consumer behaviors. Personal norms are shaped by an individual's awareness of the consequences of their actions and how responsible they feel for these consequences (Peattie 2010).

The Theory of Planned Behavior (TPB) and its revisions and extensions have been widely applied in the field of green behavior. TPB, which was formulated by Ajzen (1991) to improve the predictive capacity of TRA, demonstrates how perceived behavioral control, subjective norms, and attitudes affect an individual's behavioral intentions. In general, the theory states that human behavior is guided by an individual's beliefs about the consequences of their actions, the norms surrounding these actions, and the extent to which they can control the factors related to these actions. The theory has been, and still is, widely applied in studies pertaining to public health, business, and environmental sciences (Bosnjak, Ajzen, and Schmidt 2020). Nonetheless, the theory continues to be a work in progress.

Some of the criticisms of this theory are its lack of consideration of the context of consumption (Peattie 2010) and its proposition that intention "best" predicts action (Ozaki 2011). Therefore, studies have extended and added variables to the theory to improve its predictive capacity (Bosnjak, Ajzen, and Schmidt 2020). A frequently cited extension of the TPB is the Model of Goal-Directed Behavior (MGB) proposed by Perugini and Bagozzi (2001), which proposes that the effects of the TPB variables and anticipated emotions on the intention to perform a behavior are mediated by desires.

Another frequently used model, which is derived from NAM, is the Value-Belief-Norm Model. This model focuses on how consumers' values affect their beliefs, and how these beliefs influence their perceptions and feelings of personal responsibility for how their consumption behavior affects the environment. These perceptions then influence their behavior (Peattie 2010).

Researchers have also investigated consumer behavior from an emotion-driven perspective (Bagozzi 1997; Ozaki 2011; Peattie 2010). According to Bagozzi (1997, 132), "[e]motions serve to motivate action, qualify information processing, and in general regulate the pursuit of consumption goals." Instead

of emotions being by-products of consumption, they become the primary reason for consumers to purchase or use certain goods or services. However, research on the role of emotions in decision making remains limited (Peattie 2010), specifically with regard to studies of innovation adoption (Valor, Antonetti, and Crisafulli 2022).

These descriptive theories mainly have their roots in psychology, and posit that consumer decisions can be influenced consciously or subconsciously by conspicuous or inconspicuous factors (Luce 2015). Nevertheless, although many of these dominant theories have their roots in economics and psychology, other theories, such as consumer culture theory (CCT), which derives from anthropology and sociology, also add to the understanding of consumers' decision making. CCT argues that the sociocultural context plays a significant role in consumers' judgments and decision making (Luce 2015). Table 1 presents various psychological and marketing theories that could assist in understanding how consumers behave.

Table 1 Theories and approaches in psychology and marketing that help to predict consumer behavior

Theories / Approach	Key concepts	Definition of concept	Examples of questions in consumer behavior
Theory of Reasoned Action	Intention	Intention to perform a behavior	What is the "relationship between beliefs about salient consequences and attitudes toward paying more for renewable energy?" (Bang et al. 2000, 449)
	Attitude toward the behavior	Positive or negative evaluation of performing a behavior	
	Subjective norms	Perception about what others think of the behavior	
Theory of Planned Behavior	Perceived behavioral control + Theory of Reasoned Action concepts	Perception of the ability to perform a behavior	"Can the factors derived from the TPB mediate the relationships between consumer innovativeness and the purchase intentions of sustainable products?" (Li et al. 2021, 775)
Model of Goal-Directed Behavior	Past behavior	Frequency of performing the behavior in the past	How do anticipated emotions and past behavior predict pro-environmental behavioral intentions, such as the use of public transportation? (Carrus,
	Emotions (both positive and negative)	Anticipated reaction to the achievement or non-achievement of the intended goal of behavior	

	Desire + TPB concepts	Personal motivation to perform a behavior	Passafaro, and Bonnes 2008)
Norm Activation Theory	Awareness of consequences	Awareness of the effects of behavior on the environment	What are the "effects of personal norms, perceived green value and perceived pleasure on users' green intention to use DBS [dockless bike sharing]?" (Huang et al. 2020, 638)
	Ascription of responsibility	Extent to which one assumes responsibility for the environmental consequences of behavior	
	Personal norm	Feeling of moral obligation on how to behave	
Value-Belief-Norm	Environmental concern	Extent to which one is concerned about environmental issues	To what extent do value-belief-norm (VBN) factors explain the early adoption of high-involvement eco-innovations, such as alternative fuel vehicles? (Jansson, Marell, and Nordlund 2011)
	Values + Norm Activation Theory concepts	Beliefs that guide one's actions	

Even though this thesis is based on the DOI theory, the general idea of how rational, emotional, and social factors could affect consumer decision making is covered by the motivations related to instrumental, environmental, hedonic, and social attributes in innovation adoption outlined in the following sections. For example, instrumental motivations partly include the attitude toward performing an action, learning from past behavior, and behavioral control based on a person's ability to achieve the goal of an action. Environmental motivation points out that the decision to adopt shared e-bikes and e-scooters is driven by concern for the environment and the environmental impact of using shared microvehicles. Therefore, this motivation could be linked to the norms of behaving with regard to protecting the environment and how an individual is guided by environmental values. Hedonic motivations encompass the emotions in the MGB. Finally, social motivations are based on subjective norms in the TPB. Therefore, this thesis synthesizes and uses the basic tenets of other frequently applied consumer behavior theories.

Motivations

In this research, I examine perceptions of various product attributes as motivators for the adoption of innovations. This view is similar to how value perceptions drive the purchase intentions of collaborative consumption services (Hwang and Griffiths 2017), and how product attribute perception could impact purchasing decisions in general (Kalro and Joshipura 2023). Therefore, the terms "motivations" and "perceptions" are used interchangeably in this thesis, which I acknowledge could confuse readers, but I maintain that this use was meaningful in the studies that I conducted. In this thesis, I evaluate the importance of consumers' perceptions of various product attributes in their decision to adopt shared micromobility. This perspective proposes that it is not only personal characteristics that affect the decision to adopt an innovation, but also product perceptions. These product perceptions can be categorized according to instrumental, environmental, hedonic, and social perceptions. Therefore, I define motivations as how users and non-users perceived the instrumental, environmental, hedonic, and social benefits of using shared micromobility.

Instrumental motivations

Instrumental motivations are related to whether consumers perceive a product's functional benefits to outweigh the costs. Consumers would not necessarily choose one product instead of other alternatives due to cost savings. In fact, financial motivations are not the only relevant consideration in consumer behavior (Abrahamse and Schuitema 2020; Trudel 2018); consumers could also be motivated by the functional advantages related to efficiency that could result in greater satisfaction and continued use. Some consumers are motivated by convenience and time saving in their decisions to choose a product or service instead of other product benefits (Hwang, Kim, and Kim 2019). Nonetheless, consumers often misjudge the costs of owning items such as cars (Andor et al. 2020), thus making the transition to other, more cost-effective products a challenge.

As highlighted in the review paper included in this thesis, instrumental motivations could be linked to the relative advantages of green innovations, including economic benefits, performance, effort, and compatibility (Song, Chu, and Im 2021; Wang et al. 2019). Economic benefits are related to the financial gains or losses that an individual could incur when adopting green products. Although consistently having been shown to be significant, the costs

associated with the purchase of green innovations could hinder the widespread adoption of these products (Hustvedt, Ahn, and Emmel 2013; Sandra and Alessandro 2021). According to Rogers (2003), functional performance is assigned tremendous significance when a new product is launched on the market. However, having functional drawbacks can be beneficial for green innovations because they intensify their symbolic advantages (Noppers et al. 2014). For example, perceived functional disadvantages could have a positive impact on the decision to use green products because one could signal altruistic characteristics through the consumption of green products (Griskevicius, Tybur, and van den Bergh 2010).

Another way of classifying functional benefits is based on their private-functional and societal-functional benefits (Axsen and Sovacool 2019). The categorization is related to the level of society that benefits from it. In terms of novel mobility modes, the private-functional benefits include cost, safety, and convenience for the users, while the societal-functional benefits include the environment, the safety of non-users, and the reduction of road congestion, among others (Axsen and Sovacool 2019).

Environmental motivations

Environmental motivations could also drive consumers to adopt green innovations. Some green innovations that focus on the reduction of resource use or efficiency are designed to decrease the use of energy and the emission of carbon, while others that aim to eliminate resource use emphasize the removal of harmful products in the production process. Another type of green innovation focuses on replacing environmentally harmful input with greener substitutes (Paparoidamis and Tran 2019). Consumers have a more positive evaluation of green innovations that eliminate or replace the use of harmful inputs than they do regarding those that reduce the use of resources (Paparoidamis and Tran 2019).

In general, many consumers have favorable attitudes toward the environment and would prefer products that have a less negative impact on it. Several studies have demonstrated that consumers have a greater likelihood of choosing green products because they believe they can benefit the environment through green consumption (Bang et al. 2000; Kong and Zhang 2014). Nevertheless, Lin and Chang (2012) showed that consumers' perceptions of the greenness of products could also have negative implications for their use; because some consumers see green products as being less effective than their traditional counterparts, they tend to increase their product consumption to

compensate for this perceived reduced efficacy. This finding is more apparent for consumers who are environmentally conscious. Haws, Winterich, and Naylor (2014) also showed that individuals with high green consumption values, or those who consumed green products to express their environmental values, also tended to evaluate the non-environmental attributes of green products more favorably, and that their consumption was not only aimed at environmental protection, but was also aimed at preserving personal resources. In relation to these findings, Noppers et al. (2015) stated that environmental attributes were less likely to predict the adoption of electric cars than were instrumental and symbolic attributes. This means that positive assessments of the costs and benefits of ownership and the perceptions of others concerning the use of electric cars were more important than was the environmental impact of the adoption of electric cars. Nevertheless, Noppers et al. (2015) stated that this result may not be generalizable to other sustainable innovations.

In a study of cognitions related to car use and its alternatives, the attitude toward non-car use was found to be influenced by cognitions related to the environment (Gardner and Abraham 2010); environmental reasoning has also been shown to be more important for products that are perceived to have a significant environmental impact than it is for products that do not (Kong and Zhang 2014). Thus, environmental concern can serve as an accessible heuristic for consumers in the decision to act sustainably (Dermody et al. 2015).

Nevertheless, based on a study of renewable energy, concern for the environment does not translate directly into improved knowledge (Bang et al. 2000). In fact, although some researchers have argued that the formation of environmental motivations can be linked to knowledge about the effects of products, (moral) reasoning only plays a decisive role when the environmental impact is substantial (Thøgersen 1999). Although they are linked to environmentally related information processing, these findings have revealed that environmental motivation could also be based on other forms of cognitive deliberation, such as financial or social gains.

Hedonic motivations

Venkatraman and Price (1990) argued that innovators could respond to innovations through cognition or via the senses. Hedonic motivations include sensory and affective experiences in innovation adoption. Some novel product adopters are hedonically motivated; instead of placing high importance on the instrumental benefits of the innovation, they emphasize the emotional benefits that they experience when using the product (Li et al. 2021). In fact, several

researchers have found that the hedonic attributes of innovations could be a significant predictor of innovative behavior (Hahnel, Gölz, and Spada 2014; Heidenreich, Spieth, and Petschnig 2017). When one is motivated to behave hedonically, the objective is to enhance how one feels and to attain these improved feelings within a short period (Lindenberg and Steg 2007).

Hedonist innovativeness, or the need for stimulation, refers to the tendency to use novel or unfamiliar products to have a stimulating experience. Hedonic attributes evoke positive feelings and emotions associated with the use of new technologies. These attributes are subjective because they are highly dependent on a person's level of sensory and emotional arousal (Hwang, Kim, and Kim 2019). Hedonism has also been linked to age, as younger people are more affected by the hedonic benefits of innovations (Hwang and Griffiths 2017).

According to Loewenstein and Lerner (2003), immediate emotions, or those emotions that individuals feel during the decision-making process, can have a direct or an indirect effect on their decisions. Anticipated emotions, or those feelings that people expect to feel about the consequences of their actions, could also be a significant predictor of behavior (Mellers, Schwartz, and Ritov 1999). Emotions can also have a direct influence on both reason and beliefs (Dolan 2002), as well as on satisfaction and loyalty (Enrique Bigné, Mattila, and Andreu 2008). In terms of brand information, consumers' feelings about products can play a significant part in evaluating a brand (Pickett-Baker and Ozaki 2008). Therefore, emotions can lead to a bias against the cognitive beliefs that people have regarding particular objects (Dolan 2002). For products that are perceived as high risk, such as radical innovations, hedonic values exert a greater influence on purchase intentions (Arruda Filho, Simões, and De Muylder 2020). Specifically, with regard to radical innovations or new products that meet consumers' needs significantly better than existing products do, Chaudhuri et al. (2010) suggested that emotions could determine consumers' responses to radical innovations, and could have a direct effect on how they evaluated these products in terms of risk perception and willingness to try them. Emotions also become more salient in experiential decisions, such as those involved in traveling, than in information processing (Kwortnik and Ross 2007). In the decision to use cars, affect is also a better predictor than are the functional benefits (Steg 2005).

In terms of engaging in social behavior, emotions influence the intention and adoption of behavior more than knowledge does (Parkinson, Russell-Bennett, and Previte 2018). According to Smith et al. (1994), affect could also be linked to the decision to act pro-environmentally. Pooley and O'Connor (2000) argued that affect was more significant than was information provision in the

case of green attitude formation. A study of young eco-innovators showed that this group wanted to experience the hedonic benefits of the product while protecting the environment (Gurtner and Soyez 2016).

To encourage the adoption of new behavior, such as the adoption of green innovations, Fitzmaurice (2005) proposed illustrating the positive emotions that individuals could feel during consumption. It has been demonstrated that the intention to use electric cars is significantly affected by emotions and attitudes (Moons and De Pelsmacker 2012; Rezvani, Jansson, and Bengtsson 2017). Venkatesh, Speier, and Morris (2002) found that the intrinsic motivation to experience positive emotions also increased the perceived usefulness and ease of use of new technologies. These hedonic motivations lead individuals to spend more time using the products, thus making them more knowledgeable about the products' benefits. However, studies have also shown that anticipated negative emotions could adversely affect the decision to behave more pro-environmentally, such as taking public transport and recycling (Carrus, Passafaro, and Bonnes 2008). Therefore, the inclusion of hedonic motivations in the study of green innovations is important.

Social motivations

Consumers' motivations underlying consumption behavior vary considerably. As Rogers (2003) proposed, the degree of observability of a product can drive its trial and long-term use. Observability is the extent to which the user and the social environment can see a product's advantages, and consumers have a greater likelihood of adopting innovations when the advantages are clearly visible (Min, So, and Jeong 2019). However, an issue regarding observability is the limited view of the benefits of innovations. Many studies that have measured observability have only focused on the tangible effects of innovation use; tangible benefits are those that are easily measured and are mainly related to the functional aspects of the products. These studies have not considered self-image (used synonymously with identity in this thesis because findings from various papers use the terms interchangeably and often refer to how individuals perceive themselves – e.g., Chen et al. 2019; Chernev, Hamilton, and Gal 2011) cues that users of innovations want to communicate to others.

Social motivations are aligned with enhancing or maintaining social status; they also involve defining self-identity and obtaining tangible materialistic gains through the symbolic benefits of products (Townsend and Sood 2012; Trudel 2018). In fact, whereas some products are purchased and used due to their functional features, others are consumed because of the symbolic benefits

they offer (Levy 1959). The self-congruence theory argues that products have attributes that reflect one's image (Sirgy 1985). Scholars have long argued that consumers use products that are consistent with their self-concept (Belk 1988; Escalas 2013), and that the self-concept can be considered from various perspectives – the actual, the ideal, and the social. While the actual and ideal perspectives concern how a person sees the self and how a person wants to see the self, respectively, the social self is related to the way a person presents the self to others (Sirgy 1982).

In line with the actual and ideal self-concepts, there has been increased interest in studies addressing the consumption of products to confirm, maintain, and promote self-identity (Berger and Heath 2007; Dhar and Wertenbroch 2012). Products help to define self-identity and, at times, help to provide missing characteristics that a person desires to have (Grewal, Mehta, and Kardes 2000). Moreover, products can be used to obtain tangible materialistic gains through the symbolic benefits they confer (Bliege Bird and Smith 2005). Thus, some innovations that are considered symbolic may be adopted to express self-identity, which means that some innovation attributes should be congruent with a person's self-image. For example, a person may choose to buy a less tasty but healthier food option to validate their self-identity of living a healthy lifestyle (Dhar and Wertenbroch 2012). Another example is when consumers utilize aesthetic products to solidify their value of beauty (Townsend and Sood 2012).

Johansson-Stenman and Martinsson (2006) studied the connection between self-image and owning a luxury vehicle; they argued that people gained utility from having a positive self-identity and that people were driven to act in a socially acceptable manner to receive approval and esteem. However, people would not openly admit that they were driving an expensive car due to the status that it conferred. In the context of green products, a study has demonstrated how the use of green products could be motivated due to their positive influence on how an individual assesses their social value (Tezer and Bodur 2020).

In innovation studies, consumer innovativeness can be said to be a manifestation of the need for uniqueness and stimulation (Roehrich 2004). Social innovativeness, or the need for uniqueness, is related to an individual's tendency to adopt products before others do so in the social system. The social attributes of an innovation are the characteristics that signal an individual's social need for differentiation (Vandecasteele and Geuens 2010).

Instrumental, environmental, hedonic, and social motivations in the use of shared micromobility

Based on the different motivations that could be applied to understanding green innovation adoption, Table 2 presents how shared micromobility, particularly e-powered micromobility, could motivate users in terms of its instrumental, environmental, hedonic, and social advantages over other modes of transport. It also outlines a comparison of the advantages between two of its electric forms, namely e-bikes and e-scooters. The table mainly summarizes the aspects that could encourage adoption, as this thesis concerns motivation for use. Nonetheless, it is possible that, if shared micromobility replaces walking or public transport, it could generate more carbon emissions for a single trip, which could weaken consumers' environmental motivations for use. It could also be more costly to use shared e-bikes and e-scooters than to ride a regular bicycle or to engage in other active forms of transport. Consumers could also have anticipated negative emotions about the use of shared micromobility because of the controversies surrounding it. However, it is likely that consumers will evaluate both the advantages and the disadvantages simultaneously in the decision to adopt the technology. Because this thesis focuses on users, it is justifiable to assume that the advantages have been more decisive than the drawbacks in the users' decisions.

Table 2 Motivations for shared micromobility adoption

Shared e-bike and e-scooter vs. other transport modes	Shared e-bikes vs. shared e-scooters
Instrumental	
• First-and-last mile solution • Complement public transport trips • Electric boost reduces physical exertion and increases speed, but could also help to improve the health of users as they are active forms of transport • Dockless shared micromobility allows users to park closer to their final destinations • Generally cheaper than taking a car • Fewer issues with vandalism and theft for consumers and reduced parking problems • Possibility of avoiding congestion	• Shared e-scooters are more readily available than are shared e-bikes • Shared e-scooters are smaller and easier to park • Shared e-bikes have clearer regulations for use and are safer • Shared e-bikes are familiar to consumers, particularly those who know how to ride bikes • Shared e-bikes could be cheaper than shared e-scooters
Environmental	
• Produce less harmful emissions than cars	• Shared e-scooters have had a shorter life span but have seen tremendous

• Possibly replacing car trips • Moving consumption away from ownership to sharing	improvements in battery life and durability; e.g., Voi e-scooter's lifespan is five times longer for its 2021 models compared to the model that it launched in 2018. This could cover 6,529 km, and the battery could last up to 3.7 years (Persson 2022)
Hedonic	
• Used for taking leisure trips for fun, pleasure, or other hedonic experiences • Experience a sense of novelty	• Shared e-scooters could be more strongly related to hedonic trips
Social	
• More conspicuous than cars, as their use can easily be seen by the social community • Could be regarded as a novel way of communicating a certain image of users	• Some negative perceptions, as consumers may believe that (shared) e-bikes are for the elderly or those who are physically unfit, and that shared e-scooter users are reckless and cause accidents

Instrumental motivations in shared micromobility adoption include convenience, ease of access, and cost, among others. Dockless e-bikes and e-scooters provide their users with the convenience of being able to park the shared vehicles anywhere, depending on how they are regulated, and increased accessibility (Guidon et al. 2019; Orozco-Fontalvo, Llerena, and Cantillo 2022). As they are also presented as first-and-last mile solutions (Abduljabbar, Liyanage, and Dia 2021; Oeschger, Carroll, and Caulfield 2020), shared e-bikes and e-scooters save their users the time and energy entailed in having to walk to the closest or most convenient public transport stop. Shared micromobility could also complement existing public transport options, and could replace car trips (Abduljabbar, Liyanage, and Dia 2021; Guidon et al. 2019; Oeschger, Carroll, and Caulfield 2020). Users also do not have to worry about the microvehicles being stolen or vandalized because they do not own these vehicles, and they do not have to think about parking, particularly if the microvehicles are dockless. Moreover, they could help users to avoid congestion during peak periods (Elmashhara et al. 2022).

Nonetheless, as shared micromobility is often more expensive than is taking public transport, particularly for longer trips, and because availability is sometimes difficult to predict, the instrumental drawbacks could outweigh the benefits. Furthermore, relative to their non-electric counterparts, although shared e-bikes and e-scooters offer the possibility of covering longer distances

without the need to exert much effort, they must be collected or returned to docking stations and charged due to their limited battery life (Guidon et al. 2019; Orozco-Fontalvo, Llerena, and Cantillo 2022). However, recent developments have enabled the swapping of batteries at shared micromobility locations, thus reducing the need for picking up and charging the vehicles at stations (Carey and Lienert 2022).

Shared e-bikes are a more widely accepted form of transport than are e-scooters. In many cities, lanes are allocated to cyclists, and there are stations where people can park their bikes easily (Guidon et al. 2019). However, shared e-scooters are lighter and can be parked anywhere (Orozco-Fontalvo, Llerena, and Cantillo 2022). Shared e-scooters have also become more accessible as their number has increased faster than that of their e-bike counterparts (O'Brien 2022).

Shared micromobility use could also be motivated by environmental reasons. Shared micromobility trips produce fewer carbon emissions than do car journeys (Hollingsworth, Copeland, and Johnson 2019); micromobility trips also have the potential to replace car trips. Shared micromobility, as with other products in the sharing economy, could drive consumption away from ownership toward sharing, thus reducing production and, consequently, the need for raw materials. On the negative side, they could induce ownership of the microvehicles (Reck, Martin, and Axhausen 2022).

When evaluating the greenness of the two types of shared microvehicles, shared e-scooters suffer from shorter life spans because of the ways in which they are used. They could easily be discarded or vandalized, thus making perceptions of their environmental benefits less convincing, particularly for non-users (Gössling 2020). Nonetheless, shared e-scooter providers have acknowledged these issues, and some have been collaborating actively with the authorities to make shared e-scooter use safer and more pro-environmental. They have also introduced more robust vehicles that could withstand reckless use for longer periods (Persson 2022).

Shared e-bikes and e-scooters could also provide hedonic benefits, as they can be used for leisure trips or for fun. Studies have shown that the use of shared micromobility could be linked to hedonic trips, and not necessarily to commuting. With regard to the two types of shared microvehicles, some studies have revealed that one of the main reasons for the use of e-scooters is related to leisure and fun (Reck et al. 2021; Useche et al. 2022), whereas e-

bikes are generally used due to their environmental benefits (Fukushige, Fitch, and Handy 2021; Handy and Fitch 2020).

Finally, shared micromobility use could also be connected to social motivations. Studies have revealed how the social environment could affect one's decision to use shared micromobility (Elmashhara et al. 2022). The perception of others' acceptance of the behavior could affect an individual's decision to use a shared e-bike or an e-scooter. A study of bicycles, in general, has shown that their use can be driven by someone's desire to belong to a particular social category, such as people who are perceived as being healthy and active (Parsha and Martens 2022). Associations with non-socially desirable groups can also deter the use of bikes, as in the case of e-bikes, which could be associated with aggressive and violent men (Parsha and Martens 2022). Moreover, shared e-bikes and e-scooters could be symbolically differently perceived because shared e-scooters are frequently used for hedonic purposes and by young men (Useche et al. 2022), whereas shared e-bikes are used more often for commuting and could complement existing public transport systems (Guidon et al. 2019). The difference in purposes creates different associations related to their adoption in the social environment.

Motivations and shared micromobility adoption

Considering the four possible motivations for the adoption of green innovations, which of the perceived advantages of shared micromobility entice consumers to adopt this mode of transport more quickly? Are functional motivations more important than social and hedonic motivations? Does environmental motivation play a role in the adoption of shared e-bikes and e-scooters, or are emotions more important? Are there interactions among these motivations and, if so, what types of interactions are significant? With these questions in mind, I present the second question that I aimed to answer:

To what extent can the decision to use shared e-bikes and e-scooters be linked to instrumental, environmental, hedonic, and social motivations, as well as to (some of) the interactions among these factors?

Research framework

This thesis examines five factors that could influence consumers' decisions to adopt shared micromobility. Figure 3 presents the framework of the thesis. It is a simplification of the complex relationships among the various factors that could be relevant in the decision to use shared micromobility. It is not the intention of the framework to illustrate the complexity of these relationships, but rather to serve as a guide for the articles included in this dissertation. Therefore, it should not be viewed as a measurement model.

The framework is based on the framework presented in the review article included in this thesis. In the review article, I presented four overarching groups that encompassed the factors that could predict green innovation adoption. These factors are social, personal, innovation, and context and externally related factors. In this thesis, personal factors are included in consumer innovativeness, social factors are incorporated in social motivations, and innovation-related factors are included in the instrumental, environmental, hedonic, and social motivations. Context and externally related factors were not examined in depth due to the dynamic changes in the regulations concerning shared micromobility, and because Denmark and Sweden are similar in terms of socio-demographic profiles to a great extent.

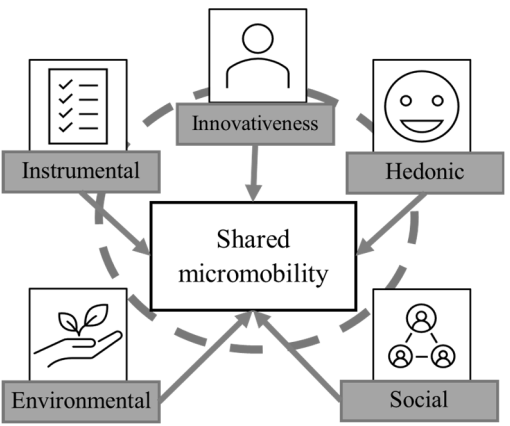

Figure 3 Thesis framework

In general, I propose that shared micromobility adoption – here explored in the case of shared e-bikes and e-scooters – could be predicted by consumer innovativeness and instrumental, environmental, hedonic, and social

motivations. In this framework, and in line with the first research question, I suggest that DSI has a significant effect on the decision to adopt shared micromobility. I follow previous studies that have embraced the view of consumer innovativeness as a consumer trait. Innovators make independent judgments about adoption decisions, and they do not rely on their social environment to obtain information about innovative products. However, I argue that it is more useful to investigate consumer innovativeness on a domain-specific level. Consumers are more likely to use innovations when they fall within their domain of interest. In this thesis, I examine the adoption of shared e-bikes and e-scooters via transport innovativeness and eco-innovativeness. Nevertheless, as discussed in the previous sections, DSI alone cannot predict adoption, as it can be influenced by how a consumer perceives an innovation. I adopt the stance that, aside from being innovative in the adoption of novel transport and green products, consumers are motivated to adopt shared e-bikes and e-scooters based on how they perceive the instrumental, environmental, hedonic, and social attributes of these shared modes of transport. However, consumer innovativeness and motivations are not distinct; as the broken line suggests, there is a constant interaction among these factors, which simultaneously affects consumers' decision-making processes.

Previous studies have shown that the four motivations – instrumental, environmental, social, and hedonic – are not distinct but are interdependent, and how innovativeness could be affected by environmental, social, and hedonic considerations. For example, in the existing literature, it has been argued that instrumental and symbolic motivations are related (Noppers et al. 2016; Schuitema et al. 2013). If we assume that the instrumental attributes of products align with a person's identity of being pragmatic or novel-seeking, the adoption intention of highly instrumental innovations becomes strongly linked to the symbolic motivation. Research has also revealed how instrumental motivation and hedonic motivations can be interrelated, in that hedonic motivation mediates the effect of instrumental motivation on the intention to adopt (Rezvani, Jansson, and Bengtsson 2018; Schuitema et al. 2013). In other cases, studies have also suggested that the consumption of green products affects the hedonic consumption experience (Tezer and Bodur 2020; Valor, Antonetti, and Carrero 2018; Venhoeven, Bolderdijk, and Steg 2020). This means that consumers may benefit from the hedonic value of green consumption due to their environmental motivation. The environmental attributes of products also allow people to communicate that they are pro-environmental to their social environment (social motivation) (White and

Sintov 2017). Thus, these factors are difficult to separate, and it would not be easy to ascertain which attribute truly drives adoption.

Although adoption could help to address environmental issues in the transport sector, higher adoption rates also come with a caveat. As adoption increases over time, the environmental impact of these innovations may plateau or become insignificant; thus, increased adoption would not lead to a substantial positive environmental impact, and it is possible that only firms and consumers would genuinely benefit from the innovation in the long term. Nevertheless, this provides more opportunities for further innovations and research to address this issue.

Adoption of shared micromobility

Overall, in this chapter, I discussed why the adoption of shared micromobility is complex given that it is not simply a curtailment or efficiency behavior, nor a daily behavior or an equipment adoption. I also presented the relevance of DSI and motivations pertaining to green innovations in the research. Specifically, DSI in shared micromobility adoption could be considered in terms of transport innovativeness and eco-innovativeness, while motivations could be examined via instrumental, environmental, hedonic, and social motivations. Finally, I provided an overview of the possible relationships among the relevant factors in the thesis framework.

Methods

This thesis employed both exploratory and descriptive research designs. Given the emergent nature of shared micromobility, the dissertation is exploratory to some extent, which means that several factors that were identified in the literature review were included and tested in the studies. It is also descriptive because it determines and tests the relationships among the identified factors and their relevance in the decision to use shared micromobility. Moreover, it is descriptive because it outlines possible differences between shared e-bikes and shared e-scooters, as well as between non-users and users. In the following sections, I present and discuss the methodological considerations; specifically, I explain why I decided to choose a deductive approach and to gather data via a literature review and two surveys. In addition, I discuss some methodological limitations.

Research approach

Empirical studies have examined the adoption of green innovations using various theories; these theories have respective advantages and disadvantages. The decision to use consumer innovativeness as the central concept in this research was due to its prominence in the innovation adoption literature. Nonetheless, studies have indicated that it is more beneficial to examine innovativeness on a domain-specific level rather than on an innate level (Bartels and Reinders 2011; Chao, Reid, and Mavondo 2012).

Research on the diffusion of innovations and consumer innovativeness has been on-going for several decades. Therefore, many researchers have proposed and tested several models and variables to explain consumers' adoption of innovations. Although many of these models suffer from theoretical and measurement problems (Bartels and Reinders 2011; Roehrich 2004), scholars have nevertheless applied, extended, and revised them in order to address their limitations and disadvantages. This research attempted to overcome these

models' common drawbacks by integrating several perspectives, particularly influenced by the motivated consumer innovativeness concept developed by Vandecasteele and Geuens (2010), in which different scales, such as functional innovativeness and hedonic innovativeness, were established to measure consumer innovativeness.

In line with this, I employed a deductive approach, which means that I began by examining different measures of consumer innovativeness on a domain-specific level, as well as other variables, including emotions, values, and identity, that could drive green innovation adoption. I then decided which of these could be relevant to my research, and conducted surveys to gather data. By using a deductive approach, I am aware that I am accepting the assumptions, albeit critically, of consumer innovativeness, as well as the other examined variables and the theories that led to them. I also understand that these concepts could suffer from some theoretical problems and limitations. Nevertheless, by following the categorizations of motivations of innovation adoption according to four dimensions – instrumental, environment, hedonic, and social – I can contribute to both theory and practice in a more straightforward and more practical manner, as opposed to generating new concepts and theories, as is usually done in inductive research (Woiceshyn and Daellenbach 2018).

Research design

I conducted a literature review and two surveys to collect empirical data for this compilation thesis. In the first paper, a systematic literature review was conducted to identify the relevant factors that influenced consumers' decisions to adopt green innovations. The two surveys were conducted to test the relationships among the relevant factors that were identified in the literature review and the adoption of shared electric micromobility.

Literature review

The purpose of the literature review was to identify the determinants of green innovation adoption across various behavioral consumer domains. The literature review provided an overview of the theories and variables that have been examined in green innovation adoption. This overview allowed for the selection of consumer innovativeness and motivations as the central concepts

in this thesis. Using the steps recommended by Paul and Criado (2020) concerning how to conduct a systematic literature review, my co-author and I determined the relevant papers to be included. Figure 4 outlines the steps that were followed. In total, forty-seven articles were included in the review, encompassing at least five industries and nineteen green innovations.

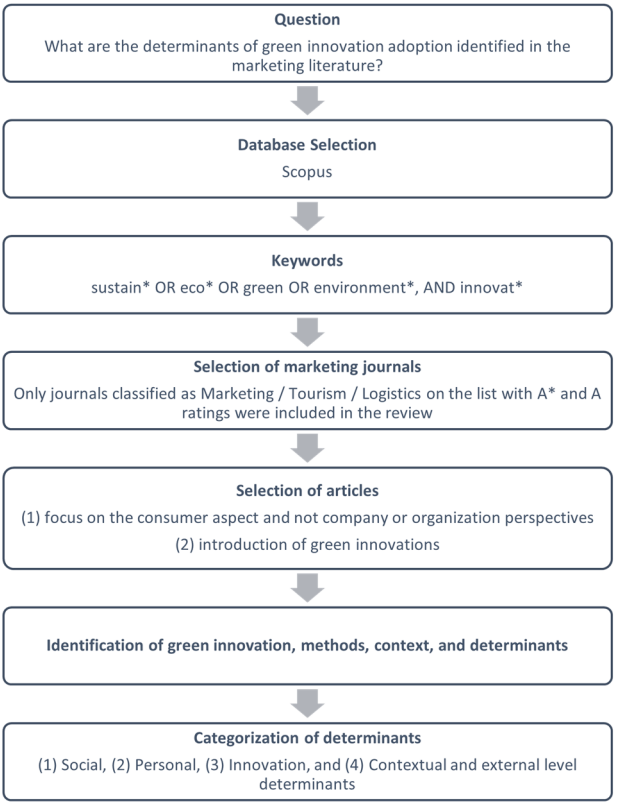

Figure 4 Steps in the systematic literature review

Selection of database, keywords, and journals

My co-author and I decided to use Scopus because it captures more articles than does the Web of Science (Paul and Criado 2020); we used the keywords sustain* OR eco* OR green OR environment*, AND innovat* to identify the articles. The first set of words referred to common terms to indicate being green, and the second limiting term, innovat*, aimed to capture articles

addressing innovations. The terms were reduced to sustain* to include articles that mentioned sustainable and sustainability, eco* for eco-innovation(s) and ecological, environment* for environment and environmental, and innovat* for innovation(s) and innovative. As the focus was on marketing, we limited the results to marketing journals, and used the 2019 journal classification of the Australian Business Dean Council. Only journals that were classified as Marketing/Tourism/Logistics on the list with A* and A ratings were included in the review. Finally, we only included articles that were published during the last decade (between 2010 and July 2021), as research has shown that the increase in studies regarding green innovations began in this period (Oduro, Maccario, and De Nisco 2021).

Selection of articles

We applied two main criteria to select the articles to be reviewed:

(1) a focus on the consumer aspect and not on company or organizational perspectives, and

(2) the introduction of green innovations.

The main consideration for the decision about whether to consider a green product as an innovation was made by identifying whether the article presented the product or parts of the product as an innovation. Based on these criteria, a total of forty-seven articles were included in the final review.

Identification and categorization of determinants

The next step was to identify the green innovations that these studies explored, the methods that they employed, the contexts and, finally, the determinants that they used. Given the vast range of determinants, after a thorough investigation of the topics, we decided to group them according to four categories depending on the source of the motivation to adopt green innovations. These groups were (1) social, (2) personal, (3) innovation, and (4) contextual and external level determinants, or the SPICe determinants. The main consideration was then the degree to which the determinants were related to the social, personal, and environmental factors surrounding the consumer, as well as the attributes of the green innovations.

Surveys

Two surveys in the form of online questionnaires were conducted via a market research organization to gather the data for this thesis. The questionnaires can be found in Appendix Survey 1 and Survey 2. A survey design "provides a quantitative description of trends, attitudes, and opinions of a population, or tests for associations among variables of a population" (Creswell and Creswell 2018, 147). Surveys are tools that researchers use to answer the questions that they ask in their research problems. This method involves systematic observations or interviews, which often provide respondents with pre-determined answers based on theory (Sapsford 2007). An advantage of surveys is that they provide researchers with standardization to obtain consistent answers to the same questions (Sapsford 2007).

Surveys are suitable for establishing correlations (Kardes 1996). Because the main purpose of this thesis is to identify and compare the relevance of consumer innovativeness and various motivations in the decision to adopt two comparable green innovations, surveys were used to establish correlations among the variables. Although causal inferences could also be conjectured due to the internal nature of the factors as traits and motivations, causality could not be established via the surveys.

The questionnaire surveys in this thesis were cross-sectional. Cross-sectional surveys are collected at a single point in time (Creswell and Creswell 2018). I chose the survey research design because the literature review indicated that there were numerous existing studies examining green innovation adoption; these studies cited the most frequent factors influencing consumers' decisions to adopt novel green products. In addition, much of the current research involving green product use has employed surveys to question the respondents about their perceptions and motivations. Therefore, I followed the methods used in previous research to make my results easier to compare to and contrast with other findings.

Surveys also permit researchers to collect more data points and to include more variables in their studies, which could help to refine existing theories and to understand the relationships among these variables. Since this research aimed to contribute to a clearer understanding of green innovation adoption by determining patterns of association among psychological factors, it was relevant to include as many significant variables and to make the surveys as comprehensive as possible. By focusing on diverse yet specific variables and their relationship with the decision to adopt a nascent and green transport

option, micromobility in this case, the survey research design used in this thesis allowed for the provision of an overview of possible motivations for green innovation adoption. At the same time, the thesis results are specific, as they are more concerned with the comparison of two comparable yet differently perceived green innovations.

As is the case with any other research method, surveys, specifically those conducted online, have advantages and disadvantages compared to those conducted in person. On one hand, online surveys are less expensive, more time-efficient, and are more environmentally friendly than are pen-and-paper surveys. Online surveys also ensure that there is no bias in selecting survey participants, as the participants are chosen randomly (Evans and Mathur 2005). However, the concern regarding the sample's access to the internet to participate in the online survey is present (Evans and Mathur 2005). Nonetheless, because the surveys were conducted in Sweden and Denmark, where there are high internet penetration rates (93% and 97%, respectively; Statista 2018), this was not a significant issue in this thesis. Furthermore, although a web-based survey limits the respondents to internet users, this was not a problem because the research pertained to innovations in transport. Shared micromobility is a transport mode that is predominantly based on access to online applications; thus, commuters who can avail themselves of the service have a smartphone and an internet connection, and questions concerning access to shared micromobility were not emphasized in this thesis.

The first questionnaire survey used in Papers 2 and 3 was conducted in Sweden and Denmark because shared micromobility was first introduced in Scandinavia in these countries (Wachunas 2019). The survey took place between February and March 2020. In total, 1501 respondents participated in the survey, and were grouped according to non-users (n = 515), shared e-bike users (n = 400), and shared e-scooter users (n = 586) based on whether they had used shared micromobility in the previous year and which form they had used more often.

The first survey consisted of four parts. In the first part, the participants were asked if they had used shared e-bikes and e-scooters. They were then asked about their travel behavior, such as the mode of transport that they used for their daily commutes and the extent to which they used their cars and bicycles. The second part, which was adapted from the study by Noppers, Kiezer, Milovanovic, and Steg (2015), asked about how the participants saw themselves in terms of transport DSI. The categorization ranged from following new technological developments in transport and daring to take risks

and trying new things to being traditional and not wanting to have much involvement with innovative transport products. This question enabled the categorization of the participants ranging from laggards to innovators in the transport domain. Those who had not used shared e-bikes or e-scooters were also questioned about the reasons for not trying these mobility modes. Those who had used these modes were asked which apps they used for shared micromobility, the purpose of their trips, and what transport mode they would have used if they did not have access to shared micromobility. The third part of the survey queried the environmental motivations of the participants based on how green the participants perceived shared e-bikes and e-scooters to be. The questions were adapted from Noppers et al.'s (2016) study of the adoption of smart energy systems. The third part also contained other measures related to environmental motivations, such as environmental knowledge, adapted from Bamberg, Hunecke, and Blöbaum (2007), biospheric values taken from Bouman, Steg, and Kiers (2018), the ascription of responsibility questions derived from Rezvani, Jansson, and Bengtsson (2017), pro-environmental attitudes adopted from Jansson, Nordlund, and Westin (2017), and positive and negative emotions derived from Bouman, Steg, and Kiers (2018). The final part asked about the socio-demographic characteristics of those who took the survey, such as whether they had a driver's license, their age, sex, highest educational attainment, employment status, and income. Only users were included in Paper 3, and only 400 randomly selected e-scooter user data points were analyzed. The reason for the exclusion of the other data points was simply to ensure that the groups had the same sample size. In hindsight, the results would have been more conclusive had I included all the data points in the analysis. Nevertheless, this drawback does not undermine the results of the paper, as the sample size is sufficiently large to draw reliable conclusions according to existing usability studies or those that examine users' experiences of products (Sauro and Lewis 2012).

The second survey for the fourth and fifth papers was conducted in Sweden. The focus on Sweden was aimed to eliminate country-related factors that could affect the interpretation of the results. The online panel survey about shared e-bikes and e-scooters was conducted in June 2022. In total, 1378 people answered the survey, of whom 1001 were non-users, and 377 were users of shared e-bikes and shared e-scooters. Among the users, fifty-eight had used shared e-bikes, 243 had tried shared e-scooters, and seventy-six had taken trips using both transport modes.

The survey consisted of four parts. In the first part, the participants were asked if they had used shared e-bikes and e-scooters. The question allowed for the grouping of the participants according to use: (1) non-users, (2) shared e-bike users, (3) shared e-scooter users, and (4) shared e-bike and e-scooter users. Users of both microvehicles were asked which transport mode they had used more frequently. Subsequently, they were randomly assigned questions about either vehicle. Thus, the analysis comparing users and non-users was based on 1001 non-users and 377 users, 280 of whom answered questions about shared e-scooters, and ninety-seven of whom were asked about shared e-bikes.

The second part of the survey was used to identify the participants' travel behavior, while the third part concerned the participants' DSI. The users were asked about the purpose of their trips and what transport mode they would have chosen if they had not had access to a shared e-bike or an e-scooter. Both users and non-users were asked to answer a question about their likelihood of using shared micromobility for specific trips and their preferred travel mode; they were asked to compare how shared e-bikes or e-scooters ranked in comparison to their preferred travel modes for the important trip dimensions outlined in the transport literature. The participants were then asked about their consumer innovativeness in the domains of transport and green products. The questions were adapted from the studies pertaining to DSI by Goldsmith, Freiden, and Eastman (1995) and Gurtner and Soyez (2016).

The third part of the survey included questions about instrumental, environmental, hedonic, and symbolic motivations for using shared e-bikes and e-scooters. The questions were randomized. The instrumental motivation questions were based on the important trip dimensions identified in the transport studies. The environmental motivation questions were adapted from Noppers et al. (2016), the same set as the first survey; the symbolic motivation questions were also taken from this study. The hedonic motivation items were derived from Kopplin, Brand, and Reichenberger (2021) in their paper about consumers' acceptance of shared e-scooters. Finally, the fourth part contained questions about the congruence of shared e-bike or e-scooter use with the participants' actual and ideal selves. The statements that reflected congruence were adapted from Helgeson and Supphellen (2004). The participants were asked about the self-expressive involvement of shared micromobility based on Noppers et al. (2015) and Fitzmaurice (2005). They were then asked about their likelihood of recommending, continuing to use, and saying positive things about shared e-bikes and e-scooters; the questions were based on Cowart, Fox, and Wilson's (2008) article about the application of approach and avoidance

frameworks for new products. In addition, the participants were asked to respond to statements that reflected their likelihood of consuming a product due to the status it conferred, which were adapted from Goldsmith et al. (1995). Following this, the participants were asked to answer questions about their green identity (Barbarossa and De Pelsmacker 2016), hedonic-seeking identity (Barbarossa and De Pelsmacker 2016; Bouman, Steg, and Kiers 2018), and rational identity (Barbarossa and De Pelsmacker 2016; Voss, Spangenberg, and Grohmann 2003). Lastly, they were asked about their subjective knowledge of shared e-bikes and e-scooters (Flynn, Goldsmith, and Pollitte 2016; Tajdini 2021). The socio-demographic characteristics of the participants, such as age and gender, were provided by the market research company.

Some variables in the survey, such as DSI in transport, were measured differently in the two surveys. The main motivation for this was that, in the first survey, the participants self-selected from among the five types of adopters of innovations. Although this made the analysis more straightforward, the measure was only based on a single measure. Therefore, to examine DSI in a more objective and reliable manner, multiple items were adopted from other studies.

An important aspect of the two surveys that were conducted is that they included users of shared e-bikes and e-scooters. Unlike most of the studies that have examined motivations in the adoption of shared microvehicles, these answers were based on "actual" use and not only on the "intention" to use (Elmashhara et al. 2022). By doing so, the thesis addresses the intention-behavior gap, which has become a prevalent issue that has been identified in the literature on green consumer behavior.

Analysis of the data

I used several statistical analyses to test the relationship of innovativeness and various motivations for the decision to use shared micromobility. Table 3 summarizes the data collection and the analysis methods that I used in my papers.

Table 3 Methods and data analyses in the papers

	Paper 1	Paper 2	Paper 3	Paper 4	Paper 5
Data collection method	A relevant literature search using keywords	Survey	Survey	Survey	Survey
Data analysis	Systematic literature review	Regression analysis, t-test, ANOVA	Structural equation modeling	Structural equation modeling, multigroup analysis, t-test	Regression analysis, t-test

As outlined previously, in Paper 1, I conducted a systematic literature review using relevant keywords. In Paper 2, using SPSS, my co-author and I applied Linear and Multiple Logistic Regressions, t-tests, and an Analysis of Variance (ANOVA) to achieve the paper's objectives, which were (1) to determine how green consumers perceived shared e-bikes and e-scooters and how transport innovativeness influenced shared micromobility adoption, and (2) to analyze the relationships among green perceptions and other factors that we referred to as environmental referent cognitions — biospheric values, environmental knowledge, ascription of responsibility, and environmental attitudes. To attain the first objective, the relationships among green perceptions, transport innovativeness, and shared micromobility use, a logistic regression analysis was applied due to the dependent variable being categorical (Pallant 2016); in this case, use or non-use. A multiple logistic regression was applied to test the relationships among the environmental referent cognitions and green perceptions. This form of analysis is appropriate when the dependent variable is continuous (Pallant 2016), which is the case for green perceptions of shared e-bikes and e-scooters. Finally, we used ANOVA and t-tests to assess and compare the innovativeness and green perceptions of non-users, shared e-bike users, and shared e-scooter users. These tests are used to check for significant differences between and among groups (Pallant 2016), such as groups based on gender and income, or based on transport innovativeness.

The focus in Paper 3 was on determining the decision-making route relating to hedonic and environmental motivation in the adoption of shared e-bikes and e-scooters. It also aimed to determine the effect of transport innovativeness on emotions and of green identity on environmental motivations. In this paper, a confirmatory factor analysis (CFA) with AMOS 25.0 applying a maximum

likelihood estimation was used to test four measurement models to compare the decision-making processes related to the hedonic and environmental motivations involved in the adoption of shared e-bikes and e-scooters. I assessed several indices to assess which of the four models provided a better fit for the data.

In Paper 4, I examined the relationship of eco-innovativeness and motivations in the adoption of shared e-bikes and e-scooters. Furthermore, I determined the impact of these factors on the behavioral intentions of users. I used structural equation modeling in AMOS 28.0 to examine these relationships. In addition, I used a multigroup analysis to investigate the robustness of the behavioral intention model. Finally, I applied t-tests to assess and compare the mean results between different groups (users versus non-users, and shared e-bike versus e-scooter users).

Logistic and linear regressions were conducted to analyze the data in Paper 5. In this paper, I determined the relevance of self-expressive involvement (SEI; the product reflects the self-image) and self-congruency (SC; the product image is aligned with the ideal self-image), and consumer identities of being green, fun seeking, and rational in shared micromobility use. Furthermore, I identified how SEI, SC, and identities were related to the likelihood of continuing to use and to recommend shared microvehicles. I used a logistic regression to determine whether ideal SC, SEI, green identity, hedonic-seeking identity, and rational identity were significantly related to the decision to use shared micromobility. I then conducted linear regression analyses to test the relationship among SC, SEI, identities, and the likelihood of continuing to use and recommend shared e-bikes or e-scooters. Age and gender served as control variables in the regressions.

Methodological limitations and future analysis

It should be noted that the surveys applied quota sampling and did not consider market aggregates. Therefore, they are not representative samples of the market. In addition, given the length and comprehensiveness of my surveys, I still have numerous data points to analyze, which have not been included in the papers. For example, I have not yet outlined the potential reasons for not using shared micromobility. I have also not examined other potential relationships, such as how subjective knowledge could moderate the

relationship between innovativeness and use. Nevertheless, the analyses that I have conducted thus far are sufficient to help to understand consumers' motivations for adopting green innovations, particularly shared e-bikes and e-scooters. Furthermore, I have included other descriptive analyses, such as the purpose of the trips and their development over time, in the results section.

Although the papers rely solely on cross-sectional data and the survey simply provides correlational data, the method allowed for the inclusion of various relevant factors and showed that shared micromobility providers should not only consider socio-demographic data to profile their consumers. Nevertheless, the lack of causality implies that the results should be interpreted with caution.

The papers and the results

This compilation thesis is composed of five papers that can be found after the concluding chapter. This section summarizes the important findings in the papers that I wrote to address the different objectives of the thesis concerning the relevance of consumer innovativeness and motivations for the use of shared e-bikes and e-scooters. The statistical figures in the results are mainly outlined in the papers to facilitate easier reading. The figures shown in the subsequent sections are either those that were not included in the papers or that were presented to highlight comparisons.

Paper 1 is part of a special issue of the *International Journal of Consumer Studies* "Systematic Literature Reviews in Consumer Studies." It reviewed the existing literature regarding green innovation consumer adoption studies. Paper 2, which was published in the *Journal of Consumer Behaviour*, identified how shared micromobility users perceived the greenness of shared e-bikes and e-scooters, and how transport innovativeness affected their adoption of these modes of transport. The paper also analyzed the relationships among green perceptions, values, knowledge, attitudes, and ascription of responsibility. Paper 3, which was published in the *Journal of Marketing Management*, determined the decision-making route relating to the hedonic and environmental motivations for the adoption of shared e-bikes and e-scooters and showed how two similar green innovations could motivate consumers differently. Paper 4, a version of which was accepted and presented at the Australian and New Zealand Marketing Academy Conference 2022 in Perth, Australia, examined the relevance of eco-innovativeness in the adoption of shared e-bikes and e-scooters, and determined the role of instrumental, environmental, hedonic, and symbolic motivations in their use, as well as the users' behavioral intentions. Finally, Paper 5 focused on the significance of social motivations and consumer identities in the use of shared micromobility. The paper has been accepted as an oral presentation at the European Marketing Academy Conference 2023 in Odense, Denmark. Table 4 illustrates the contribution of each paper to answering the research questions in this thesis.

Table 4 Summary of the papers' contributions to the research questions

Research Questions	Paper 1	Paper 2	Paper 3	Paper 4	Paper 5
RQ1: Can a product belong to more than one domain, and are transport DSI and eco-innovativeness significantly related to the use of shared e-bikes and e-scooters?					
Transport DSI	X	X	X		
Eco-innovativeness				X	
RQ2: To what extent can the decision to use shared e-bikes and e-scooters be linked to instrumental, environmental, hedonic, and social motivations, as well as to (some of) the interactions among these factors?					
Instrumental	X			X	
Environmental	X	X	X	X	
Hedonic	X		X	X	
Social	X		X	X	X

Results

One of the novel aspects of this thesis is the examination of green transport innovations to reveal how two similar green innovations can motivate consumers differently. Of note, this thesis demonstrates that products are not limited to one specific domain, and that consumers' motivations for innovation adoption extend beyond the intended benefits of the innovation. The thesis also presents how emergent technologies could develop, as well as the factors that are important in their diffusion. Furthermore, this thesis goes beyond the use intention by showing that innovativeness and motivations are relevant in the "actual" use of green innovations. The thesis results are based on two online survey questionnaires with non-users and users of shared e-bikes or e-scooters. The first survey was conducted in Denmark and Sweden, while the second only included participants residing in Sweden.

Descriptives, trip purpose, and alternatives

The socio-demographic characteristics of the participants and their use status are presented in Table 5. In both surveys, the majority of the participants were female (about 52%), and were non-users. The second survey also differentiated between those who had only used shared e-bikes or e-scooters and those who had used both. Notably, the first survey had a larger proportion of shared e-bike users (26.65% versus 4.21%). This could be attributed to the duration of the data collection. The first survey was completed within two months, while the second was completed within a month due to the project's deadlines. The first survey had several extensions in order to include more shared e-bike users. Furthermore, to compensate for the lack of shared e-bike user participants in the second survey, it was decided to include more non-users because shared e-scooter users were not available. Another important point of comparison is age. The first survey had younger participants, the majority of whom were younger than 40 (52.63%), while most of the participants in the second survey were older than 40 (57.19%). This could also help to explain the difference in the proportion of users and non-users in the two surveys.

Table 5 Socio-demographic characteristics and participant adoption in the two surveys

	Survey 1 (n = 1501) (in %)	**Survey 2 (n = 1378) (in %)**
Gender		
Female	52.17	51.96
Male	47.83	48.04
Age		
16-30	31.91	22.86
30-39	20.72	19.96
40-49	18.79	15.17
> 50	28.58	42.02
Users		
Non-users	34.31	72.64
Shared e-bike	26.65	4.21
Shared e-scooter	39.04	17.63
Shared e-scooter and e-bike users	-	5.52

Table 6 outlines the purposes of the users' most recent trips. Note that, in the first survey, only regular users or those who used a shared e-bike and e-scooter at least once a week were asked this question. Because of this limitation, drawing conclusions about the general population of users is challenging. Furthermore, some of the options in the surveys differed; for example, the exclusion of "to get to a car park" and the inclusion of "to get to/from parties, clubs, or restaurants" in the second survey, and the distinction between shopping for fun and for necessities in the second survey. Nevertheless, it is still possible to obtain insights from these results. First, it can be observed that the most frequently cited purpose of the trips taken using shared e-scooters in 2020 was to get to the nearest public transport stop (30.65%), followed by trips to or from work or to the place of study (24.19%). This trend was also reflected in the second survey in 2022, in which over 26% of the participants claimed that they had used shared e-scooters to go to or leave their workplace or school/university, while 19% said that they had used shared microvehicles to get to a bus, train, or other public transport station. From this, we can deduce that a significant portion of regular shared e-scooter users took functional trips. Compared to the overall results for the users in 2022, the most frequently cited purposes for trips involved fun activities, such as going to clubs and parties (34.69%), and just for leisure and fun (21.40%). Therefore, it is likely that, once users become accustomed to using shared e-scooters, they think more about the transport mode as something that could be used to replace the transport mode used for commuting.

In the first survey, regular users of shared e-bike used the transport option for functional trips, such as get to work and to their place of study (31.58%), and to get to public transport stations (21.05%). However, in the second survey, there was an even distribution of transport to work or to study and trips for leisure and fun. However, this comparison should be considered carefully because there were only two regular users of shared e-bikes in the second survey compared to thirty-eight in the first. The lack of regular users in the second survey could be attributed to the question mentioning the providers Lime and Citybike, as they were the main shared e-bike providers in Sweden at the time of the survey. Overall, presenting the purpose of the trips provides valuable insights regarding the types of trips for which these shared microvehicles are used and how the types of trips have changed since microvehicles were introduced. More importantly, it could help to explain the similarities and differences in the results of the papers in this thesis.

Table 6 Purpose of the most recent trip

Purpose	Shared e-scooters			Shared e-bikes		
	2020* (n = 62)	2022 (n = 280)	2022* (n = 27)	2020* (n = 38)	2022 (n = 97)	2022* (n = 2)
Transport to/from work/studies	24.19	14.76	26.63	31.58	26.56	50.00
Just for leisure and fun	17.74	21.40	11.11	10.53	31.25	50.00
To get to/from parties, clubs, or restaurants	n.a.	34.69	22.22	n.a.	6.25	/
To get to the nearest public transport stop	30.65	11.81	18.52	21.05	15.63	/
To shop	9.68	7.01	18.52	13.16	10.94	/
Other	14.52	5.54	/	7.89	3.13	/
To shop for fun	n.a.	4.80	/	n.a.	6.25	/
To get to a car park	3.23	n.a.	n.a.	15.78	n.a.	n.a.

*Purpose of the most recent trip for those who had used an e-bike or e-scooter at least once a week in the past year.

In the first survey, the regular users of shared micromobility were asked which transport mode they would choose if the shared e-bike or e-scooters were not available. As Figure 5 illustrates, 33% would choose public transport, followed by walking (27%) and using their own bicycles (19%). Only 9% would take their cars. These results suggest that shared micromobility does not replace car trips but does replace other low-emission transport modes, which is in line with the results in previous studies (Gössling 2020; Guidon et al. 2019; Laa and Leth 2020; Lee et al. 2021; Reck et al. 2021). This trend continued in the second survey, as shown in Figure 6, as walking and public transport remained the alternative transport modes for users of shared e-bikes and e-scooters if shared micromobility was not available. From this point of view, it would be difficult to justify the greenness of shared micromobility because it does not point to the replacement of car trips. However, the results suggest that it could complement public transport options and could serve as first-and-last mile trips.

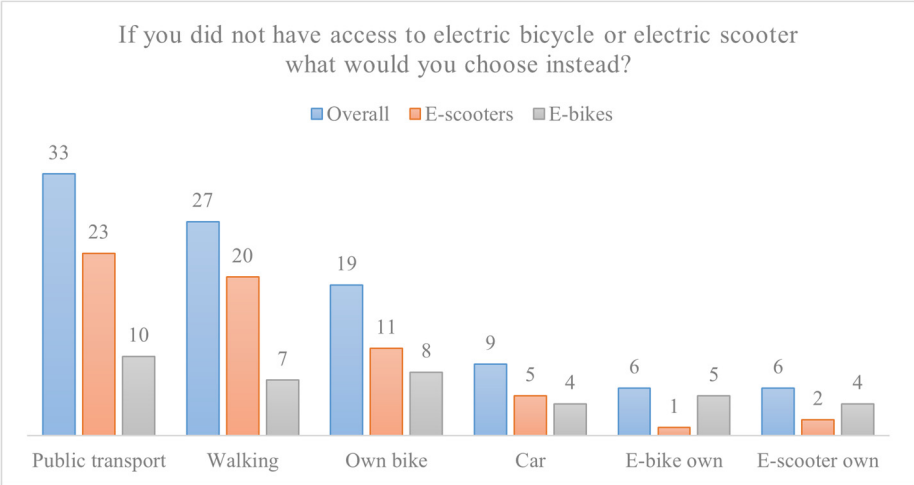

Figure 5 Alternative transport mode if shared micromobility were not available in the first survey in terms of the number of respondents

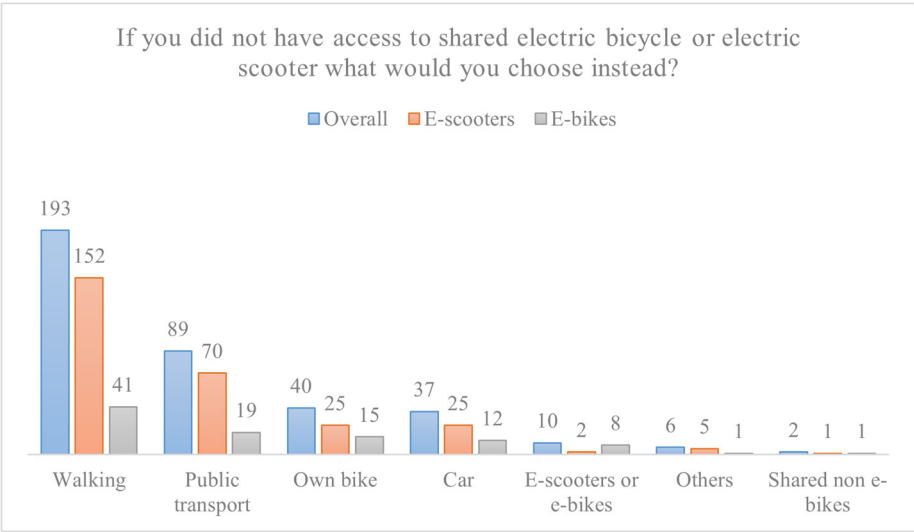

Figure 6 Alternative transport mode if shared micromobility were not available in the second survey in terms of the number of respondents

Results of the papers

The results of Paper 1 provided an overview of the current knowledge about green innovation adoption in the marketing literature. It revealed the lack of focus on the consumer aspect of green innovation adoption and highlighted the need for more studies of consumers' motivations to adopt these new environmental products. It also provided evidence that no single determinant could predict the adoption of green innovations. Consequently, this thesis focuses on different types of consumer innovativeness and various motivations that could help to predict the adoption of shared micromobility. The paper also showed that different types of green innovations elicited different consumer reactions, and therefore required different considerations. In this thesis, I investigated two seemingly comparable green transport innovations, namely shared e-bikes and e-scooters.

In line with one of the proposed research agendas in Paper 1, which was to examine the relevance of consumer innovativeness in predicting green innovation adoption more closely and to investigate the various factors involved in the adoption decision-making process, the subsequent papers address the relationship of transport innovativeness, eco-innovativeness, instrumental motivations, environmental motivations, hedonic motivations, social motivations, and the use of shared micromobility.

Domain-specific innovativeness

According to Rogers (2003), only 2.5%, 13.5%, and 34% of consumers should belong to the innovators group, the early adopters group, and the early majority group, respectively. The results in Paper 2 showed the distribution of adopters based on the categorization of transport innovativeness and revealed that about 84% of the users of shared e-bikes or e-scooters considered themselves to be innovators, early adopters, or part of the early majority of adopters of innovations in transport. By comparison, almost 50% of the non-users considered themselves to be either part of the late majority or a traditionalist group. This descriptive argument indicated that the self-classified adopters of shared e-bikes and e-scooters were early users of innovations in the transport sector; that is, they belonged to the first half of the general adoption curve in the transport domain. This result supports the argument that the sharing of e-bikes and e-scooters could be regarded as something innovative.

Based on the users' and non-users' responses to transport innovativeness in Paper 2, there was a significant difference between the innovativeness of non-

users and users. A closer examination revealed a significant difference in the transport innovativeness of non-users, shared e-bike users, and shared e-scooter users. However, no significant difference in transport innovativeness between shared e-bike and e-scooter users was found. These findings are interesting because the sharing of e-scooters is more recent than is the sharing of e-bikes, despite previous literature showing that users of newer technologies are assumed to be more receptive to the adoption of novel products (Hwang, Kim, and Lee 2021; Truong 2013). Furthermore, although shared e-scooter users were younger than were shared e-bike users and should therefore be more innovative than those belonging to older age groups (Lambert-Pandraud and Laurent 2010), they were not more innovative based on the results. This indicates that age is insufficient to explain the differences in the use of shared e-bikes and e-scooters, and is in line with the argument that younger people are not always more innovative than their older counterparts (Vandecasteele and Geuens 2010).

In Paper 4, based on the user and non-user responses to the eco-innovativeness scale, the results revealed a significant difference between the eco-innovativeness of the two groups. However, no significant differences in the degree of eco-innovativeness between shared e-bike and e-scooter users could be determined. In the second survey, questions about transport innovativeness and eco-innovativeness were asked. The decision to focus on eco-innovativeness in Paper 4 was because the original measures were used to test eco-innovativeness, while the measures for transport innovativeness were only adapted from the eco-innovativeness questions. As the measures for eco-innovativeness and transport innovativeness were loaded as one factor in the exploratory factor analysis, problems related to the validities of the constructs would arise when combined in an analysis. Nevertheless, the means for the users and the non-users were compared to check whether there was a significant difference in their transport innovativeness. Users were more transport innovative than were non-users ($t = -16.025$, $df = 684.684$, $p < .001$). With regard to the shared e-bike and e-scooter users, there was no evidence supporting a variation in the level of their transport innovativeness ($t = .063$, $df = 95.016$, $p = .950$). These results are congruent with the results of Paper 2, in which there were no significant differences between the two groups. This congruency could indicate that the diffusion of shared e-bikes and e-scooters has not yet reached its peak, as supported by the projected growth in sales and the increased number of users in the coming years. This could also imply that the late adopters had not yet used this mode of transport, or that transport

innovators were still using the shared microvehicles because there were still significant differences in the innovativeness of the users and the non-users.

Combined, the results of Papers 2 and 4 suggested that users were more transport innovative and eco-innovative than were non-users. More notably, the results of the papers also demonstrated that both transport innovativeness and eco-innovativeness were significant predictors of shared micromobility adoption, in line with previous studies showing the relevance of consumer innovativeness in the intention to adopt green innovations (Gurtner and Soyez 2016; Li et al. 2021).

Instrumental motivations

Instrumental motivations were measured in the second survey, as presented in Paper 4. As expected, instrumental motivations, in terms of efficiency and making places accessible, were relevant in the decision to use shared micromobility. This supports studies that have shown the importance of functional aspects in the adoption of ride-sharing services (Arteaga-Sánchez et al. 2020) and pro-environmental products (Barbarossa and De Pelsmacker 2016; Sopha and Klöckner 2011).

A comparison of the instrumental motivation mean scores for non-users and users revealed that the users were more aware of the functional benefits of shared micromobility than were non-users. This could mean that, despite the infrastructure provided for microvehicles in Sweden, shared e-bikes and e-scooters are still not viewed as efficient modes of transport by those who do not use them. Another possible reason for this difference is that non-users could be people who do not live, work, or study in areas in which shared e-bikes and e-scooters are easily accessible.

However, no significant difference in the instrumental motivations between shared e-bike and e-scooter users could be determined. This result suggests that shared e-bikes and e-scooters could serve as alternatives, and could therefore be in competition. Nonetheless, it is worth considering that the use of shared e-bikes and e-scooters may require different skills on the part of their users. Therefore, only providing one alternative may hinder some individuals from using shared micromobility. However, although instrumental motivation could predict shared micromobility use, the significance of rational identity could not be established in Paper 5. This suggests that, despite being partly rationally motivated to use shared e-bikes and e-scooters, being rational alone is not sufficient to motivate an individual to use shared microvehicles.

Environmental motivations

Environmental motivations are related to the perceived environmental benefits of shared e-bike and e-scooter use. Even though shared micromobility is promoted as a green transport mode, the results of the papers only provided partial support for the positive effect of environmental motivations. Paper 2 showed a positive effect of environmental motivations regarding the use of shared micromobility, but Paper 4 revealed that environmental motivations had a significantly negative effect on decisions related to use.

The positive influence of environmental motivations could be linked to the green identities of the users, which may justify their use of shared micromobility either through perceiving the transport innovation as being green or by only using products that they consider to be green; in this case, shared e-bikes and e-scooters. In fact, Paper 3 corroborated that green identity was related to shared e-bike users' environmental motivations, as also shown in other green innovations, such as the adoption of bio-plastics (Confente, Scarpi, and Russo 2020) and alternative fuel vehicles (Potoglou et al. 2020).

Of interest, Paper 3 also demonstrated the lack of a significant relationship between green identity and environmental motivations among shared e-scooter users. This finding may be attributed to issues related to the environmental impact of these microvehicles (Gössling 2020; Hollingsworth, Copeland, and Johnson 2019). Due to the skepticism regarding the green attributes of shared e-scooters, users may find it difficult to justify their use based on their green identity. This could also have been the reason for the negative impact of environmental motivations in Paper 4. Nonetheless, a more plausible explanation for this adverse effect is that, when consumers evaluate products, strong environmental attributes could signal a reduced functional capacity of the products (Lin and Chang 2012). Paper 4 showed that the instrumental and hedonic motivations of non-users were relatively low compared to their environmental motivations. Therefore, despite perceiving shared micromobility as being green, they were not motivated to use it because they did not consider its use to be enjoyable and functional. In relation to this, the results of Paper 5, which included hedonic and rational identities, did not support the relevance of green identity in the decision to use shared e-bikes and e-scooters. Thus, environmental motivations and green identities become less significant when other factors are considered in the decision to use shared e-bikes and e-scooters.

When comparing users and non-users, there was a significant difference in their environmental motivations. Paper 2 showed that the environmental motivations of non-users, shared e-bike users, and shared e-scooter users differed. In general, users perceived shared e-bikes and e-scooters as being green, whereas non-users did not. Among the users, there was also a significant difference between the environmental motivations of shared e-bike and shared e-scooter users. Although both user groups perceived their respective shared microvehicles as being green, the perceived greenness of shared e-bikes was considered to be higher by shared e-bike users than was the perceived greenness of shared e-scooters by shared e-scooter users. Paper 4 also compared the environmental motivations of non-users and users, and revealed that there was a significant difference in the environmental motivations of the two groups. However, Paper 4 showed that there were no significant differences in the environmental motivations of shared e-bike and e-scooter users. The result could be explained by the time gap between the two surveys.

As shared e-scooters have recently witnessed increased life cycles due to improvements in the batteries and durability of the devices, as well as increased regulations in their use, an increased green perception among users could have developed over time. Shared e-scooter users could also have become more familiar with e-scooters and have had the time to evaluate the environmental benefits of using shared e-scooters, specifically in comparison to cars, thus decreasing prior differences in environmental motivations. In fact, experience has been demonstrated to influence the evaluation of product performance (Pickett-Baker and Ozaki 2008). Among the regular users of shared e-scooters, we can also see that the purpose of the trips changed to become more utilitarian in nature, as indicated in Table 6. Another theoretical reason could be that information processing with regard to high-technology products in new contexts, such as in shared e-scooters, is complex (Lee, Ha, and Widdows 2011). Because of this complexity, during the introduction of shared e-scooters, users could have been hesitant to deliberate about the environmental aspects of the transport option. On a more optimistic note, marketers of shared e-scooters could have convinced users that the use of the microvehicles was green.

Other related results in Paper 2 indicated that environmental knowledge and pro-environmental attitudes were significantly correlated with the green perceptions of shared micromobility. By contrast, biospheric values and the ascription of responsibility did not have a significant relationship with the green motivations in shared micromobility adoption. An explanation for this

could be that the questions about values and responsibility focused on "me" and "I," whereas the questions regarding environmental knowledge and attitudes had a more collective framing. We can infer that, when consumers perceive environmental problems as a societal issue and not as an individual responsibility, their environmental motivation increases (Matthews and Rothenberg 2017; White, Habib, and Hardisty 2019).

Hedonic motivations

Another proposed important factor in the decision to adopt shared micromobility is hedonic motivations. Hedonic motivations encompass the enjoyable and pleasurable aspects of shared e-bike and e-scooter use. Paper 4 showed that hedonic motivations had the strongest effect on the decision to use shared microvehicles. This outcome was in line with previous studies highlighting the importance of positive emotions in the adoption of sustainable behavior (Venhoeven, Bolderdijk, and Steg 2020; Spielmann 2021). However, this also demonstrated that, when hedonic aspects of green innovations were the strongest drivers for their use, negative perceptions of them could arise.

A comparison of hedonic motivations between non-users and users of shared micromobility in Paper 4 revealed a significant difference in the hedonic motivations of the two groups. The results of Paper 3 illustrated that shared e-scooter users tended to be hedonic innovators, while shared e-bike users were more likely to be environmental innovators. These results are consistent with previous studies that have revealed that one of the main reasons for the use of e-bikes was their environmental benefits (Handy and Fitch 2020; Simsekoglu and Klöckner 2019), whereas e-scooters were used more for hedonic experiences (Kopplin, Brand, and Reichenberger 2021). However, the findings in Paper 4 showed no significant difference between the hedonic motivations of shared e-bike and e-scooter users. Although this was surprising, as observed based on the purposes of the trips of shared e-bike users, many of the trips were simply for pleasure or fun.

Other aspects of hedonic motivations were also explored in the papers. For example, Paper 3 explored the interaction of transport innovativeness, environmental motivations, green identity, and hedonic motivations. Transport innovativeness strengthened the hedonic motivations for the use of both shared e-bikes and e-scooters. As explained in Paper 3, being innovative makes consumers more aware of the emotional benefits of products (Moons and De Pelsmacker 2012). Another reason for this is that innovative consumers seek products that are stimulating and elicit positive emotions (Aroean and

Michaelidou 2014), thus suggesting that shared microvehicles are perceived as enjoyable modes of transport. As expected, shared e-bikes and e-scooters attracted innovators in transport, as demonstrated in other studies regarding electrically powered vehicles (Seebauer 2015; Simsekoglu and Klöckner 2019), and these innovators experienced positive emotions when they used these shared microvehicles (Kopplin, Brand, and Reichenberger 2021).

Based on the findings in Paper 3, environmental motivations also affected the hedonic motivations of shared e-bike users. By contrast, shared e-scooter users were first driven by their hedonic motivations before their environmental motivations. According to these results, it can be deduced that the use of shared e-bikes supports previous studies suggesting that consumers may benefit from the hedonic value of green consumption through their environmental motivation (Valor, Antonetti, and Carrero 2018; Venhoeven, Bolderdijk, and Steg 2020). However, the environmental motivations of shared e-scooter users were partly driven by hedonic motivations, which shows that environmental motivations can be considered to be a secondary motive, as indicated in a study of organic food (Vega-Zamora et al. 2014), and that hedonic motivations can influence the adoption of green innovations (Gurtner and Soyez 2016).

Paper 5 also investigated the relationship between hedonic identity and the use of shared e-bikes and e-scooters, which could affect the degree of an individual's hedonic motivations. According to the results, the use of shared micromobility was linked positively to how strongly the users considered themselves to be hedonic-seeking. Overall, these findings revealed that hedonic motivations had a significant relationship with the decision to use shared e-bikes and e-scooters.

Social motivations

Social motivations are aligned with enhancing or maintaining social status, or simply motivations that are symbolically related. It also involves defining self-identity and obtaining tangible materialistic gains through the symbolic benefits of products (Townsend and Sood 2012; Trudel 2018). Studies have increasingly supported the importance of the symbolic value of products, particularly those that are conspicuously consumed, in the adoption of green innovations (Noppers et al., 2014, 2016; Schuitema et al., 2013; White & Sintov, 2017).

Paper 4 demonstrated that there was no significant relationship between symbolic motivations and the decision to use shared micromobility. Users do not necessarily need to view shared e-bikes and e-scooters as a means of status

promotion or self-identification, as shared e-bikes and e-scooters are generally accessible to everyone; thus, others could easily achieve the status and identities derived from their use. Consumers also do not usually admit their status consumption behaviors openly (Johansson-Stenman and Martinsson 2006), which could explain the insignificance of the symbolic motivations.

When comparing non-users to users, the results revealed a significant difference in the social motivations related to the symbolic benefits of the two groups. Users had stronger symbolic motivations than did non-users, and believed that they could gain status from shared micromobility use. A significant difference could also be seen between the two user groups; specifically, Paper 5 demonstrated that shared e-bikes were used more often to convey the status of users and to differentiate them from others than were shared e-scooters. This could most likely be explained by the widespread public familiarity with shared e-bikes, or at least with bicycle sharing, or the more positive evaluation of the environmental impact of shared bicycles.

Another way of investigating social motivations is through self-image congruency and involvement. Paper 5 demonstrated that ideal self-congruency could predict the use of shared e-bikes and e-scooters. The use of shared micromobility was linked positively to how the users would like to see themselves. This result supports the literature stating that the use of products should match how individuals want to perceive themselves (Cowart, Fox, and Wilson 2008; Helgeson and Supphellen 2004). However, Paper 5 did not support the significance of self-expressive involvement in the decision to use shared microvehicles. These findings suggest that shared e-bikes and e-scooters are not necessarily used to reflect the self-image of users to others, and therefore could not be regarded as useful image-signaling mechanisms. Users do not consider the use of shared e-bikes and e-scooters to be a way for others to see who they are as being relevant in their decisions to use the shared microvehicles. Accordingly, they do not consider the use of these shared microvehicles to communicate an image of themselves to their social environment. Nonetheless, these results could have also been due to the methods that were used, thus leading to the common method bias.

Behavioral intentions

Apart from decisions regarding use, Papers 4 and 5 examined the future behavioral intentions of shared e-bike and e-scooter users. Despite the results extending beyond the intended scope of this thesis, it would be interesting to reveal some factors that could be relevant in the behavioral intentions of users

in terms of the likelihood to recommend and say positive things about shared e-bikes and e-scooters, as well as the continuing use of the shared microvehicles, because intentions are strong predictors of behavior (Klöckner 2013).

As Paper 4 demonstrated, instrumental, environmental, and hedonic motivations were positively correlated with the users' behavioral intentions, whereas eco-innovativeness and symbolic motivations were not. First, these results imply that innovativeness does not necessarily lead to long-term adoption. Second, they suggest that instrumental and hedonic motivations are not only important for the initial uptake, but also for continued use. Third, environmental motivations could increase the perceived satisfaction during use (Arteaga-Sánchez et al. 2020), which could then result in long-term adoption. Finally, symbolic motivations are not always relevant in conspicuous consumption.

Paper 5 investigated the likelihood of recommending and continuing to use shared e-bikes and e-scooters based on the users' social motivations. The results in Paper 5 indicated that, with regard to the likelihood of recommending shared e-bikes, ideal self-congruence, and green and rational identities were relevant. Thus, in order for users to recommend shared e-bikes, they must perceive a match between their ideal self-image and such use, and must see themselves as people who use products for their instrumental benefits and values, as well as people who care about the environment. With regard to the intention to continue to use shared e-bikes, ideal self-congruence and green and hedonic identities were correlated positively with the intention, whereas self-expressive involvement was negatively (and unexpectedly) correlated. These results indicated that shared e-bike users were more likely to continue to use the shared microvehicles if they saw themselves as fun seeking and green, and when the use matched how they wanted to see themselves. Of interest, they were also more likely to continue to use shared microvehicles if they considered the use not to communicate their self-image to others.

With regard to shared e-scooter users, ideal self-congruence and hedonic identity were correlated positively with the intention to recommend, while self-expressive involvement was negatively correlated. These variables had identical effects on the intention to continue to use the shared e-scooters. By contrast, green identity and rational identity were only marginally significant in the intention to continue to use the shared e-scooters. In general, these results demonstrated that, as in the case of shared e-bike users, the match between ideal self-congruence and the use of shared e-scooters was related to the

intention to recommend and to continue to use the microvehicles. However, the ability of shared e-scooters to communicate something about their users decreased the users' intention to recommend shared microvehicles. It also weakened the intention of continuing to use shared e-scooters.

In summary, these findings suggest that image congruence is highly relevant in the behavioral intentions pertaining to shared micromobility, as demonstrated in a study about new product adoption (Cowart, Fox, and Wilson 2008). In fact, the study suggested that promoting the self-image enhancement attributes of novel products could better facilitate their wider adoption than could focusing on the utilitarian aspects (Cowart, Fox, and Wilson 2008). Nonetheless, shared e-bikes and e-scooters are not necessarily used to convey users' self-image, thus limiting their use as a symbolic tool. This could be explained by the sense of social contagion that users might experience when using shared products, which is a barrier to the potential for self-extension during consumption (Bardhi and Eckhardt 2012). In addition, it could be caused by the strong relevance of hedonic identities. As shown in Paper 4, hedonic consumption could create negative perceptions; thus, users may not want to communicate hedonic identities to others, particularly in the use of green products.

Socio-demographic variables

Socio-demographic variables were also controlled in the papers. Gender, age, possession of a driver's license, and income could predict the decision to use shared micromobility. Across the papers, being male and young could increase the likelihood of using shared e-bikes and e-scooters, thus supporting studies showing the relevance of gender (Vandecasteele and Geuens 2010) and age (Gurtner and Soyez 2016) in the adoption of innovations. Papers 2 and 3 also showed that having a higher level of income was also significantly correlated with the use of shared micromobility. Therefore, although the effects of socio-demographic variables are contested, they could still serve as valuable indicators in the adoption of novel green products.

Summary

To summarize, DSI and motivations had different effects on the decision to use shared e-bikes and e-scooters. Transport and eco-innovativeness were positively correlated with decisions to use. Hedonic motivations had the strongest effects, while social motivations had the weakest, if not insignificant, impact. Environmental motivations were positively significant when other

motivations were not considered, but these effects became negative when instrumental and hedonic motivations were taken into account.

In addition, the results indicated that users and non-users differed in the domain-specific level of innovativeness in transport and green product adoption. As expected, users had a higher level of innovativeness in these two domains, thus highlighting the importance of determining consumer interest in specific domains and their willingness to take risks to adopt novel products in these domains. Consequently, this could help to predict their decision to adopt innovations.

Users and non-users also differed in their perceptions of the instrumental, environmental, hedonic, and social benefits of shared e-bikes and e-scooters, with users being more sensitive to these benefits. In general, these findings could be linked to the level of the users' innovativeness because innovators are more likely to be receptive and open to new ideas than are their peers, as shown in the papers. However, it could also be connected to how knowledgeable the participants were about the use of these transport modes and the extent to which they believed that these shared microvehicles could be a substitute for cars. An analysis of the subjective knowledge of the participants included in survey 2 showed that users were more familiar with the use of shared micromobility than were non-users. Studies have supported how knowledge could positively affect how consumers perceive the benefits of using a product (Antón, Camarero, and Rodríguez 2013; Lin and Filieri 2015). Some significant differences in the users' motivations could also be observed. Overall, these findings addressed the important questions about the roles of innovativeness and different motivations in the adoption of green innovations. This thesis also revealed that, despite apparently being similar in terms of attributes and promotion, shared e-bikes and e-scooters motivated consumer adoption differently. These findings help to explain the differences in why and how consumers use shared micromobility apart from their functional attributes, and why some green innovations become controversial.

Conclusions and implications

The aim of this thesis was to understand what motivated consumers to adopt two novel forms of green transport – shared e-bikes and e-scooters. I demonstrated the relevance of the use of two types of DSI (transport innovativeness and eco-innovativeness) and four different motivations (instrumental, environmental, hedonic, and social) for understanding consumers' decisions to use shared micromobility.

The first paper, which was a literature review, presented various theories, factors, products, and industries involving green innovations that have been studied. In the review, my co-author and I showed how fundamental consumer innovativeness is in the study of various novel green products. However, a dominant issue with the concept is its restricted generalizability across various contexts. Therefore, in the subsequent papers, I tested two types of DSI – transport innovativeness and eco-innovativeness – to determine the extent to which DSI could predict adoption and to evaluate whether products could belong to more than one domain. The findings in the papers demonstrated that consumer innovativeness is viable at the domain-specific level and that product examination should not be limited to one specific domain. In this thesis, DSI was related to the use of shared e-bikes and e-scooters and, more specifically, both transport innovativeness and eco-innovativeness were significantly correlated with the use of these shared microvehicles. The significance of eco-innovativeness also provides evidence of the emergence of consumers who are more open to buying novel environmental products (Gurtner and Soyez 2016).

Moreover, the results demonstrated that the transport innovativeness and eco-innovativeness of the users and non-users differed significantly, but they did not show a significant difference in the transport innovativeness and eco-innovativeness of shared e-bike users and shared e-scooter users. These results could indicate that the diffusion of shared micromobility has not yet reached its peak (Heineke et al. 2019).

In the papers, I also investigated how instrumental, environmental, hedonic, and social motivations could be linked to the use of shared micromobility.

Overall, instrumental motivation was significantly correlated with the decision to use, although the significance of rational identity could not be established. This means that, despite being partly instrumentally motivated to use shared e-bikes and e-scooters, being rational alone was not sufficient to motivate an individual to use shared microvehicles. Nonetheless, seeing oneself as rational was relevant in terms of the likelihood of recommending shared e-bikes, and was of borderline significance in the likelihood of continuing to use shared e-scooters, thus supporting the instrumental motivations in use to some extent. The instrumental motivations of non-users and users differed significantly; users had stronger beliefs in the instrumental benefits of shared micromobility than did non-users. With regard to the two user groups, there was no indication that there was a significant difference in the instrumental motivations of the shared e-bike users and the shared e-scooter users.

Environmental motivations could also help to predict the adoption of shared e-bikes and e-scooters. The second paper supported the positive effect of environmental motivations on the decision to use shared e-bikes and e-scooters. However, in the fourth paper, environmental motivations had a significant and negative effect. A reasonable explanation for this is that the second paper did not consider how functional and hedonic the shared microvehicles were perceived, while the fourth paper analyzed the relevance of environmental motivations together with the instrumental, hedonic, and social benefits of shared e-bikes and e-scooters. Nonetheless, environmental motivations had a positive impact on the behavioral intentions of the users.

There were developments in the users' environmental motivations across the papers. At first, shared e-bike users had stronger environmental motivations than did e-scooter users but, in more recent years, the environmental motivations of shared e-bike users and e-scooter users are no longer significantly different. A logical justification could be that shared e-scooters have seen increased life cycles due to improvements in the batteries and durability of the devices, as well as increased regulations in their use (Persson 2022). This could also be connected to the green identities of users, which might lead users to justify the use of shared e-scooters either due to perceiving the transport innovation as being green or by only using products that they consider to be green; in this case, shared e-scooters. However, there was less support for the second argument because green identities were not always relevant in the decision to use shared e-bikes and e-scooters; thus, they are not necessarily related to the environmental motivations of adoption. For example, green identities could only relate to green motivations in shared e-bike use, but

may not be significantly related to green motivations in shared e-scooter use. Moreover, despite being positively correlated with the likelihood of recommending and continuing to use shared e-bikes, green identity was only marginally significant in the likelihood of continuing to use a shared e-scooter and was not important in terms of the likelihood of recommending it.

Hedonic motivations were also positively linked to the adoption of shared micromobility. In fact, hedonic motivations were the strongest predictor among all the factors. Predictably, shared e-scooter users had stronger hedonic motivations than did shared e-bike users in the first survey. Nonetheless, no significant differences in hedonic motivations were identified in the second survey. This development is difficult to explain, but it is possible that the use of shared e-bikes has become more enjoyable because they are promoted together with another fun mode of transport, shared e-scooters. The use of shared micromobility can also be positively linked to hedonic identity. Seeing oneself as being fun seeking also increases the likelihood of continuing to use shared e-bikes and recommending and continuing to use shared e-scooters. Overall, hedonic motivations had a significant relationship with the decision to use shared e-bikes and e-scooters, as well as with the behavioral intentions of the users.

Finally, social motivations were not always significantly related to the decision to use shared micromobility. When measured as status and differentiation tools, social motivations did not significantly impact the decision to use or behavioral intentions. Nonetheless, when comparing non-users and users, there was a significant difference in the symbolic motivations of the two groups. Users had stronger symbolic motivations than did non-users and believed that they could gain status from shared micromobility use. A significant difference could also be seen between the two user groups; specifically, shared e-bikes were used more often to convey the status of the users and to distinguish them from others than were shared e-scooters.

When measured in terms of self-congruency, social motivations could predict the use of shared e-bikes and e-scooters. The use of shared micromobility was related positively to how the users would like to see themselves, which is in line with studies showing that the use of products should match how individuals want to perceive themselves (Cowart, Fox, and Wilson 2008; Helgeson and Supphellen 2004). However, self-expressive involvement could not be significantly linked to the decision to use shared microvehicles. Shared e-bikes and e-scooters were not necessarily used to reflect the users' self-images to others. The users did not consider the use of shared e-bikes and e-

scooters to be a way for others to judge them and to see who they are as being relevant in their decisions to use shared microvehicles.

Theoretical implications

Theoretically, this thesis contributes to the study of green innovations, particularly in transport. As outlined in the previous sections, scholars have advocated for more studies in the field of green transport innovations. In general, this research contributes to the literature by confirming the significance of consumer innovativeness in the use of novel green products (Englis & Phillips, 2013; Li et al., 2021). However, it extended beyond the commonly applied "general" or "innate" innovativeness and employed DSI. In the papers, I applied two types of DSI in terms of transport and green products. By using two types of DSI, this research contributes to understanding the adoption of (green) innovations in a more detailed and nuanced manner. Specifically, the thesis encourages researchers not to limit the domain specificity of products to one context. Although the results of my studies show that transport and eco-innovativeness had a positive relationship with shared micromobility adoption, it is possible that, as with other green innovations, one form of DSI is positively related, and the other is negatively related. In fact, a study has shown that, in the adoption of organic apparel, consumers who considered themselves to be low innovators in fashion were more likely to buy environmental and organic t-shirts compared to those with high fashion innovativeness, although fashion innovators had stronger pro-environmental beliefs (Matthews and Rothenberg 2017). Thus, it would be advisable to examine products in contexts beyond their "traditional" categories. Furthermore, DSI has seldom been applied to green product adoption (Gurtner and Soyez 2016), although green innovations are gaining ground in the development of new products. This uncommonness and the increasing relevance of green innovation make the application of DSI in studies of green product adoption more pertinent.

This thesis also provides more insights into what motivates consumers to adopt green innovations, particularly those that are emergent, by differentiating among instrumental, environmental, hedonic, and social motivations. The findings support the relevance of considering various motivations in the adoption of shared micromobility, comparable with other green innovations such as car sharing (Bardhi and Eckhardt 2012), electric cars (Schuitema et al.

2013), and organic food (Thøgersen and Zhou 2012), and how they differ between these two innovations. In terms of the difference in motivations, this thesis contributes to the theory by differentiating between two similar green innovations. The papers demonstrate that, even though green innovations are promoted in the same manner and share similar attributes, consumer motivations and the decision to adopt can still vary, thus emphasizing the significance of more detailed approaches. Furthermore, the findings illustrate that environmental motivations do not always have a positive effect on the decision to use, and that the greenness of innovations could indeed backfire. Although they are designed for the benefit of the environment, green innovations should benefit their users first. The functional and emotional attributes are actually more important in the use of shared e-bikes and e-scooters than are their environmental benefits. This greater value placed on personal gains could explain the controversies surrounding the environmental impact of shared e-bikes and e-scooters, as well as why some users use the shared microvehicles recklessly. Nonetheless, environmental motivations are important in the future behavioral intentions of users. Overall, the findings of thesis point to the relevance of examining not only one factor, but several factors simultaneously when studying the adoption of new products.

On a broader scale, this thesis also assists in understanding how an emergent innovation could develop by examining the development in the adoption of shared microvehicles. When shared micromobility was introduced, many of the users were hedonically motivated. Consequently, the purpose of their trips would naturally be related to trips for pleasure and fun. Therefore, this thesis supports how the diffusion of innovations works by showing that the more experience and knowledge the market gathers regarding these novel products (Antón, Camarero, and Rodríguez 2013; Lin and Filieri 2015), such as shared micromobility, the more people use them, and the likelihood that their intended benefits will be realized increases. The findings of the compiled studies could also help to explain why green consumers do not necessarily adopt green products. In the case of shared micromobility, consumers could be discouraged from using the shared transport mode because of its hedonic and social attributes, which could affect how they justify product use (Luchs and Kumar 2017) and their self-perceptions (Brough et al. 2016). However, there have been developments in the types of trips for which these shared microvehicles are used, particularly those made using shared e-scooters. Many of the trips are currently related to utilitarian trips such as commuting to work or school and shopping. Data also show that there is expected to be an increase in the projected uptake of shared micromobility in the coming years, which could

mean that those who were skeptical about its benefits are slowly beginning to realize its potential advantages.

Another important contribution of this thesis is that it supports the argument that, in order to motivate people to behave pro-environmentally, they have to be inspired in a collective manner rather than on an individual level (White, Habib, and Hardisty 2019), as shown in the results of the second paper, in which the "I" questions were not related to green perceptions, while the "we" questions had a significant relationship with how green consumers perceived shared micromobility. The thesis also shows how various identities could be relevant in the decision to use, to continue to use, and to recommend green innovations. The results revealed that different identities played a role in the types of decisions that users made.

Finally, by examining social motivations using self-congruency, this research adds to the knowledge about the non-verbal and less conspicuous aspects that occur during the diffusion of innovations. By using self-congruency, this thesis determined whether there was an alignment between the promotion and the perception of shared micromobility. This alignment is consequential because it shows whether shared micromobility can be perceived as a green transport mode based on its adopters. This can then be related to whether the transport mode is a good symbolic mechanism.

Practical implications

In practical terms, the results of this thesis could assist in formulating future marketing strategies for green innovations. For example, the results indicated that the promotion of green innovations should not be limited to one domain, and that several motivations were relevant in the decision to adopt. Therefore, marketers who are interested in introducing and accelerating the process of the diffusion of novel green products should not only consider the instrumental and environmental perceptions of the product, but also how its use could affect a user's social status and how the consumers' experiences during consumption could be enhanced.

More importantly, this thesis could help us to understand whether shared micromobility could be part of sustainable transport systems. Future generations' potential uptake of shared micromobility is highly likely, as reports estimate that the value of the industry will increase following the

pandemic (Heineke et al. 2022), and because the demand for green innovations continues to increase. As I identified some of the characteristics and motivations of innovators and early adopters, and because of the differentiation between shared e-bikes and shared e-scooters, this thesis could help to create more targeted messages for consumers who are easily motivated by particular product attributes and could protect them and improve their rights to some extent.

As the studies revealed that consumer DSI was correlated significantly with the use of shared micromobility, providers could target commuters who are currently non-users, but who are transport innovators or eco-innovators by presenting the novel and potential environmental aspects of shared micromobility if used to replace car trips and complement public transport trips, for example. For current users, providers could reinforce how the vehicles can be used to replace more environmentally harmful car journeys and could continue to introduce new product features and improvements, particularly green ones.

The results also signify that the marketing of green innovations should begin with the promotion of their functional aspects, in line with the suggestion to give priority to the subjective evaluation of the functional reliability and costs of sustainable technologies (Sopha and Klöckner 2011), and, where relevant, hedonic aspects. Therefore, it could be valuable to emphasize the first-and-last mile benefits of shared micromobility and to incorporate more hedonic attributes in the transport modes. Providers could also promote the use of shared e-bikes and e-scooters as a substitute for hedonic trips made by car, such as shopping for fun or joyriding on a lazy Sunday. The environmental benefits should be communicated in order to encourage continued use and positive word-of-mouth among users. This could reduce the cognitive dissonance that users and non-users may experience in the use of green innovations. This means that, when instrumental and hedonic attributes are highlighted, no conflicts regarding what their purpose should be would arise, as they are promoted for personal gain. The environmental aspects would then be perceived as being an additional advantage to improve the overall value of green innovations.

In addition, this thesis showed that shared micromobility could be promoted via its social aspects. For example, providers could tap into the symbolic aspects of use by targeting consumers who have strong symbolic motivations when they decide to adopt new products. They could accomplish this by focusing on reducing the negative perceptions related to the negative behaviors

of users, particularly those who consider these to be barriers to adoption. This reduction could be achieved in collaboration with transport authorities through clearer regulations and a more supportive infrastructure. Providers could also create advertisements that communicate how the use of shared micromobility could enhance how users are perceived in society through their contribution to saving the planet or their perceived novelty of use.

This thesis could also be relevant for manufacturers and retailers of microvehicles and providers of other ride-sharing services. Manufacturers and retailers of private e-bikes and e-scooters could work with authorities and shared micromobility providers, as the regulations and perceptions surrounding shared micromobility could also affect them. Instead of cannibalizing the shared e-bike and e-scooter market, they should focus on convincing car users who are hesitant to use shared micromobility due to the lack of ownership and accessibility issues related to the shared microvehicles and communicate directly how e-bikes and e-scooters are functional and could easily replace the short-distance trips they make using their cars.

Other shared transport providers could also benefit from the findings of this thesis. First, they could target transport and eco-innovative consumers, as they are more likely to adopt these collaborative services than are other adopter segments. As the findings showed that hedonic motivations were considerably important in shared micromobility, carpooling and shared car providers could enhance the positive utility of their services by highlighting the fun and enjoyable aspects of sharing a ride with others. They could also enhance the value of ride sharing by providing feedback about the environmental impact of traveling with others instead of using a private vehicle alone, specifically to those who are already using their products.

From an environmental perspective, this thesis provides a better understanding of whether shared micromobility could potentially help to mitigate emissions from the personal transport industry by showing that shared micromobility can indeed replace car trips in some cases, and its use could be environmentally motivated. Socially, this thesis could also help to invert the transport pyramid and contribute to the discourse about making sustainable transport a priority. Making the use of shared e-bikes and shared e-scooters socially invisible (as argued by Parsha and Martens 2022 regarding the promotion of cycling) could eliminate social exclusion. This could remove the social stigma and symbolic nuances associated with their use and make them a “normal” part of the transport system instead.

Overall, it is imperative to examine the adoption process of shared micromobility because its benefits can only be realized if a significant proportion of short-distance commuters, particularly car users, adopt it. The results in this thesis highlight the importance of developing green innovations, not only in the transport sector but also in other sectors of society. However, it is worthwhile to note that, unlike other green innovations, as well as between shared micromobility options, there are differences in what they require from the users in terms of skills, such as being able to cycle or having good balance and characteristics of being rational or social. This supports the idea that, in fact, not all green innovations are created equal.

Policy recommendations

This thesis could guide policymaking in marketing, environmental policy, and transport, particularly in cities that are grappling with the regulation and integration of novel green transport modes in their transport systems. This thesis could ensure that these modes are provided with the infrastructure they need and support from cities to launch them and gain ground. On one hand, evidence supports the use of shared micromobility to connect public transport with the first stop or destination. It is also used for utilitarian trips, including shopping and commuting to or from work or school. On the other hand, there is also evidence to suggest that shared micromobility is used more for enjoyment. Thus, policies that meet these different objectives should be implemented.

From a public policy perspective, the thesis findings indicate the importance of addressing the lack of policies or vague policies hindering the adoption and diffusion of shared micromobility. They also reveal the value of addressing the car dependency of many consumers. For example, in many cities today, passenger cars take up much of the available space for both driving and parking, which poses a barrier to other, less environmentally harmful and congesting ways of individual travel, such as walking, cycling, and the use of shared micromobility. To create clearer and more comprehensive policies, I propose that policymakers should consider the following points that could induce the adoption of shared micromobility and promote safe behavior:

- *Promote the instrumental, hedonic, and environmental aspects of shared micromobility.* The findings of this thesis demonstrated the

relevance of instrumental, hedonic, and environmental motivations in the use of shared e-bikes and e-scooters. Therefore, when promoting shared micromobility, a combination of highlighting these three attributes that could attract consumers should be included. However, it is important to:

- *Differentiate between users and non-users.* The results show that instrumental and hedonic attributes should be highlighted among non-users. Therefore, policies should be designed to address the functional limitations of shared micromobility, such as access to more and better parking spaces, and to allow more microvehicles to be on the streets to increase accessibility. Non-users could also be encouraged to try this transport mode by providing areas for shared e-bikes and e-scooters in parks and leisure areas. As the thesis results suggest, realizing the benefits of shared micromobility takes time, and consumers need a while to become used to the transport mode. Thus, it would be advisable to allow users to test the microvehicles, as this would make them feel less insecure and more knowledgeable about their use and benefits.
- *Differentiate between shared e-bikes and e-scooters.* This thesis shows that the motivations for the use of shared e-bikes and e-scooters vary. Shared e-bikes' hedonic and environmental features should be highlighted to continue the positive influence of environmental motivations on hedonic motivations. Nonetheless, the long-term environmental impact of shared e-scooters should be communicated honestly and continuously to counter negative perceptions about their greenness. Another way to reduce skepticism about the environmental impact of shared micromobility is to present its "net green" value (Geyer and Zink 2016); that is, its overall environmental impact, taking not only its production and disposal but also how it affects the market and consumer behavior into consideration.

- *Improve social norms in the use of shared micromobility.* Although social motivations are not always relevant in the decision to use shared micromobility, it is important to address the social aspects of use, as these could facilitate the adoption of pro-environmental behaviors (Chen et al. 2019; Klöckner 2013) or hinder consumers from using them. In fact, studies have shown how the use of green products could

be linked to feminine stereotypes (Brough et al. 2016), or that e-bikes are only for old people and are a form of cheating (Jones, Harms, and Heinen 2016). The results of this thesis show that it is important that the use of shared micromobility is aligned with how consumers see themselves.

- *Continue introducing new features and highlight them in promotions.* Regardless of how small the improvements are, they could assist in the diffusion of shared micromobility if providers communicate them clearly. To attract and retain innovators or those who are open to using shared micromobility, it could be helpful if they see the transport mode as an emergent innovation and are kept interested in using the microvehicles. As transport innovativeness and eco-innovativeness are related to the decision to adopt, technical improvements in travel features and environmental impact should be promoted, in line with the suggestion for how to market solar panels, in which communications should touch on the innovations' environmental and instrumental benefits (Claudy, Peterson, and O'Driscoll 2013). An example of travel features is the safety pricing feature, which aims to prevent reckless riding, such as running red lights, by not charging users when the microvehicles are not in motion (Intelligent Transport 2022).
- *Highlight key advantages in comparison car use.* Despite being controversial because car users may become defensive when they think of shared micromobility as an alternative to cars, the advantages of shared micromobility over cars should be promoted heavily, as in the case of car sharing (Geyer and Zink 2016). The thesis shows that shared micromobility is still being used to replace other pro-environmental ways of traveling, such as walking and public transport. Shared e-bikes and e-scooters are not prevalent in dissuading consumers from using their cars. Therefore, highlighting the benefits of shared micromobility to car users in a way that would make them more open to substituting their car trips with shared micromobility should be prioritized. One way of doing this is to integrate shared micromobility into the current public transport system, making its use more seamless and evident, and promoting it as part of the transport system. Another way is to devote more space to greener micro-transport modes in terms of lanes and parking to avoid interaction among different modes of transport and pedestrians. Finally, subsidizing shared micromobility in communities where there is a lack

of public transport infrastructure or where short-distance trips are predominant (McQueen et al. 2021) could also prove to be useful.

- *Regulate the use to minimize conflicts among travelers.* Finally, policymakers should formulate clear guidelines regarding how, where, and when shared micromobility is allowed. This would minimize the conflicts caused by confusion and avoid accidents related to vague policies. Based on the results of this thesis, shared micromobility does not only cater to a single type of consumer, but rather to a growing number of consumers who have different motivations and backgrounds. Clear regulations would encourage safer use and would attract consumers who have been deterred by unclear policies.

Limitations and future research

This thesis investigated the adoption of green innovations from the consumers' perspective. Despite the contributions it makes, several limitations should be mentioned. First, contextual and external factors that could affect the adoption of these products were not considered in the studies, even though they could significantly influence the adoption decision. For example, studies have revealed how weather conditions and topography significantly influence consumer decisions to use shared micromobility (Reck, Martin, and Axhausen 2022). In the second and third papers, we did not focus on a city comparison between Copenhagen and Stockholm; thus, we did not include a discussion of the similarities and differences between the users and non-users in the two cities.

Another limitation of this thesis is the use of questionnaire surveys to collect data. Despite the advantages of this data collection method, it was impossible to determine the causality among innovativeness, motivations, and the decision to use. Furthermore, the interpretation of the results was mainly based on findings from other studies and my observations. Therefore, the implications of this thesis must be interpreted carefully because the focus of the studies was on shared electric micromobility, and the surveys were only conducted in two Scandinavian cities. Consequently, the results should be more applicable to cities that have similar attributes, such as size, the residents' socio-demographic profile, and infrastructure. Larger cities, particularly those that lack the infrastructure for new mobility options and are heavily reliant on cars, should address fundamental changes in their infrastructure and policies to

better serve micromobility. In particular, rider safety should be prioritized, as this is one of the main barriers preventing people from trying active forms of travel. Nonetheless, the results and implications could serve as the initial impetus for understanding how consumers are motivated to adopt green transport innovations.

An opportunity for further research is the application of consumer innovativeness and motivations in green innovation adoption using a longitudinal approach. Using multiple surveys at different times over a longer period could improve the understanding of the motivations underlying adoption and development of these motivations. It would also be useful to replicate this research using other green innovations and to use other data collection methods to substantiate the findings of this thesis. Moreover, researchers could examine the impact of the integration of shared micromobility into the transport system, as well as how it affects attitudes toward this novel transport mode and overall consumer travel behavior. Finally, research regarding the social sustainability aspects of shared micromobility and green innovations could be further explored, particularly with regard to how they could affect social equity.

Final remarks

Not all green innovations are created equal; in other words, consumers may perceive green innovations differently. The rationale behind the title stemmed from the idea that not all green innovations are made with the environment in mind. In general, green innovations are seen as tools that could help us to achieve a green future. Nonetheless, consumers may see and use them for non-environmental purposes, and may have different perceptions about their benefits. Although green innovations aim to address environmental issues, in the minds of consumers, they could be created to serve self-interests related to instrumental, hedonic, and social benefits.

In conclusion, I would like to address the question I posed at the beginning of this thesis: Can we achieve a greener future with the help of green innovations?

My simple answer is *Yes*. However, it would take the collective determination of policymakers, authorities, providers, and consumers to realize this outcome. Green innovations offer a myriad of possibilities for us to save the planet. As consumers, it is up to us to make use of these possibilities. With this thesis, I

wish to contribute to the discussion about green innovations, particularly to the discussion about sustainable and more equitable micro forms of transport. This discussion could then hopefully help the positive development of society. Private vehicles flooding the streets is not a future that I would like to see. Given the pressing sustainability issues surrounding the transport sector, I hope and expect that public transport, together with shared transport modes, will play a more central role in supporting the progress toward more sustainable cities and communities.

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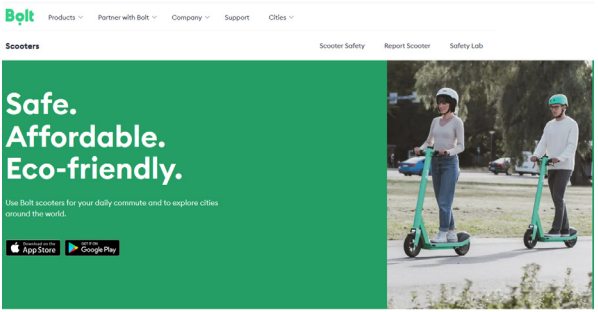
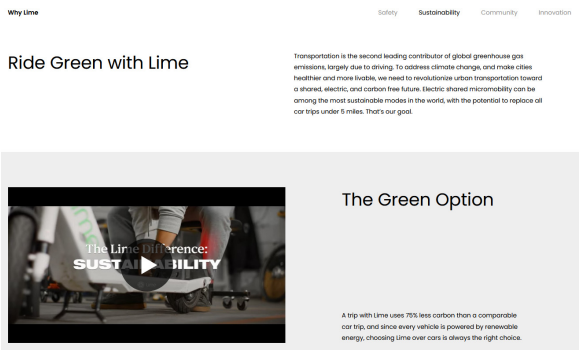
Appendix

Promotions of Shared Micromobility

Below are examples of promotions of shared micromobility as pro-environmental.



Appendix Figure 1 Screenshot of Bolt Webpage (February 2023): https://bolt.eu/en/scooters/



Appendix Figure 2 Screenshot of Lime Webpage (February 2023): https://www.li.me/why/sustainability

Surveys

Survey 1

Introduction to selection

1. In the past year, have you rented and used electric bicycles or electric scooters? (only one choice possible)
    a) No, I haven't used any of these
    b) Yes, I have rented and used electric bicycle more than electric scooters in the past year
    c) Yes, I have rented and used electric scooter more than electric bike in the past year

Travel behavior

2. Overall in the past year, which mode of transport did you usually use for everyday travel, for example, between home and work / study? (only one choice possible)
    1. Work / study and / or find myself most at home every day
    2. Walking
    3. Car
    4. Public transport such as bus, metro, tram
    5. Normal bicycle you own (not electric bicycle)
    6. Electric bicycle that you own (not that you rent / borrow)
    7. Electric scooter you own (not renting / borrowing)
    8. Electric bike that you rent at any time
    9. Electric scooter that you rent at any time
    10. Combination of public transport and rented electric bicycle or electric scooter
    11. Combination of car and rented electric bicycle or electric scooter

3. Indicate to what extent you agree or disagree with the statements below.
    a) I always have access to a car.
    b) I drive or drive daily.
    c) I always have access to a regular bike
    d) I cycle daily on a regular bike.
    e) I always have access to rent an electric bicycle or electric scooter.
    f) I ride an electric bicycle or electric scooter daily.

4. Have you ever rented and used an electric bicycle or electric scooter? We mean those where you download an app on the phone that you pay with.

a) Yes (after question 5, go to question 8)
b) No (after question 5 go to go to questions 6 and 7, then 15)

5. Please choose the option below that best describes you (only one option selectable)

a) I follow new technological developments in the field of transport and dare to take risks by being the first to try new innovative things.
b) I see the benefits of new innovative products in the transport field and I am one of the first to benefit from them.
c) I am interested in innovative products in the transport field but at the same time I am pragmatic. First, I want to take the time and be convinced of the benefits of an innovative product. My decisions are (mainly) based on recommendations from existing users.
d) I am not particularly fond of new innovative products in the transport field, but rather I appreciate safety. It is safe to buy innovative products once they have been in the market for a while and offer obvious benefits.
e) I am quite traditional and do not have much to do with innovative products in the transport field. I do not like changes in life and I buy new innovative products when the products I use are no longer produced.

6. Why haven't you rented and used electric bikes? (multiple answers possible) (scale 1, disagree at all, to, 7, totally agree)

a) I can't ride a bike
b) There are no such in my vicinity
c) I have no smartphone that I can pay with
d) I think it seems too complicated
e) I think it seems dangerous
f) I prefer walking and getting exercise
g) I prefer to ride a regular bike and get exercise
h) I think it's too expensive
i) Where to go is usually too far for electric bicycle
j) People in my area don't like electric bikes
k) Other, namely: (free text field, max. 50 words)

7. Why haven't you rented and used electric scooters? (multiple answers possible) (scale 1, disagree at all, to, 7, totally agree)

a) I don't know how to ride an electric scooter
b) There are no such in my vicinity
c) I have no smartphone that I can pay with
d) I think it seems too complicated
e) I think it seems dangerous
f) I prefer walking and getting exercise
g) I prefer to ride a regular bike and get exercise
h) I think it's too expensive
i) Where to go is usually too far for electric scooter
j) People in my area do not like electric scooters
k) Other, namely: (free text field, max. 50 words)

8. Do you currently have an app in your phone to rent an electric bicycle or electric scooter?
a) Yes (go to question 9 below)
b) No (go to question 10 below)

9. What apps do you have on the phone for this?
a) Voi
b) Tier
c) Lime
d) Other, namely: (free text field, max. 50 words).

10. In the past year, how often have you used an electric bike and / or electric scooter via an app? (scale: 1, never, 2, only a few times, 3, once a month, 4, once a week, 5, almost every day)
a) Electric bike through an app
b) Electric scooter via an app
(for answers 4 and 5 to both or any of the above proceed below, otherwise send to question 14)

11. Think about your recent trip when renting an electric bicycle or electric scooter, what was the purpose of the trip? (only one option selectable)
a) Transport to / from work / studies
b) To get to the nearest public transport stop (bus, metro, tram)
c) To get to the car parking space
d) To shop
e) Just because it was fun
f) Other, namely: (free text field, max. 50 words)

12. In normal cases when you rent an electric bicycle or electric scooter, what is the purpose of the trips? (only one option selectable)

a) Transport to / from work / studies
b) To get to the nearest public transport stop (bus, metro, or tram)
c) To get to the car parking space
d) To shop
e) Just because it was fun
f) Other, namely: (free text field, max. 50 words)

13. What is the name of the company or app you use most often?

a) Voi
b) Tier
c) Lime
d) Other, namely: (free text field, max. 50 words).

14. If you did not have access to electric bicycle or electric scooter what would you choose instead? (only one option selectable)

a) Walking
b) Car
c) Public transport such as bus, metro, tram
d) Normal bike you own (not electric bike)
e) Electric bicycle that you own (not that you rent / borrow)
f) Electric scooter you own (not renting / borrowing)
g) Other, namely: (free text field, max. 50 words).

Below are questions only for those who do not use electric bicycles or electric scooters, i.e., answered: No, I have not used any of these on question 1 above.

15. Indicate to what extent you agree or disagree with the statements below. (scale 1, disagree at all, to, 7, totally agree)

Environmental motivations

1) Renting and using electric bicycles and / or electric scooters in general would help reduce air pollution caused by car traffic in residential areas.
2) Renting and using electric bicycles and / or electric scooters in general would help to reduce the environmental problems caused by car traffic.
3) Renting and using electric bicycles and / or electric scooters in general would reduce the climate problems caused by car traffic.

4) Renting and using electric bicycles and / or electric scooters in general would reduce society's dependence on fossil oil.

Knowledge

1) Car traffic is one of the biggest environmental problems today
2) Driving a car on gasoline and diesel contributes to greenhouse gas emissions that warm the atmosphere
3) The increase in greenhouse gases is mainly caused by human activities.
4) Carbon dioxide, which is a greenhouse gas, is emitted when using fossil fuels.

Values

1) It is important for me to prevent environmental pollution.
2) It is important for me to protect the environment.
3) It is important for me to respect nature.
4) It is important for me to live in harmony with nature.

Ascription of responsibility

1) I feel partly responsible for the increase in the use of fossil fuels as oil / gasoline / diesel
2) I am partly responsible for the problems of fossil fuels in society today.
3) I feel partly responsible for global warming.

Attitude

1) We are approaching the limit of the population the earth can give birth to.
2) If development continues as hitherto, we will soon experience a major ecological disaster.
3) The balance in nature is very sensitive and is easily disturbed.
4) When man intervenes in the course of nature, it often has disastrous consequences.

Hedonic motivations

1) I think it is fun to rent and use electric bicycles and / or electric scooters.
2) Renting and using electric bicycles and / or electric scooters makes me enjoy life.
3) It is entertaining to rent and use electric bicycles and / or electric scooters.

Negative emotions

1) I get scared of renting and using electric bicycles and / or electric scooters
2) I feel guilty when I rent and use electric bicycles and / or electric scooters.
3) I am sorry to rent and use electric bicycles and / or electric scooters.

Locus of control

1) Renting and using electric bicycles and / or electric scooters for everyday life is completely possible for me
2) I am sure that in the near future I can rent and use electric bicycles and / or electric scooters for everyday use

Below are questions only for those who use electric bicycles and scooters, i.e., answered:
2. Yes, I have mostly used electric bicycle in the past year on question 1 above.
3. Yes, I have mostly used electric scooter for the past year on question 1 above.
Bicycle is replaced with scooter, for those who choose option 3.
14. Indicate to what extent you agree or disagree with the statements below.
(scale 1, disagree at all, to, 7, totally agree)

Environmental motivations

1) Renting and using electric bicycles in general would help to reduce air pollution caused by car traffic in residential areas.
2) Renting and using electric bicycles in general would help to reduce the environmental problems caused by car traffic.
3) Renting and using electric bicycles in general would reduce the climate problems caused by car traffic.
4) Renting and using electric bicycles in general would reduce society's dependence on fossil oil.

Knowledge

1) Car traffic is one of the biggest environmental problems today
2) Driving a car on gasoline and diesel contributes to greenhouse gas emissions that warm the atmosphere.
3) The increase in greenhouse gases is mainly caused by human activities.

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Values

1) It is important for me to prevent environmental pollution.
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Ascription of responsibility

1) I feel partly responsible for the increase in the use of fossil fuels as oil / gasoline / diesel
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Attitude

1) We are approaching the limit of the population the earth can give birth to.
2) If development continues as hitherto, we will soon experience a major ecological disaster.
3) The balance in nature is very sensitive and easily disturbed.
4) When man intervenes in the course of nature, it often has disastrous consequences.

Hedonic motivations

1) I think it's fun to rent and use electric bikes
2) Renting and using electric bikes makes me enjoy life
3) It is entertaining to rent and use electric bicycles

Negative emotions

1) I get scared of renting and using electric bikes
2) I feel guilty when I rent and use electric bikes
3) I'm sorry to rent and use electric bikes

Locus of control

1) Renting and using electric bikes for everyday life is completely possible for me
2) I am sure that in the near future I can rent and use electric bicycles for everyday use

15. Do you have a driving license for a car? (only one answer possible)
    a) Yes
    b) No

16. Age
17. Gender
18. Highest educational attainment
    a) Elementary school, i.e., 9 years or less
    b) High school, i.e., 12 years or less
    c) A few years of college studies without a degree
    d) College studies with a completed degree
    e) Started doctoral studies
    f) Completed doctoral degree
    g) Other

19. Main employment right now, fill in what is best), only one answer possible
    a) Full-time
    b) Part-time
    c) Jobseeker
    d) Retired
    e) Student

20. Income
    a) Less than 20,000 per month before tax
    b) Between 20 and 35,000 per month before tax
    c) Between 35 and 50,000 per month before tax
    d) Between 50 and 65,000 per month before tax
    e) Over 65,000 per month before tax

END

Survey 2

Introduction to selection

1. In the past year, have you used shared electric bicycles (e.g., Citybike or Lime) or shared electric scooters? (Only one choice possible)
    a) No, I haven't used any of these
    b) Yes, I have rented and used an electric bicycle only
    c) Yes, I have rented and used an electric scooter only
    d) Yes, I have rented and used both shared e-bikes and shared e-scooters

If both, which one do you use more often?

If answer is A skip to question 3 and random assignment to e-bike and e-scooter (50/50).

If answer is B or C, random assignment to shared e-bike or e-scooter questions.

If no, go directly to question 5

If yes, answer first questions 2-4.

2. In the past year, how often have you used used shared electric bicycles (Citybike or Lime)/shared electric scooter? (scale: 1 – only once, 2 – a few times, 3 – at least once a month, 4 – a couple of times a month, 5 – at least every week, 6 – almost every day, 7 – every day)

3. Travel behavior (Purpose and Substitution Effect)

Only users:

Think about your recent trip when renting a shared e-bike/e-scooter, what was the purpose of the trip? (Only one option selectable)

a) Transport to / from work / studies
b) To get to the nearest public transport stop (bus, metro, tram)
c) To go shopping for necessities (grocery, medicine, etc.)
d) To go shopping for leisure and fun
e) Just to have fun
f) To get to / from party, clubs, restaurants
g) Other, namely: (free text field, max. 50 words)

4. If you did not have access to e-bike/e-scooter what would have you chosen instead? (only one option selectable)
    a) Walking
    b) Car
    c) Bus/Train
    d) Bike you own (electric/non-electric)

e) Rental non-electric bike
f) Rental electric scooter (Rental electric bike)
g) Other, namely: (free text field, max. 50 words).

Both users and non-users

5. How likely will you use shared e-bikes/e-scooters the purpose of the trips? (1 Highly unlikely – 7 Highly likely)
   a) Transport to / from work / studies
   b) To get to the nearest public transport stop (bus, metro, tram)
   c) To go shopping for necessities (grocery, medicine, etc.)
   d) To go shopping for leisure and fun
   e) Just to have fun
   f) To get to / from party, clubs, restaurants

6. What is your preferred travel mode to accomplish your daily activities? (Only one option selectable)
   a) Walking
   b) Car
   c) Bus/Train
   d) Bike you own (electric/non-electric)
   e) Rental non-electric bike
   f) Shared e-scooter (Shared e-bike)
   g) Other, namely: (free text field, max. 50 words).

7. To what extent do you agree with the following statements? (Scale 1 strongly disagree – 7 strongly agree)
   a) Compared to your preferred travel mode, shared e-bikes/e-scooters
   b) makes it easier to take me to places I usually go to
   c) are easier to access
   d) makes my trips faster
   e) helps me save more time
   f) are safer to use

8. Compared to your preferred travel mode,
   a) There is more infrastructure to ensure the safety of e-bike/e-scooter users
   b) The use of shared e-bikes/e-scooters gives me more value for money
   c) The use of shared e-bikes/e-scooters is more economical / cost-effective

9. Rate the importance of the following travel dimensions? (Scale 1 not very important – 7 extremely important)
    a) The travel mode I choose,
    b) Makes it easier to take me to places I usually go to
    c) Is easily accessible
    d) Makes my trips fast
    e) Helps me save time
    f) Safe to use
    g) Has sufficient infrastructure to ensure my safety
    h) Gives me value for money
    i) Is economical / cost-effective

Consumer Innovativeness (randomized) (Scale 1 completely disagree – 7 completely agree)

10. Domain-specific transport innovativeness
    a) In general, I am the first in my circle of friends who knows or has knowledge of new advances and innovations in the field of transport.
    b) Compared to my friends, I do not try new transport modes.
    c) In general, I am among the first in my circle of friends to try new transport modes when they appear.

11. Domain-specific green innovativeness
    a) In general, I am the first in my circle of friends who know about the latest new organic and environmentally friendly products.
    b) Compared to my friends, I own very few new organic / environmentally friendly products.
    c) In general, I am among the first in my circle of friends to buy new organic / environmentally friendly products when they appear.

Motivations (randomized)

Indicate to what extent you agree or disagree with the statements below. (Scale 1 – completely disagree to 7 – completely agree)

12. Instrumental motivation
    a) The use of shared electric bikes / electric scooters means that places I usually go to are more accessible than if I were to use another mode of transport.
    b) Shared e-bikes/e-scooters are easily accessible.
    c) Shared e-bikes/e-scooters make my trips faster.
    d) Shared e-bikes/e-scooters help me save time.
    e) Shared e-bikes/e-scooters are safe to use.

f) There is sufficient infrastructure to ensure the safety of e-bike/e-scooter users
g) The use of shared e-bikes/e-scooters is worth the value for money
h) The use of shared e-bikes/e-scooters is economical / cost-effective.

13. Environmental motivation
    a) Use of shared e-bikes/e-scooters, in general, would contribute to solving air pollution in residential areas caused by traffic.
    b) Use of shared e-bikes/e-scooters, in general, would help reduce the environmental problems caused by car traffic.
    c) Use of shared e-bikes/e-scooters, in general, would reduce the climate problems caused by car traffic.
    d) Use of shared e-bikes/e-scooters, in general, would reduce society's dependence on fossil oil.

14. Hedonic motivation
    a) Riding a shared e-bike/e-scooter is enjoyable.
    b) It is entertaining to use a shared e-bike/e-scooter.
    c) Using a shared e-bike/e-scooter is exciting.

15. Symbolic motivation
    a) The use of shared e-bikes/e-scooters gives me status
    b) The use of shared e-bikes/e-scooters enables me to distinguish myself from others
    c) I can show who I am with the use of shared e-bikes/e-scooters
    d) The use of shared e-bikes/e-scooters fits me

Identity and self-congruence

16. Think about the kind of person who typically uses shared e-bikes/e-scooters. Imagine this person in your mind and then describe this person using one or more personal adjectives, such as tall, big, or whatever personal adjectives you can use to describe the typical user of shared e-bikes.

Write the adjective(s) here (max 5 words): _____

Congruence – Ideal and Actual Self

Once you have done this, indicate your agreement or disagreement to the following statements using this scale: strongly disagree = 1, strongly agree= 7.

17. Actual (Helgeson & Supphellen, 2004) (randomized)

a) The use of shared e-bikes/e-scooters is consistent with how I see myself.
b) I am quite similar to the typical user of shared e-bikes/e-scooters.
c) The image of the typical user of shared e-bikes/e-scooters is congruent with how I see myself.

18. Ideal
    a) The use of shared e-bikes/e-scooters is consistent with how I would like to see myself.
    b) I would like to be perceived as similar to the typical user of shared e-bikes/e-scooters.
    c) The image of the typical user of shared e-bikes/e-scooters is congruent with how I would like to see myself.

Note that the order of the SC and BP measures is counterbalanced: half of the respondents respond to the BP before the SC measures; the opposite is true of the other half.

19. Self-expressive involvement: The use of shared e-bikes/e-scooters
    a) Says something about me who uses them
    b) Is an activity others use to judge me
    c) Tells others about me
    d) Portrays an image of me to others

20. To what extent do you agree with the following statements?
    a) How likely are you to recommend shared e-bikes/e-scooters?
    b) How likely are you to continue using shared e-bikes/e-scooters ?
    c) How likely are you to say positive things about shared e-bikes/e-scooters?

21. Status consumption
    a) I would use a product just because it has status.
    b) I am interested in new products with status.
    c) I would pay more for a product if it had status.
    d) The status of a product is irrelevant to me.

22. Green identity
    a) I think of myself as someone who is concerned about environmental issues.
    b) I think of myself as a green consumer.
    c) Buying green products would make me feel like a green consumer.

d) I would feel totally satisfied with myself if I bought green products.

23. Hedonic identity
    a) I think of myself as someone who enjoys life's pleasures.
    b) I think of myself as a fun-seeking consumer.
    c) Using enjoyable products would make me feel like a fun consumer.
    d) I would feel totally satisfied with myself if I bought enjoyable products.

24. Instrumental/Rational identity
    a) I think of myself as someone who is rational.
    b) I think of myself as a practical consumer.
    c) Using functional products would make me feel like an effective consumer.
    d) I would feel totally satisfied with myself if I bought practical products.

25. Subjective knowledge shared e-bikes/e-scooters
    a) I know pretty much about shared e-bikes/e-scooters.
    b) I do not feel very knowledgeable about shared e-bikes/e-scooters.
    c) Compared to most other people, I know more about shared e-bikes/e-scooters.

END

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Not all green innovations are created equal

Consumer innovativeness and motivations in the adoption of shared micromobility

Can we achieve a greener future with the help of green innovations? In this dissertation, I examine how consumer innovativeness and motivations relate to the adoption of green innovations, specifically shared e-bikes and e-scooters. I outline the differences and similarities in consumer characteristics and motivations between these two purportedly green innovations, and how these innovations can contribute to a greener future.

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