

Give car-free life a try: Designing seeds for changed practices

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Abstract: For sustainable practices to emerge, they have to be tried out. In the design intervention A Car-free Year, we studied the particularities of three families' changed practices. With a collaborative mind-set, the practices' constituting elements were analysed, and their intertwined links followed, forming possible design concepts. When designing these seeds for changed practices, we have found, through the knowledge gained from the participants' different perspectives, possibilities to design initiatives that could enable more people to live car-free. We believe that designing enabling ecosystems, where all types of elements encourage sustainable practices, can be an important role of sustainable design. Furthermore, design research can challenge existing societal norms, as clearly revealed in this project, and consequently inspire more people to make sustainable lifestyle choices.

Keywords: sustainable design; practice-oriented design; service design; collaborative design.

1. Introduction

Sustainable design embraces many different aspects, from design activities forming concrete physical products, to shaping intangible abstract values. Central to design is the creation of futures and how things ought to be (Simon, 1996), whereby the notion of change is inherent. With this immanent power of design, there are great potentials for designers to support the necessary transformations of human behaviour. As we have entered the Anthropocene (Crutzen & Stoermer, 2000), the era in Earth's history when humans' effect on the planet has created a new geological epoch and humanity in itself has become a global force changing the planetary systems, there is an urgent need to accomplish change at many different levels, enabling life on this planet to remain within the planetary boundaries (Steffen et al., 2015). Sustainable design has to acknowledge the tight interconnections between economical structures, social situations as well as the ecological status of the planet.



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Humans, and humans' actions, are woven into the ecosystems of the planet, hence peoples' behaviours and practices are necessary to address.

Within sustainable design research, there are many examples addressing human behaviours and social practices. A lot has been done relating design opportunities to understandings of sustainable behaviours (Strömberg, Selvefors, & Renström, 2015) and research has also been carried out taking a practice-oriented design approach (Kuijer, 2014; Scott, Bakker, & Quist, 2012). The practice turn in, for example, social sciences, philosophy and humanities, as a focus on what people do (Stern, 2003), suggests that design could pay closer attention to activities. Furthermore, it is not enough to focus on persuasions of the individual (Brynjarsdottir et al., 2012) and their activities. The complexities of broader sociocultural practices also need to be taken into account in order to understand possibilities for sustainable practices.

We applied this broad perspective of wanting to understand the intertwined practices in peoples' everyday lives to the case of transportation in families with children. With the aim of identifying possibilities for design to contribute to changing transportation practices, we carried out a one-year design intervention: A Car-free Year. In this research project, three families with children substituted their cars for light electric vehicles for a trial-period of one year (see Figure 1). The project was set in Stockholm in Sweden, with challenges such as different weather conditions depending on the seasons and winter months including darkness and snow. With this project, we aim at bringing the situated knowledge from the participants into design possibilities of what future sustainable lifestyles could be like if more families made the same choices. The project was set in a large city, rather than on the countryside, for two main reasons. First, living car-free can be a possibility for many residents in cities where public transport is readily available and well functioning. Second, it is in big cities, where congestions negatively affect CO₂-emissions, that the benefits are greatest. With compact light electric vehicles, the footprints, both in terms of emissions and physical space, are drastically reduced.

This paper presents the project set-up, applied methods, results from the participants' changed practices and how these were used as a basis for analysis and design activities. Together this contributes to increased understanding of how design can be part of transforming peoples' everyday practices. More specifically, we identify design seeds for trying out and growing sustainable transportation practices, relevant for designers and city planners, as well as researchers of several different disciplines. Additionally, by taking advantage of the role of design research to question existing societal norms, some of the car norms the car-free families faced were revealed and examples of how design can challenge such norms are discussed. Hopefully this can provoke and inspire others to further investigate changes needed to encourage more to make sustainable choices.



Figure 1 Examples of the participating families' light electric vehicles. Top left is the scooter, top right is the four-wheeled motorcycle, bottom left is one of the box bikes and bottom right is the bike.

2. Method

A combination of research method approaches inspired by participatory action research and practice-oriented design has been used in the project. This interventionist approach, described as “into the wild” (Brown, Reeves, & Sherwood, 2011), including both us as researchers and the participants, has aimed at investigating and understanding car-free transportation practices. We have also focused on collaboration, since that can be a way to create the social innovations needed for a future sustainable society (Manzini, 2015).

By using practices in everyday life and their constituting elements as the basis for the analysis, possibilities for sustainable design can arise (Kuijer, 2014; Shove, Pantzar, & Watson, 2012). Practises are routinized activities carried out in everyday life where several elements are connected to each other (Reckwitz, 2002). A practice has sets of actions and is linked to rules and structures (Schatzki, 1996). These fundamentals of practices are drawn on by Shove, Pantzar & Watson (2012) and defined as constitutions of elements, integral to the enactment of practices. The types of elements suggested are divided into material, meaning and competence. Material refers to tangible objects and technologies related to a practice, meaning refers to shared symbolic meanings, and competence refers to individual skills and knowledge used in a practice.

2.1 One year of car-free living: project set-up

The project “A car-free year” had three phases: a preparation phase before the trial year, a one-year period during which three families lived car-free and finally a design phase where the knowledge gained from the families’ experiences was developed into design concepts.

The project was set up with three car-owning families with children in Stockholm, Sweden. The families were recruited on the project’s Facebook page and in Facebook flows targeting people with sustainability interests. After 11 interviews, out of 74 applicants, the three participating families were selected not only through the requirements of owning a car, having children living at home and living in the urban region of Stockholm, but also in order to cover a mix of challenges that could be faced when living without a car. We selected families to cover apartment households as well as those living in detached houses, single parents and two-parent families, families living in the centre and suburbs, and families with children of different ages. Furthermore, there was also a range of previous car use: from everyday work commuting, to regular evening and weekend activities, and to the occasional weekend and evening activities including holiday journeys (see Table 1).

Table 1 The three participating families, their living situations and vehicle usages.

Families	Housing and area	Family members	Electric vehicles (monthly fee)	Previous car use
Family 1	Detached house in suburb	Mother, father, three children (aged 8 – 15)	1 four-wheeled motorcycle (€240), 1 scooter (€80), 1 bike (€50)	Daily for work (mother). Regularly for family activities. Occasionally for renovations.
Family 2	Apartment in suburb	Mother, three children (aged 11 – 13)	1 three-wheeled box bike (€70), 1 bike (owned by the family)	Regularly for evening and weekend activities. Visit summer house during holidays.
Family 3	Apartment in centre	Mother, father, three children (aged 2 – 9)	1 three-wheeled box bike (€70), 1 two-wheeled box bike (€70)	Occasionally for evening and weekend activities. Visit summer house during weekends and holidays.

For the three families, the car-free year started in October 2014. Each family rented, through the project, a mix of light electric vehicles suitable for their own needs. The vehicles included scooters, four-wheel motorcycles, box-bikes and bikes (see Figure 1). The families paid a monthly fee, which included vehicle maintenance and expert advice on appropriate equipment for the vehicles and themselves. During the year, the families were allowed a maximum of 24 car trips, at their own expense, with taxi or rented or borrowed cars.

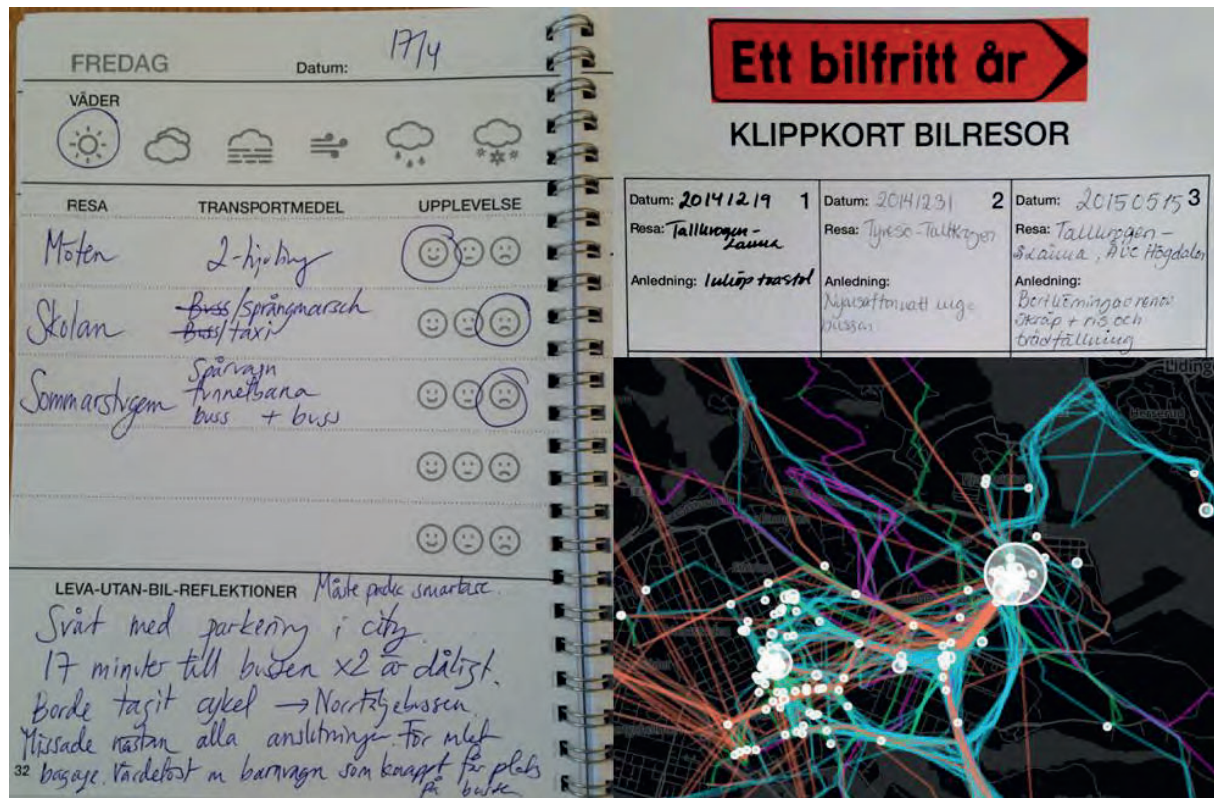


Figure 2 Trigger material used in the interviews: a trip diary (left), the 24-car-trips card (top right) and a visualisation of trips colour coded by transportation mode (bottom right).

Once a month, throughout the year, we interviewed the families in their homes. Two researchers attended each interview, where one was in charge of the interview and the other took detailed notes. Audio was recorded to support the notes. Prior to each interview, the families had a “log week” when they took notes of all the trips made and described their trip-related experiences and reflections of car-free living (see Figure 2). In addition, the parents used the smartphone app Moves¹, which automatically tracked their trips including the different transportation modes. This data was visualised on a map with the connected app Move-o-scope² (see Figure 2). Both the trip visualisations and the diary notes were used as probes to trigger discussions in the interviews. Other probes were a “24-car-trips card” where the families logged and counted the car trips they made (see Figure 2) and photos the families had posted on the project’s Facebook page. The contextual interviews were also

¹ <https://www.moves-app.com>

² <https://app.moveoscope.com>

useful for observing practical arrangements in the home related to the new vehicles and other physical manifestations of new practices.

2.2 Tools for analysing and packages of insights for design inspiration

We analysed the data gathered throughout the year with a practice theory lens. In the first step, the families' positive and negative experiences of car-free living were identified and divided into practical or emotional. As a second step, to gain a broad understanding of the elements of car-free living, we used a modified version of the Contextual Wheel of Practice, COWOP (Mose Entwistle, Kruse Rasmussen, Verdezoto, Brewer, & Schaarup Andersen, 2015). The COWOP builds on Shove et al.'s (2012) division of elements into the materials, competences and meanings with an addition of two dimensions: *physical to abstract* and *individual to shared*. In our modified version of COWOP, we used the following four types of elements of practices as grounds for possible design interventions: personal materiality, individual knowledge, distributed infrastructure, and shared values (see Figure 3).

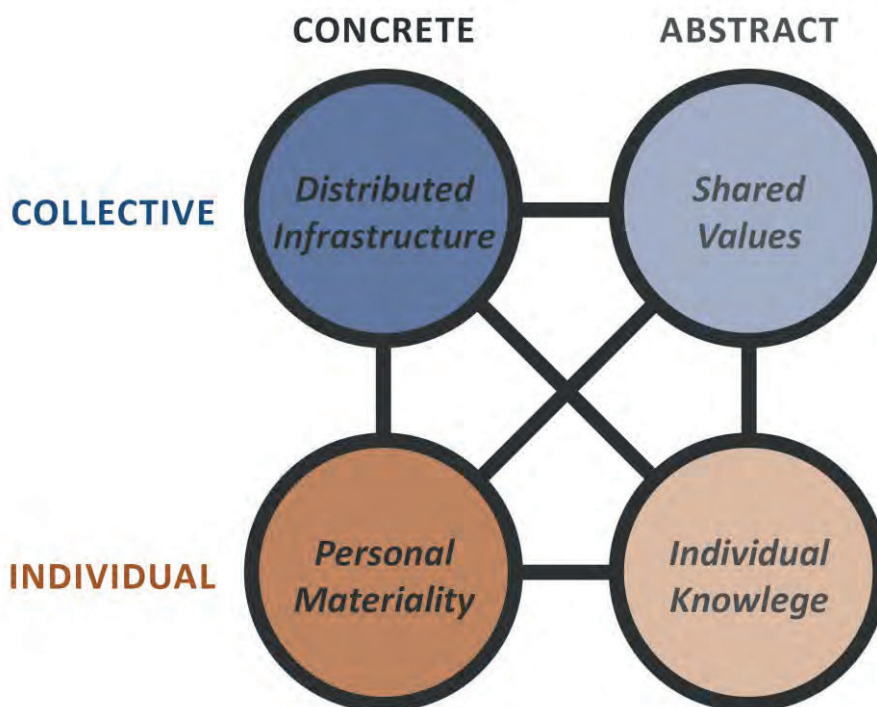


Figure 3 The four different types of elements of practices and their relations to the dimensions: concrete to abstract, and individual to collective.

This two-step analysis was condensed into a workbook where key insights were brought together with relevant images to create a well-informed and creative design brief. The workbook was presented to a design agency that was brought into the project as design practitioners complementing the design researchers and as a collaborative partner. Other collaborations included workshop sessions involving the design researchers, the design practitioners, the participating family members and various mobility experts. The workbook

material was digested, distilled and further developed into a number of design concepts suggesting possibilities for car-free living in Stockholm.

3. Changing practices

The three families had previously used their cars mainly for three kinds of purposes with different frequencies: daily transportation to work, regular transportation to various evening and weekend activities and occasional transportation (including going to summer houses) during weekends and holidays. Various practices in all these situations changed during the car-free year and the participants clearly adopted new practices, including new elements of practices, in order to still get to work, manage various evening and weekend activities and enjoy time in their summer houses. In this section, a selection of the results of these three categories of changed situations are presented and commented upon in terms of practical and emotional challenges and benefits that occurred. Furthermore, these examples of new practices are related to four different types of elements: personal materiality, individual knowledge, distributed infrastructure and shared values (see Figure 3). The selected examples are also summarised in Table 2.

Table 2 Examples of new practices replacing the previous three car situations of different frequency, related to the four different types of elements.

Previous car practices	Personal (near) materiality (personal items)	Individual knowledge (competences/skills)	Distributed infrastructure (shared objects)	Shared values (meanings/images)
Daily commuting travels to work	<ul style="list-style-type: none"> - Mastering new electric vehicles. - Winter equipping bikes & people. - Getting services and maintenance. 	<ul style="list-style-type: none"> - Acquiring winter biking knowledge. - Finding suitable routes. 	<ul style="list-style-type: none"> - Utilising dedicated bike lanes. - Benefiting streets with less traffic. - Exploiting well-maintained roads. 	<ul style="list-style-type: none"> - Dealing with feeling different.
Regular evening trips for activities	<ul style="list-style-type: none"> - Having a valid ticket. - Ridesharing through online tool. 	<ul style="list-style-type: none"> - Finding the way. - Utilising time while travelling. - Identifying whom to ask for a ride. 	<ul style="list-style-type: none"> - Using working public transport. - Using failed public transport. 	<ul style="list-style-type: none"> - Tackling inability to help. - Being concerned of bad parenting.
Occasional journeys during weekends & holidays	<ul style="list-style-type: none"> - Online shopping at summer house. - Acquiring a shopping trolley. - Online shopping for renovation. 	<ul style="list-style-type: none"> - Finding & keeping track of timetables. - Learning how to pack (also bulky). - Planning where and how to go. 	<ul style="list-style-type: none"> - Sharing transport distribution for home delivery. 	<ul style="list-style-type: none"> - Coping with owing someone.

Since the car-free life affected many practices, the results presented in this paper do not give a complete picture of the families' new practices. Instead, we give a few examples of everyday practices and highlight the close relationships existing between the different

elements included in these practices. Furthermore, the results pointed out are those where changes occurred because the participants tried out new things and where new practices were settled during the year.

3.1 Daily commuter cycling to work

For one of the adult participants the car-free year meant new practices of daily work commuting by bike instead of car. Three of the adult participants started new commuting practices including the use of electric box-bikes instead of public transport, cars and regular bikes.

In order to adopt new commuter cycling practices, both by regular bikes and electric box-bikes, a number of elements had to be in place. As examples of *personal materiality* elements, the new vehicles had to be mastered both in traffic and when parking. The box-bikes are rather large and tricky to handle, and some time was required before the positive experiences exceeded the negative. Since some family members biked all year around, including in the cold and dark winter months, they also had to learn the necessary elements of winter biking practice. Consequently, the participants had to both acquire new *individual knowledge*, including learning about suitable winter gear for the bikes (winter tyres and strong bike lights) and themselves (protective clothing), as well as get hold of the materials and services needed to fit them, i.e. other *personal materiality* elements. This combination of skills and stuff, including services such as maintenance, proved essential to adopt winter biking practices. The participants felt somewhat uncomfortable at the beginning of the winter months, but the provided support made them try winter biking and eventually they felt more and more comfortable with the new practices. However, in one of the families, after a bike accident, winter biking was given up for some time.

A comfortable cycling practice also meant that the participants had to obtain *individual knowledge* related to finding suitable routes. This included knowledge about where to find dedicated bicycle lanes, streets with less traffic and well-maintained bike roads (also during snowy winters). These elements of *distributed infrastructure* needed to be in place in order for the cycling practice to feel secure and pleasant.

When being a bike rider, as opposed to a car driver, there were many examples of how the participants felt out of place in situations where the car is a norm. These *shared values* are perhaps the most difficult to change, but possibly also the most important. In the project, the participants found their own strategies for how to deal with being different.

3.2 Regular use of public transport – for the children

For almost all of the participating children, the car-free year meant that they had to transport themselves more on their own. During the previous year, they were mostly driven to their regular sports activities by the parents in their cars. When living car-free, the families, including the children, had to acquire new practices for how to get around in the

city. As a result, most of the children started to use public transport on their own, without accompanying parents.

For the children to learn how to use public transport on their own, many new elements had to be obtained. They had to make sure to have valid tickets and find their way without getting lost, as examples of *personal materiality* and *individual knowledge* that had to be obtained. Finding your way is also connected to the elements of *distributed infrastructure* and the children's new transportation practices were particularly challenging when infrastructure failed (e.g. the tube suddenly stopped or the bus did not arrive on time). As the children tried public transport out, found their way and sorted out the occasional problems, they became more confident and eventually found it normal to travel on their own. With the children's increased confidence, also the parents felt more secure. However, there were situations when the parents asked themselves if they were doing the right thing.

The children also found ways to enjoy, or make use of, the trips by public transport: they listened to music, read books or did their homework. These added practices made them feel all right with the fact that the trips sometimes took considerably longer by public transport than by car. Also, when the parents did not spend time driving their children they, to some extent, had better possibilities to have dinner ready when the children arrived home, which all family members appreciated. All these activities can be seen as elements of skills and *individual knowledge* that were acquired and even though some inconveniences aroused, the new practices also had benefits.

One of the children's sports teams used an online tool for ridesharing as part of a digital platform being used for signing up for activities. This tool can be seen as an element of *personal materiality* (a technology and a service), as well as an element of *individual knowledge* (e.g. when someone needed to identify whom to ask for a ride). It can also be seen as an element of *shared values* as it reinforces the car norm by suggesting that the children should be driven to activities in cars. There were also more sensitive examples of *shared values* being challenged when the parents felt concerned that other parents would consider it bad parenting to let the children travel alone by public transport.

3.3 Occasional weekend and holiday journeys – or renovating the house

During the previous year, two of the families used their cars to get to their summer houses, one family more frequently than the other, as their summer house is closer to Stockholm. The third family, without a summer house of their own, used their car for occasional home renovation projects during weekends and holidays, but also for visiting friends all over the country. For the car-free year, new practices had to be obtained for all of these situations.

Learning how to use public transport to get to the summer houses was considered a challenge in the beginning. Examples of these elements of *individual knowledge* were: finding, and keeping track of bus times; packing food and clothes to last for the whole weekend, but at the same time being able to carry the luggage between the family members; and transporting large and heavy items. One family made use of the service of

ordering food online with delivery in their local store, near to the summer house, as a way to minimize the transportation need. This service can be considered a *personal materiality* element connected to the products (the groceries). Another example of this type of element is the trolley the family acquired for easier transportation of goods. One of the experienced benefits when using public transport, as opposed to the car, was the discovery of the different family members being able to travel to and from the summer house at different times. When using a car, everyone had to leave at the same time, but without a car the various individual needs could easier be fulfilled.

The occasional holiday trips had similar challenges as the summer house travels, when performed without cars. Transporting the whole family, including all luggage and necessities, required considerable planning skills, including not only how to deal with the specific situations (for example how to bring bulky toilet paper and beddings) but also deciding on where to go and how to move about once there. Previously with the car, these aspects were nearly non-relevant, but without a car they became high priorities of the holiday planning. All these can be seen as elements of *individual knowledge*, where new competences had to be obtained by the participants. Other interesting examples of this type of element are the positive emotions several family members' travel experiences revealed. Travelling together on a train, all family members had possibilities to enjoy the trip, even those who would normally drive. Sitting facing each other, as can be normal on a train, encouraged more conversations and the travel time spent together was valued more.

Another example of when occasional transport needs emerged, was during renovation projects two of the families carried out. In these cases many new elements of practices had to be acquired. The families experienced that it was quite easy to order, and receive, new products and materials online. For example, buying white goods was simple and ordering wood panels was a straightforward business. However, second-hand shopping of furniture through various online platforms was a lot more difficult as home-delivery was not included in these services. Furthermore, when wanting to get rid of leftover materials or scrap, there were hardly any services to find. The services of transporting stuff to and from the homes can be considered both as elements of *personal materiality* as well as *distributed infrastructure*.

It is interesting to note how normal it has become during the last few years to order food and materials online for home delivery. It is also interesting to pay attention to the lack of normality, and lack of services provided for transporting scrap. When no monetary streams exist, there are fewer business potentials and hence not so many companies ready to help. At several occasions, the families had to ask relatives, friends or colleagues for help to transport their stuff away from home. Some of these were happy to help, gladly offered their cars as enablers, which potentially made the lender feel better about their own car ownership. At other times, the participants felt uncomfortable about having to ask for help, leaving them with a feeling of owing the lenders something. The *shared values* in society, the norm of owning a car, had in these circumstances to be overcome and the families had to

learn to cope with the discomforts and insufficiencies through individual strategies ranging from embracing the rebellious challenger role to brushing it off with humour.

4. Designing seeds for change

In this section we present some design seeds nurtured through the insights from the analysis of the elements of changed practices. By suggesting these design possibilities we aim to spark imaginations of sustainable lifestyles. Furthermore, we plan to use these design concepts as tools for dialogues (Sennett, 2012) and inspiration in future collaboration activities with local politicians, authorities and organisations. It is clear that collaborative efforts at many different levels will be required in order for more people to live car-free.

With our interventionist approach, the “configurations” (Suchman, 2012) of the families’ transportation means were altered and their practices were changed. The light electric vehicles are research “devices” (Lury & Wakeford, 2012), different from the families’ prior cars, brought into their lives by this research project and, by trying them out, a number of new practices emerged. Following how these provided “links” are enacted upon (Law, 2004), we can better understand possibilities for change. Apart from the vehicles, support and services were also included in the trial set-up. These intangible assets proved essential to take the families through the car-free year. Following these insights, several embryos of design possibilities with regards to encouraging people to try new things out, were generated in the project, where not only new elements of personal materiality (such as vehicles and equipment, including services), but also access to individual knowledge (like planning skills) were included. Distributed infrastructure (for example bike lanes and public transport) and shared values (challenging the car norm) were also addressed in the proposed design possibilities.

4.1 New try-out vehicle schemes

One suggested design concept, where several design seeds are surfaced, is to initiate, implement and communicate try-out schemes with electric vehicles and bikes provided by for example employers. Included in the trial-periods, services directly related to the physical vehicles allied with expert advice, should be provided. This could mean collaborations between shops where vehicles are sold and serviced, and companies and organisations wanting to promote sustainable lifestyles. Retail shops can value from this by developing their business more sustainably, where new revenue streams can arrive from services sold, complementing products merchandised. Companies and organisations can benefit from this in many different ways, where intangibles such as goodwill and employees’ wellbeing can be generated but also concrete benefits like fewer required parking spaces. Employees can take advantage of discovering new sustainable practices in easy and non-committing ways. Once tried out, together with added skills and knowledge, new habits have a chance to settle. When tried together with others, and with local support, it is also easier to break norms.

Furthermore, municipalities and authorities can lead the way to sustainable practices by not only adhering to schemes for their employees' private usage, but also by professional use of different vehicles in their practices, such as inner-city policing by electric bikes or caretaking of the elderly using electric four-wheeled motorcycles. Questioning given norms and invisible societal structures should be important purposes of politicians and governmental agencies.

4.2 Further design possibilities

Elements of practices can be addressed using suitable design specifics, for example communication skills when designing infrastructure or service design thinking when approaching materiality. We believe that by taking a practice-oriented design approach (Scott, Bakker, & Quist, 2012), using a deeper understanding of all the types of elements needed for new practices to emerge, paths between the nodes can also be provided. By responding to actual social innovations taking place, and understanding how radicals solve their particular problems, structures of pathways can be provided.

The three families in the study, as well as many of the families who applied to the car-free year, expressed a desire to live car-free and had in many cases already a limited car use. However, they were unsure how they would manage without owning a car and were hesitating to make the leap to sell it. In some situations it can be easier to make such a leap, for example when the car is old and need to be replaced, when moving or when life changes in other ways that affect everyday practices. We see design opportunities in understanding and intervening at these "tipping points" in life, as a way of supporting transitions towards more sustainable practices.

It is not unusual that local authorities and state agencies focus their efforts on the development of the physical infrastructure. In Stockholm a number of cycling initiatives have been carried out aimed at increased bike use. However, these initiatives neither include electric nor box bikes and their particularities. As we have seen in this research project, there are many opportunities to support these alternative vehicles. Infrastructure plays a fundamental role, but their mere existence is not enough to make people change transportation practices. The communicative design aspects of infrastructure also need to be elaborated with explicit and evident gestures clearly showing, for example, cyclists that they are cared for in the traffic.

Other physical materiality also includes products where many design possibilities exist, for example related to improved design of the light electric vehicles. By also embracing services, creating well-functioning product-service-systems, focus can be shifted from consuming artefacts to experiencing use values and consequently facilitating the creation of sustainable solutions (Manzini & Vezzoli, 2002). We have identified many readily available service design opportunities in the car-free year project. It can be easier to get people to try unknown products, and practices, if the required services are included in the offer, hence facilitating pleasurable user experiences.

At the more abstract level, acquiring additional knowledge and novel skills have proved essential in order to change practices. When trying new things out, one has to learn to master the materiality but also obtain practical information about how and where to move. New meanings have to be made when individual values are to change, connecting abstract with real. We can in this research project see the potential of design, not only its optimisation of functionalities but also in its meaning-making role (Manzini, 2015).

Finally, and most importantly, as we have repeatedly encountered in this one-year design intervention, questioning the car norm is difficult. The development of individual strategies to deal with emotions of being different and insufficient is necessary to cope with the emerged inconveniences. New shared values need to replace old ones, and reinforcements are required for them to bite. In this transformation, we believe, there are many design, and design research, potentials.

5. Sowing the seeds

For seeds to grow they have to be set in the ground. Unless planted, they never stand a chance to flourish, but once deployed, given the right soil, surroundings and resources, their roots can branch out and grow to strong and vivid structures. Changing everyday practices is difficult. Unless planted, they do not stand a chance to even emerge. But once attached, they can, just like seeds, settle and sustain. However, just like any resilient ecosystem, diversities, flexibilities and fruitful collaborations between all involved agents, have to exist. In the planned continuation of this research project, we aim at further study necessary co-operations and suggest more design possibilities for new sustainable practices to emerge and establish.

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