Paving the Way towards Sufficiency in Mobility

Promoting Cycling Through a Bicycle Subscription Service

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Abstract *This chapter explores to what extent Swapfiets, a bicycle subscription provider, can promote sufficiency mobility practices among users. Through social practice theory, we trace mobility changes attributable to the subscription model and to determinants beyond the firm's reach: external factors and related practices. We conclude with business and policy recommendations.*

1. Changing mobility practices for sufficiency

The way we produce and consume is highly unsustainable, leading to adverse effects on the climate, biodiversity and societal well-being (Wiedmann et al. 2020). This requires a transition towards sustainable levels of production and consumption in all sectors. Some suggest the need for a de-transition, for example, shifting back to car-free cities (Taillandier et al. 2023) or simpler lifestyles (Osikominu/Bocken 2020) for sustainability. To tackle the excessive use of resources through consumption behavior and related production, sufficiency is an important leverage point. Sandberg (2021) lists four types of consumption changes that can promote sufficiency: reducing absolute amounts of consumption, shifting consumption modes, increasing product lifetimes and sharing products. These changes can be operationalized in all sectors. In this chapter, we look into an example from mobility. Here, sufficiency could mean to "create a transport system that facilitates the highest quality of life possible while staying within the capacity of the environment to handle emissions" (Waygood et al. 2019: 56). This sufficiency can be promoted by travelling less often and less far, through a modal shift away from fossil fuel-based private transport, through extending the lifetime of vehicles and through using vehicles more intensively by sharing (Heisserer/Rau 2015; Sandberg 2021). Cycling can be considered a sustainable mobility practice and can promote sufficiency if it replaces less sustainable mobility practices. Changing mobility practices is eminently necessary

since the sector is estimated to cause around 24 per cent of global CO_2 emissions (Solaymani 2019).

Businesses can be key actors in driving sufficiency if they change their own production processes and influence their customers towards sustainable lifestyles (Bocken/Short 2016). To promote sufficiency in their customers' practices, they can implement sufficiency-enabling strategies, such as services to extend product lifetimes, reuse, sharing and leasing systems (Niessen/Bocken 2021), or actively promote sufficiency practices in their communications (Gossen et al. 2019; Niessen et al. 2023b). For mobility, businesses could promote less travel, a modal shift to low emission active transport, as well as increasing vehicle use through sharing and long lifetimes. However, despite the will of some businesses to promote sufficiency, it is unclear to what extent they can support such a shift.

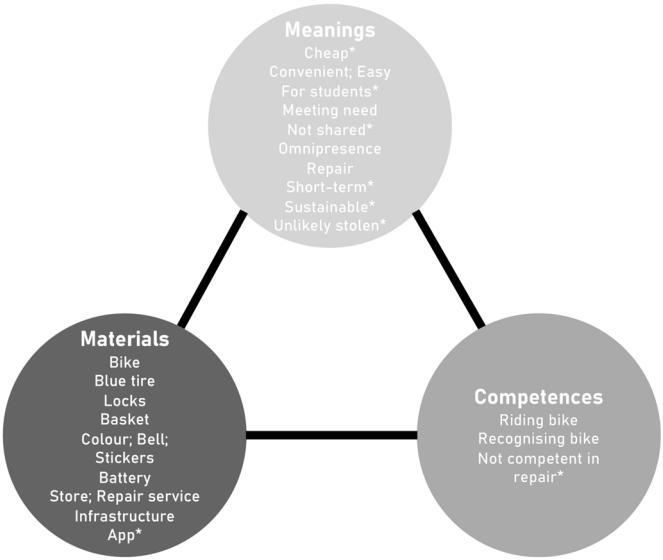
In Niessen et al. (2023a), we collected customer data from Swapfiets, a bicycle-as-a-service business that encourages its customers to use cycling as a transport mode. This data was used to understand to what extent the service can bring about a modal shift to cycling and support long bike lifetimes through better care. It showed that the bicycle subscription can increase the uptake of cycling and can also support the continuation of the practice after the subscription is finished. While the service was able to recruit practitioners to the practice of cycling, it also lost some again after the subscription period was up. In interviews, it was highlighted that the practice of cycling is highly dependent on external factors and other practices. In this chapter, we delve deeper into these interview data to further tease out these processes of practice change and other influences. We aim to answer the following questions: *To what extent can a bicycle subscription business promote sufficiency mobility practices amongst its users? And to what extent are these practices influenced by determinants outside of the business' control?*

A practice theoretical lens will be used to understand changes in mobility patterns through the bicycle-as-a-service offer. Practice theory focuses on the practices that humans perform rather than on individuals or overarching societal structures (Evans 2018). Practices can be understood as "a routinized type of behaviour" (Reckwitz 2002: 249). Mobility choices are usually habitual (Javaid et al. 2020), with few people consciously choosing different forms of mobility every day. Therefore, practice theory lends itself to analyzing transport and mobility transitions. Shove et al. (2012) developed a simplified practice theory model that consists of three elements: materials, meanings and competences. In this model, materials refer to objects, physical entities and technologies; competences to knowledge and skills; and meanings to symbolic meaning and ideas. The model will be used in this research to understand and illustrate practice changes.

A bicycle-as-a-service subscription is broadly consistent with the practice of cycling but holds some distinct elements that make it different from cycling a bike that is owned. Spotswood et al. (2015) analyzed cycling in the United Kingdom as

a social practice and identified relevant materials, meanings and competences. In Niessen et al. (2023a), we analyzed the practice of using a Swapfiets bicycle subscription through Shove et al.'s (2012) elements model (see Figure 1). While the materials were similar to conventional cycling practices, some were specific to the service, such as recognizable bicycle elements (e.g., blue tire) and business model structures (e.g., store). In terms of competences, users of the subscription did not see many requirements beyond being able to ride a bike. The meanings also largely focused on the perception of the business model (e.g., convenient) rather than cycling. There were some contested practice elements (marked with an asterix in Figure 1). For instance, interviewees disagreed on whether the bicycle subscription could be seen as sustainable. While some argued that any cycling was sustainable and that the business encouraged product longevity, others pointed out that owning a bike might be more sustainable. While the practice of using a bicycle-as-a-service is somewhat distinct from the practice of cycling, it is considered in the following as cycling to discuss the modal shift between different mobility practices.

*Figure 1: Practice elements of using a bicycle-as-a-service. * indicates disagreement among interviewees on item as part of the practice. (From Niessen et al. [2023a])*



A practice can expand by "recruiting" more practitioners that perform it (Shove et al. 2012). In mobility, this recruitment can imply a modal shift: "We can think about practices as competing to recruit practitioners, or to encourage defection from rival practices – for example from commuter driving to cycling" (Spurling et al. 2013: 28). By recruiting practitioners to the practice of cycling, these people likely defect from other mobility practices which they performed before. The practice of cycling can replace other forms of mobility, such as cars, public transport or walking. For sustainability considerations, it is important to note that public transport and walking can also be considered as sustainable forms of transport (as opposed to car-based private transport), so the best modal shift for sufficiency is away from car use towards cycling. To what extent such practice change can be brought about by one business is not sufficiently studied (Niessen et al. 2023a) and will be further analyzed here.

In the following, the case and the methods of data collection are introduced. Building on the data from interviews, we then look at the role of the subscription business and to what extent it has the ability to promote sufficiency, as opposed to the influence of determinants beyond the firm's reach. We conclude with business recommendations and policy implications.

2. Method

Businesses can promote sufficiency practices through various strategies. From the four generic ways of sufficiency mentioned above, businesses in the mobility sector may be most inclined to the latter three, i.e. sufficiency changes through modal shift, long vehicle lifetimes and sharing, rather than promoting reduced travel frequency and distance. Bicycle subscription business Swapfiets was used as a case study, since it was identified as publicly promoting sufficiency (Niessen/Bocken 2022) and allowed access to users through its channels. The business operates in several European countries and customers can join a bicycle subscription service for regular or electric bicycles. The user pays a monthly fee and is given a bicycle for their exclusive use. While the business retains ownership of the bike, users receive repairs, maintenance and a replacement if the bike is stolen. Swapfiets actively advocates for more cycling and less overall consumption through its communication channels, for instance in their "Consume less, Enjoy more" campaign (Niessen et al. 2023a).

To better understand users' mobility practices and what impacted them before, during and after their membership with the subscription service, interviews with customers were analyzed. These interviews partly overlap with the data in Niessen et al. (2023a), but, here, we include more details into the practice change that had not yet been unpacked. In March to May 2022, the first author conducted semi-structured interviews with Swapfiets users. These interviews took place in the local Swapfiets stores in Cologne (Germany), Leuven (Belgium) and Maastricht (Nether-

lands), as well as remotely through online or telephone calls. A total of 66 interviews were conducted, ranging from 1 to 9 minutes (short in-store interviews) and 12 to 27 minutes (longer interviews). Table 1 provides interviewee details per location. The interviews included questions about demographics, use of the vehicle, mobility patterns and how the service was perceived[1]. Interviewees were also asked about their mobility modes before the subscription, during and, hypothetically, after they might leave the subscription. Participants for longer interviews were then recruited through a printed survey in Cologne, Leuven and Maastricht, and an online survey sent to Netherlands-based users in which they could volunteer to join further research. Longer interviews used the same interview guide as short interviews but further elaborated on participants' answers, asking for motivations behind travel practices and perceptions. Participants in longer interviews were reimbursed by Swapfiets with a one-month voucher for their subscription (value up to €20).

Table 1: Interview sample used for this chapter

Location	Gender	Age range
Amsterdam		
Short interviews: 0	/	/
Long interviews: 4	3 female, 1 male	25–39
Cologne		
Short interviews: 18	8 female, 10 male	22–65
Long interviews: 3	1 female, 2 male	25–30
Leuven		
Short interviews: 13	3 female, 10 male	19–42
Long interviews:1	1 male	26
Maastricht		
Short interviews: 23	7 female, 16 male	18–57
Long interviews: 4	3 female, 1 male	19–26

All interviews were coded using thematic coding and patterns. For this chapter's focus, interview transcripts were coded deductively along the three stages of potential modal shift: mobility before, during and after the subscription. We also coded for the uses of the bike and potential external factors that might influence mobility changes. While overarching categories had been determined beforehand, new themes inductively came to the fore, such as infrastructural or geographic factors.

1 The interview guide can be found in Appendix B of Niessen et al. 2023a.

3. Findings

In the following, we present the results of the data analysis, trying to differentiate between the potential impact of the business in driving change towards sufficiency mobility practices and the impact of determinants outside of the control of the business.

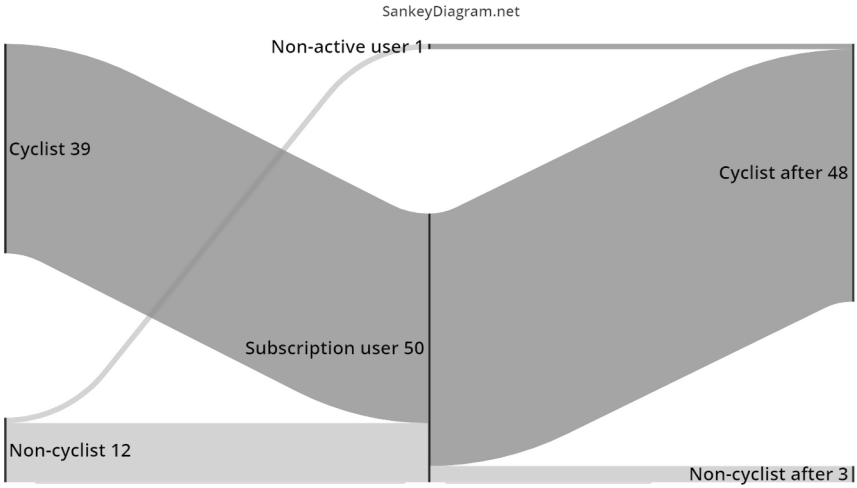
3.1 Joining the subscription

Recruiting people to the practice of cycling might entail a modal shift away from other mobility practices, such as cars, public transport or walking. Figure 2 shows the process flow of 51 of the interviewees in their cycling practices before, during and after the subscription.[2] Respondents were considered cyclists if they reported to cycle periodically (as opposed to rarely or never). As visible in Figure 2, all but one of the interviewees were active cyclists during their subscription[3], even if twelve of them did not actively cycle beforehand. Not all of these previous non-cyclists stated which form of transport they used instead but public transport and cars were common answers and also often combined. To better understand a potential modal shift from this to cycling, we can look at what recruited users to the practice.

2 While 66 people were interviewed, complete data for all three temporal stages was only obtained from 51 interviewees.

3 One subscription user did not actively use her bike while paying for the subscription because she found cycling inconvenient.

Figure 2: Sankey diagram of modal shift in cycling based on data from 51 interviewees. (Own illustration made with SankeyDiagram.net)



Interviewees were asked what made them join the subscription. In many instances, the subscription was taken up by people that had previously cycled but relocated to a new city. In those cases, the move to another place meant that it was more convenient to join the subscription than purchasing another (additional) bike: "My bike is in The Hague. So it's a bit too far to bring it to Maastricht. So we got a bike [subscription] here" (Maastricht, female, 18). These users did not experience a modal shift, since they moved from cycling with another bike to cycling with a Swapfiets.

Yet, there were also instances where the business offer brought about a modal shift to more cycling. Two of the interviewees that did not cycle regularly had owned bicycles but had not used them as a regular form of transport because their bicycles broke repeatedly or were difficult to ride: "I have a bike but it is relatively old and it is a relatively sluggish bike and it cannot get it to move. It is very annoying to ride it so I haven't used it much" (Translated from German[4], Cologne, female, 22). As such, these interviewees that did not relocate decided to take up cycling because of the provision of a well-functioning bicycle through the business.

However, for the ten other people that did not commonly cycle before, the move to another location made them take up cycling. This was mainly spurred by determinants beyond the Swapfiets offer, such as a new convenience for cycling and cycling

4 The interviews were conducted in English, German or Dutch. Where an original quote was translated into English, it is highlighted in the text.

being the norm. This interviewee had taken up cycling because distances were short compared to his home city: "[W]e have long distances there, so I use the car in Italy. I don't usually cycle" (Leuven, male, 30). Another incentive for change mentioned was the infrastructure for cycling that had not previously been available: "I didn't cycle at all because in my country, there's problem[s] with bike lanes. There is not enough of them, so I mainly use public transport […] or cars" (Maastricht, male, 19). All of the interviewees that did not actively cycle before knew how to ride a bicycle. Still, they often mentioned that it was not as common to cycle in their previous home as it was in their new location: "I knew how to cycle but I wasn't cycling daily. It wasn't really a daily thing in my country. So when I came here, I saw it's like an everyday thing and you don't walk, you just bike" (Leuven, female, 19).

3.2 Mobility during the subscription

The vast majority of subscription users were active cyclists during the time of the contract (see Figure 2). Only one interviewee did not actively use her subscription bicycle. In that sense, we can surmise that the impact of Swapfiets in promoting cycling as a sufficiency mobility practice was quite successful during the subscription. However, another finding was that cycling was often not the only form of transport that interviewees used during the subscription. This combination of mobility modes was created by determinants beyond the business offer.

While using the Swapfiets bike, most interviewees combined it with walking, public transport and car use. Walking as an addition was used for shorter distances. Public transport was seen as a popular alternative when cycling was uncomfortable, for instance because of strong winds or heavy rain: "Sometimes you have to go for work – 40 minutes biking – and it's a lot of wind […] or terrible weather, then I take once or twice the public transport" (Amsterdam, female, 27). Public transport also often complemented cycling for longer distances: "Normally, I use [the bike]. Sometimes I walk or go with [the] train if I am going far away" (Maastricht, female, 22).

During the time of the bicycle subscription, a considerable number of interviewees (almost a third) also owned cars or used cars they had access to through car sharing or borrowing. This would indicate that a potential modal shift to cycling did not always mean a shift away from cars. Cars were mainly used for the same reasons as public transport: for comfort and for longer distances. In terms of comfort, one car-driving interviewee describes the need to look fresh when arriving at important occasions: "Especially if I have something important to do, I take the car [so] that I'm not too sweaty because I get red very quickly" (Leuven, female, 21). For longer distances, interviewees also reported using cars, particularly when leaving the city. One recurrent reason for owning a car next to the bicycle subscription was if the interviewees had children. Taking them to childcare, school or other activities was not

something that these interviewees felt could easily be done by bike: "Of course, I use a car. It's a bit difficult [to cycle] with my kids" (Maastricht, male, 48).

The interviewees were asked what activities they would use their subscription bicycle for. Activities that the interviewer suggested included cycling to work or study, to meet friends, for free time activities, to do (heavy) groceries or for weekend trips. Almost half of the interviewees responded that they would use the bicycle for everything, particularly within the city and at short distances. Less popular uses of the subscription bike were weekend trips and heavy groceries. Weekend trips were mainly considered to be longer distance and the interviewees did not consider the bicycle a good form of transportation for that, also because the bike models in the subscription are more convenient for city biking: "I did buy a good trekking bike. So if I would go somewhere far away, I would take that one because my [subscription bike] doesn't have any gears" (Amsterdam, female, 27). While many interviewees used the bike for grocery shopping, there were some concerns with the weight of the shopping: "Sometimes I get [groceries] delivered because it's heavy to go by bike" (Maastricht, female, 19). The bicycle was commonly used for free time activities, such as meeting friends, but also to go to study or work. Many interviewees used it to commute and some also used it for their work as bicycle delivery drivers: "So I work 20 hours with that bike, and I could keep it with me at home. So […] I used it to go to university, to go around" (Leuven, male, 24).

Yet, cycling was rarely the sole means of transport and cars were often required for work purposes, as illustrated by this interviewee who owned two cars: "I need the cars for my work because I sometimes have to cover longer distances at 6am and I refuse to go by train" (translated from German, Cologne, female, 60). Sometimes, the materials required for other practices constrained cycling, for instance for one interviewee who had to transport work equipment: "But the problem remains that I have to transport things [for work]. Expensive equipment. And bike bags left and right would not be enough. I would need a real electronic cargo bike and that is not currently an option for me" (translated from German, Cologne, male, 30).

In addition, the interview data also brought up external determinants that influenced which mode of transport was preferred. Good cycling infrastructure, short distances and a cycling culture were named in 3.1 as enablers to joining the practice. There were also external barriers to cycling. Among these were topographical conditions (e.g., hilly terrain), long distances in widespread settlements and weather: "I specifically do not bike during the winters because it's too cold outside around that time and I don't want to take the headache. […]. Uphill roads, cold winds and super cold temperature outside" (Leuven, male, 26). Another barrier was the lack of appropriate cycling infrastructure that made users feel that cycling was not a safe practice in some places: "But tomorrow, if I move to Madrid, […] I don't think I would get [a bike] because it's not the main public transport. […]. You're just going to get killed on the road" (Amsterdam, female, 25).

3.3 Mobility after the subscription

Interviewees were asked what hypothetical form of transport they would use in the future if they were to end their subscription. In most cases, ending the subscription did not mean stopping the practice of cycling. Many interviewees indicated that they would continue cycling and purchase a bike of their own. This was the case for both the interviewees that cycled before the subscription and some that had only started cycling with the subscription bike. Yet, it would be difficult to attribute long-term cycling to the Swapfiets business offer, since interviewees did not state this was explicitly caused by their experience with the subscription provider. Oftentimes, interviewees rather mentioned that their modal shift was influenced by determinants beyond Swapfiets. This interviewee had come to the shop to return his subscription bike: "I've already bought my own bike. So I think I'll just give the Swapfiets back" (Maastricht, male, 19). He had not been an active cyclist before the subscription and reported this was due to a lack of cycling lanes in his home city. Since coming to live in Maastricht, he had taken up cycling and decided to buy his own bike to continue cycling[5].

Several other interviewees that were non-cyclists before the subscription stated that they would continue the practice of cycling even if they went back home: "Cycling is just really great. […]. I mean, depends really on the city. But I would say there's a pretty high likelihood I'd go back and cycle a lot. [Interviewer: Even in [your home country]?] I: Even in [my home country]" (Maastricht, male, 18). Before the subscription, this interviewee had used public transport because he found cycling in his hilly home city difficult. Therefore, he suggested that while he might cycle, he might get an electric bike. Similarly, another interviewee who had not cycled beforehand in his home city thought he might continue the practice if he went home but would have to adjust the bicycle to make it more convenient: "I'm going to see if I can put a motor in my bike over there. [Interviewer: An electric one?] Yeah." (Leuven, male, 29). Several interviewees that had been previous non-cyclists had joined the practice of cycling through the Swapfiets subscription and intended to bring it with them to other locations, even if sometimes in an altered form.

There were also interviewees that intended not to cycle in the future. Three of the interviewees that did not cycle before the subscription answered that they would probably not cycle regularly in the future. This was oftentimes related to cycling infrastructure: "It's about 15 kilometres or more and we haven't got many cycle lane[s]. So it would be also dangerous in some streets to go by bike" (Leuven, male, 30); and spatial planning: "Because of the rural location of my house, I will go back to driving a car" (Maastricht, female, 57). While only three interviewees stated they would not

5 The interviewee did not specify if he would continue cycling should he move to a city with less convenient cycling infrastructure, such as his home city.

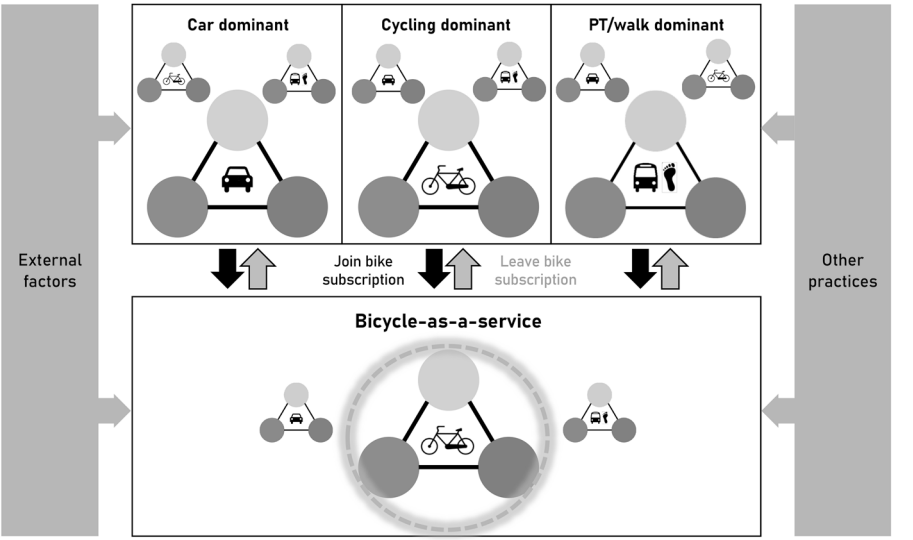
cycle after the subscription (see also Figure 2), it is important to note that several others were planning to use the bicycle much less and only as an additional form of transport. Even some interviewees that had been cyclists before the subscription stated that they would move away from biking as their main form of transport: "[F]or longer distances, of course, I would get a car. But if I can cycle, I would still do it" (Maastricht, male, 20). Sometimes, cycling was seen as a sport or free time activity in the future rather than a form of transport: "I feel all of these modes of transport serve very different needs but for leisure activity, for just aimless wandering, I would probably bike" (Leuven, male, 26).

4. Discussion

In this book chapter, we aim to answer: *To what extent can a bicycle subscription business promote sufficiency mobility practices amongst its users? And to what extent are these practices influenced by determinants outside of the business' control?* The Swapfiets user data provided some insight into this, graphically represented in Figure 3. In the upper half, there are practice configurations for mobility outside of the bicycle subscription, before and after. Mobility practices could be cycling dominant (i.e. mainly moving around by bike), but interviewees combined this with car driving and public transport or walking. Other interviewees had previous mobility configurations in which the car or public transport and walking were dominant, while cycling was still present to a small extent, often as a leisure activity. Upon entering the bicycle subscription (bottom half of the picture), all but one interviewee became active cyclists. However, when ending the subscription, there was also a "bounce back" into previous mobility configurations.

This research set out to understand the impact of one business – Swapfiets – that wanted to promote the sufficiency mobility practice of cycling. Through enabling a modal shift away from car-driving to cycling, the business could potentially support sufficiency practices. Interviews with customers showed that users of the subscription mostly cycled while they had the contract. In a few cases, the convenience offered by the Swapfiets service can be assumed to have promoted a modal shift to more cycling. Yet, as visually represented in Figure 3, the influence of Swapfiets on user behavior is largely limited to the time of the subscription (illustrated as a dashed circle). Even during the subscription, users employed a mix of transport modes, with many still using cars. Therefore, it is important to look at the second research question and the determinants beyond the business that influence mobility practices.

Figure 3: Graphical representation of mobility practice changes (note: PT refers to public transport).



In the interviews, two main other influences were identified: related practices and external factors. These seemed to play a large role in determining the mobility mix of users, as well as what mode of transport was chosen before and after the subscription. This is visually represented in Figure 3 through the blocks on the sides influencing the mobility mix before, during and after the subscription. Dillman et al. (2021) suggest that mobility does not fulfil an immediate need but is rather a means to reach activities and relationships. Mobility practices are therefore always dependent on other practices that they help accomplish (Kent 2021), making it important to understand "why particular trips are made – what other practices (e.g., shopping, working, other leisure activities) […] all these trips enable?" (Spurling et al. 2013: 29). The interview data showed that related practices, such as child-care, working or grocery shopping were sometimes seen as barriers to cycling.

The interviews also echo existing research on the factors that influence how high the modal share of cycling is in an urban area (Adam et al. 2020), here referred to as external factors, since they are external to the Swapfiets business offer. Adam et al. (2020) identified the following factors as influencing cycling: (1) cycle-conducive infrastructure, (2) policy programs to promote cycling, (3) an overall policy direction towards cycling, (4) exogenous factors (physical environment, spatial planning), (5) socio-cultural factors (cycling culture), (6) individual factors (attitudes and beliefs). The interview data reflected the importance of several of those when users decided whether to cycle or not, particularly (1) the infrastructure, (4) exogenous factors and (5) socio-cultural factors. Particularly, cycling infrastructure was often connected to

feeling safe when cycling. Safety concerns are one of the major deterrents in making more people take up cycling, as are comfort and convenience (Hull/O'Holleran 2014). These factors are largely beyond the influence of one business.

4.1 Practice change through a business offering

Swapfiets plays a role in paving the way towards more cycling. As Spaargaren (2003) points out: "When there is a high level […] of green provisioning, people are more or less brought into a position in which the greening of their corresponding lifestyle segment becomes a feasible option" (690). The business constitutes part of the provisioning in offering convenient access to cycling. An illustrative example of this was given by the two interviewees who had bicycles beforehand but did not cycle because the bikes were not well-functioning. Providing well-functioning, convenient access made cycling their dominant form of transport. Yet, the previous points in the discussion show clear limits to the influence that a business offer such as that of Swapfiets can have.

To extend its influence and promote sufficiency beyond its current reach, Swapfiets might be able to address some of the determinants beyond its control. Organizations that want to promote cycling need to understand interlinking practices, i.e. the practices that mobility is used for, to enable adoption (Hesselgren et al. 2020). The interviews showed that some activities were less frequently undertaken with the bike, for instance grocery shopping or longer distance journeys. The business could amend its offer to add bike storage bags to its subscription offer (currently, customers can add a basket for an additional fee). These would hold a larger quantity of groceries. For longer journeys, bicycles with gears are more comfortable. Swapfiets already offers these but at an increased price, which often makes users decide for the cheaper model. The price for these models could be adjusted, potentially seasonally, so that good weather cycling over longer distances can be done with a gear-model subscription bike. Another linked practice that stopped users from cycling was childcare. In the Netherlands, a common way of transporting children by bicycle is the "bakfiets", the Dutch cargo bike with space for seating in the front (te Brömmelstroet et al. 2020). Swapfiets might add this to their subscription offer in order to facilitate users cycling even if they have to take care of children. Similarly, electric bicycles might have a higher potential to replace cars (Bourne et al. 2020) and could be suitable for longer distances. Electric bakfiets or cargo bikes might also facilitate some practices that other bicycles would not, for instance carrying work equipment. Such diverse forms of cycling could be included in the Swapfiets subscription offer. Another potential way to support moving away from cars as a share of users' mobility mix might be to promote sustainable inter- or multimodal journeys, where several modes of transport are combined (Jonuschat et al. 2015). Combinations with public transport, such as bike-train trips, could replace car trips and seem mostly success-

ful if they are perceived as the best available option (Nello-Deakin/te Brömmelstroet 2021). Swapfiets could collaborate with public transport providers, for instance on ticketing, to make such combinations more attractive than car-based trips.

Even with these possible changes by the business, the practice of cycling is influenced by not just one actor (i.e. the bike subscription business) but also by other actors in the system, such as public bodies (e.g., roads, signage, rules of traffic) and wider society (e.g., a culture giving cyclists safe space on the road). Therefore, we provide some brief policy reflections below.

4.2 Practice change through policy

While the subscription business provides one entry point for cycling as a common practice, other parts are still missing. Policy can play an important role in (also literally) paving the way for more cycling. In Adam et al.'s (2020) assessment of the factors that influence cycling, infrastructure was identified as the most important leverage point. This includes both safe cycling infrastructure (pull factor), as well as infrastructure interventions that deter other forms of transport (push factors), specifically cars. Taillandier et al. (2023) similarly found that push and pull factors need to be combined to decrease car dependence in cities. As Shove et al. (2015) point out: "infrastructures embody and carry historically specific ideas about normal and appropriate ways of living, effectively transporting these from one generation to the next" (280). Therefore, building bicycle infrastructure cannot only foster a better system of provision but also influence cultural perceptions (especially because it reduces the association of cycling being unsafe). Cultural norms towards cycling are difficult to shake. In certain contexts, cycling is considered a form of mobility for the poor, while driving cars represents status (Steinbach et al. 2011). Policy interventions could target the perception of cycling to make active transport a desirable and easy choice, building up a cycling culture akin to the one in the Netherlands (Te Brömmelstroet et al. 2020), where even some prime ministers are fond of cycling to work (Whiting/Knowles 2019).

Other relevant policy measures include spatial planning interventions to increase population density, constrain car access and improve connections to public transport, as well as programs to promote cycling at different scales (Adam et al. 2020). Examples of these could be cycle training for schoolchildren or all new drivers (Hull/O'Holleran 2014). As pointed out by Hull and O'Holleran (2014): "promotion of cycling must involve more than physical infrastructure, it must integrate across policy delivery areas including spatial planning, transport, health and education" (385).

5. Conclusion

We need to transform societal practices towards more sustainable alternatives in order to stay within the boundaries of the planet. Sufficiency alternatives to the currently dominant car mobility include public transport and active transport, such as walking and cycling. In the case of Swapfiets, the business tried to promote cycling amongst its customers to reduce the use of less sustainable forms of mobility. This research highlighted the limited reach a business has in influencing its users' mobility practices. The subscription bicycle was used as the main form of transport by both previous cyclists and non-cyclists because it was considered convenient and easy. Yet, despite using a subscription bike, users often also used other forms of mobility, such as public transport, walking or cars. Therefore, the company's offering could not fully replace other mobility practices, including unsustainable ones. Furthermore, some users expected to move (back) to car use in the future. This expectation and the mobility mix of users were mainly influenced by determinants outside of the business offer, namely external factors (e.g., weather or cycling infrastructure) and related practices (e.g., travel for work or childcare).

Even though Swapfiets offers its services and uses its communications to promote cycling, there are factors that cannot be influenced by one company. We suggested potential avenues for the business to expand its influence beyond current reach. Still, policy intervention is required to promote cycling as the main form of transport. Variables such as local weather or topography cannot be changed by policy but the availability of cycling infrastructure, spatial planning and cycling culture can be targeted. While cycling might not be able to replace car use in all contexts, policy can help to build a supportive context that makes cycling the easy choice.

This research was subject to several limitations. Data was collected from users of only one business, which allowed for more depth, but limits the transferability of the results to other businesses. Future research could investigate different businesses, other sectors and localities. Another limitation was the hypothetical nature of future transport. Users were asked what form of transport they think they would use if they left the subscription. This could not be confirmed within the scope of this research, so future research could usefully employ a longitudinal approach or experimental design to support users' assessments of their future transport.

References

Adam, Lukas/Jones, Tim/Te Brömmelstroet, Marco (2020): "Planning for cycling in the dispersed city: establishing a hierarchy of effectiveness of municipal cycling policies." In Transportation 47, pp. 503–527. https://doi.org/10.1007/s11116-018-9878-3.

Bocken, Nancy M. P./Short, Samuel W. (2016): "Towards a sufficiency-driven business Model: Experiences and opportunities." In: Environmental Innovation and Societal Transitions 18, pp. 41–61. https://doi.org/10.1016/j.eist.2015.07.010.

Bourne, Jessica E./Cooper, Ashley R./Kelly, Paul/Kinnear, Fiona J./England, Clare/Leary, Sam/Page, Angie (2020): "The impact of e-cycling on travel behaviour: a scoping review." In: Journal of Transport & Health 19, 100910. https://doi.org/10.1016/j.jth.2020.100910.

Dillman, Kevin Joseph/Czepkiewicz, Michal/Heinonen, Jukka/Davíðsdóttir, Brynhildur (2021): "A safe and just space for urban mobility: a framework for sector-based sustainable consumption corridor development." In: Global Sustainability 4/e28, pp. 1–17. https://doi.org/10.1017/sus.2021.28.

Evans, David M. (2018): "What is consumption, where has it been going, and does it still matter?" In: The Sociological Review 67/3, pp. 499–517. https://doi.org/10.1177/0038026118764028.

Gossen, Maike/Ziesemer, Florence/Schrader, Ulf (2019): "Why and How Commercial Marketing Should Promote Sufficient Consumption: A Systematic Literature Review." In: Journal of Macromarketing 39/3, pp. 252–269. https://doi.org/10.1177/0276146719866238

Heisserer, Barbara/Rau, Henrike (2015): "Capturing the consumption of distance? A practice-theoretical investigation of everyday travel." In: Journal of Consumer Culture 17/3, pp. 579–599. https://doi.org/10.1177/1469540515602304.

Hesselgren, Mia/Sjöman, Martin/Pernestål, Anna (2020): "Understanding user practices in mobility service systems: Results from studying large scale corporate MaaS in practice." In: Travel Behaviour and Society 21, pp. 318–327. https://doi.org/10.1016/j.tbs.2018.12.005.

Hull, Angela/O'Holleran, Craig (2014): "Bicycle infrastructure: can good design encourage cycling?" In: Urban, Planning and Transport Research 2/1, pp. 369–406. https://doi.org/10.1080/21650020.2014.955210.

Javaid, Aneeque/Creutzig, Felix/Bamberg, Sebastian (2020): "Determinants of low-carbon transport mode adoption: systematic review of reviews." In: Environmental Research Letters, 15/10, 103002. https://doi.org/10.1088/1748-9326/aba032.

Jonuschat, Helga/Stephan, Korinna/Schelewsky, Marc (2015): "Understanding Multimodal and Intermodal Mobility." In: Sustainable Urban Transport 7, pp. 149–176. http://dx.doi.org/10.1108/S2044-994120150000007018.

Kent, Jennifer Lee (2021): "The use of practice theory in transport research." In: Transport Reviews 42/2, pp. 222–244. https://doi.org/10.1080/01441647.2021.1961918.

Nello-Deakin, Samuel/te Brömmelstroet, Marco (2021): "Scaling up cycling or replacing driving? Triggers and trajectories of bike–train uptake in the Randstad area." In: Transportation 48, pp. 3239–3267. https://doi.org/10.1007/s11116-021-10165-9.

Niessen, Laura/Bocken, Nancy M. P. (2021): "How Can Businesses Drive Sufficiency? The Business for Sufficiency Framework." In: Sustainable Production and Consumption 28, pp. 1090–1103. https://doi.org/10.1016/j.spc.2021.07.030.

Niessen, Laura/Bocken, Nancy M. P. (2022): "A Sufficiency Database as a Tool to Drive Sustainable Business Models." Presented at: New Business Models 2022, Rome, Italy.

Niessen, Laura/Bocken, Nancy M. P./Dijk, Marc (2023a): "The impact of business sufficiency strategies on consumer practices: The case of bicycle subscription." In: Sustainable Production and Consumption 35, pp. 576–591. https://doi.org/10.1016/j.spc.2022.12.007.

Niessen, Laura/Bocken, Nancy M. P./Dijk, Marc (2023b): "Sufficiency as trend or tradition? – Uncovering business pathways to sufficiency through historical advertisements." In: Frontiers in Sustainability 4, 1165682. https://doi.org/10.3389/frsus.2023.1165682.

Osikominu, Jessica/Bocken, Nancy (2020): "A voluntary simplicity lifestyle: Values, adoption, practices and effects." In: Sustainability 12/5, 1903. https://doi.org/10.3390/su12051903.

Reckwitz, Andreas (2002): "Toward a Theory of Social Practices: a Development in Culturalist Theorizing." In: European Journal of Social Theory 5/2, pp. 243–263. https://doi.org/10.1177/13684310222225432.

Sandberg, Maria (2021): "Sufficiency transitions: A review of consumption changes for environmental sustainability." In: Journal of Cleaner Production 293/126097. https://doi.org/10.1016/j.jclepro.2021.126097

Shove, Elizabeth/Pantzar, Mika/Watson, Matt (2012): The Dynamics of Social Practice: Everyday Life and how it Changes, London: Sage Publications

Shove, Elizabeth/Watson, Matt/Spurling, Nicola (2015): "Conceptualizing connections: Energy demand, infrastructures and social practices." In: European Journal of Social Theory 18/3, pp. 274–287. https://doi.org/10.1177/1368431015579964.

Solaymani, Saeed (2019): "CO_2 emissions patterns in 7 top carbon emitter economies: The case of transport sector." In: Energy 168, pp. 989–1001. https://doi.org/10.1016/j.energy.2018.11.145.

Spaargaren, Gert (2003): "Sustainable Consumption: A Theoretical and Environmental Policy Perspective." In: Society & Natural Resources 16/8, pp. 687–701. https://doi.org/10.1080/08941920309192.

Spotswood, Fiona/Chatterton, Tim/Tapp, Alan/Williams, David (2015): "Analysing cycling as a social practice: An empirical grounding for behaviour change." In: Transportation Research Part F: Traffic Psychology and Behaviour 29, pp. 22–33. https://doi.org/10.1016/j.trf.2014.12.001.

Spurling, Nicola/McMeekin, Andrew/Shove, Elizabeth/Southerton, Dale/Welch, Daniel (2013): "Interventions in practice: re-framing policy approaches to consumer behaviour." Sustainable Practices Research Group Report, 25.7.2023 (https://pure.manchester.ac.uk/ws/portalfiles/portal/32468813/FULL_TEXT.PDF).

Steinbach, Rebecca/Green, Judith/Datta, Jessica/Edwards, Phil (2011): "Cycling and the city: A case study of how gendered, ethnic and class identities can shape healthy transport choices." In: Social Science & Medicine 72/7, pp. 1123–1130. https://doi.org/10.1016/j.socscimed.2011.01.033

Taillandier, Chloe/Dijk, Marc/Vialleix, Martial (2023): "Back to the Future: "De-Transition" to Low-Car Cities." In: Future Transportation, 3/2, pp. 808–839. https://doi.org/10.3390/futuretransp3020046.

te Brömmelstroet, Marco/Boterman, William/Kuipers, Giselinde (2020): "How culture shapes-and is shaped by-mobility: cycling transitions in The Netherlands." In: Carey Curtis (eds.), Handbook of Sustainable Transport, Cheltenham: Edward Elgar Publishing, pp. 109–118. https://doi.org/10.4337/9781789900477.00023.

Waygood, E. Owen D./Sun, Yilin/Schmöcker, Jan-Dirk (2019): "Transport sufficiency: Introduction & case study." In: Travel Behaviour and Society 15, pp. 54–62. https://doi.org/10.1016/j.tbs.2018.12.002.

Whiting, Kate/Knowles, David (2019): "Why I ride my bike to work, by the Prime Minister of the Netherlands." In: World Economic Forum, 26.9.2019 (https://www.weforum.org/agenda/2019/09/why-i-ride-my-bike-to-work-by-the-prime-minister-of-the-netherlands/).

Wiedmann, Thomas/Lenzen, Manfred/Keysser, Lorenz T./Steinberger, Julia K. (2020): "Scientists' warning on affluence." In: Nature Communications 11, 3107. https://doi.org/10.1038/s41467-020-16941-y.