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Developing B2B electric car sharing as a sustainable mode of work travels. A community-based affordances perspective

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ABSTRACT

A combination of business-to-business car sharing and electric cars—shared electric cars (SECs)—has the potential to significantly reduce emissions from local travels during work time in organisations. In this paper, we analyse the uptake of SECs in two communities of mobile workers in Norway based on a combination of community of practice and affordances theories. The term community-based affordance is coined to describe how new mobility technologies are enacted and made sense of in the community, leading to transformations in work and mobility practices. Five community-based affordances are located for the SEC-system as follows: replacements of private cars, customised use of vehicles, rapid reimbursement, co-riding to meetings and commuting mode reconfigurations. Together, these affordances indicate how an SEC-system can contribute to the development of sustainable mobility practices in enterprises with many mobile workers.

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1. Introduction

The ongoing and accelerating climate crisis represents a challenge for enterprises in most businesses, and such businesses are increasingly met with demands from public authorities, business partners, non-governmental organizations, employees and customers to improve. With an increased demand for corporate social responsibility in the last three decades, there has been growing interest in the development of organizational practices and policies that are more ecological, sustainable and socially responsible (Banerjee, 2011; Berkhout, 2012; Lozano, 2008; Whiteman et al., 2013; Wittneben et al., 2012). In the context of transportation, commuting activities and long-distance business travels are major sources of emissions for many enterprises, and the potential for improvement via reductions in greenhouse gases (GHGs) and urban pollution in these fields is significant (Beaverstock & Budd, 2013; García-Mira et al., 2017; Gruyter et al., 2016; Gustavson, 2012). Currently, there is rich literature on commuting issues that addresses various sub-themes and cuts across multiple academic strands (Dong et al., 2015; Modarres, 2017). However, one field that has received less attention is employees local mobility during work hours, here called *work mobility* (Hislop, 2013; Holley et al., 2008). This may include employees' trips to meetings, observations in the field, service assignments, visiting customers and other assignments during the day. These types of trips are often regular occurrences, and they constitute a

large share of the daily traffic in most city regions. Evidence from three Norwegian cities has suggested that as much as 15–30 per cent of daytime traffic is related to mobility among crafts and service businesses (Denstadli et al., 2014).

Recently, two mobility-based innovations seem to have had good opportunities to trigger a shift to green work mobility: First, the growing *electrification of the car fleet* is allowing electric cars to gradually replace fossil vehicles, and the electric mobility fleet is expanding at a rapid pace (Figenbaum, 2020; Xue et al., 2021). Norway has become the world leader in terms of number of electric cars per inhabitant and 2018 alone 49.1% of the new cars registered in Norway was electric. For the EU-region the number of electric vehicles of all sold cars is around 5.5% (Maciejewska et al., 2019). Second, there is an increasing appetite for alternative forms of consuming car-based services, such as *car sharing*, whereby registered members of an organization or platform can rent and operate vehicles on a self-access basis for short- and medium-term use (George & Julsrud, 2019). The oldest form of car-sharing, cooperative or business-to-consumer (B2C), include arrangements where a car-sharing organization owns a fleet of cars that are accessed by members on a short time basis¹. An adjacent model is *business-to business car sharing* (B2B) where car sharing services are offered by a car sharing provider to a public or private sector enterprise, to be used by their employees during work hours. Since the turn of the century, the use of car sharing services has grown rapidly in Europe and the U.S (Amatuni et al., 2020), and there is a fast growing literature

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¹More recently a peer-to-peer (P2P) service model has emerged, in which consumers rent out their own cars to other consumers through a two-sided platform operated by a coordinating carsharing organization (Shaheen et al., 2021). This type of car sharing will not be considered in this paper

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exploring the impact of B2C car sharing on travel patterns, urban development and CO2 emissions. (Ferrero et al., 2018; Mattia et al., 2019; Shaheen & Cohen, 2013). As for B2C-car-sharing services there are now more than 2.1 million users and 31,000 vehicles in Europe. In Germany, the largest market for car sharing in Europe—the number of users has increased from 0.26 million in 2012 to 1.29 million in 2020 (Roblek et al., 2021). Although the literature on B2B car sharing is much smaller, there are evidence of that this has got a foothold in many organizations in the EU-region (Grondys, 2019). Studies in the UK and Germany have found that approximately every fourth car sharing member are part of a B2B market segment (Clark et al., 2015). Hence, both electric and shared cars have now moved out of the ‘niche stage’ and are being actively promoted by public incentives and commercial players, influencing transport behavior in the consumer market. These are increasingly thought to represent innovations that, *in combination*, can endorse sustainability in urban transport systems (Axsen & Sovacool, 2019; Sperling, 2018). Following Sperling (2018), the integration of electric vehicles with shared (and autonomous) car systems are the driving forces for transition to a future sustainable transport system.

The literature on shared electric cars (SEC) is growing rapidly, and in particular challenges related to charging of large fleets of electric vehicles are addressed (Roblek et al., 2021). Recent user-oriented studies have, however, indicated that car sharing schemes can help promote electric cars by giving more people opportunities to try them out, but also that car sharing schemes with electric vehicles can attract more interests by consumers that emphasizes sustainable mode of transportation (Lemme et al., 2019; Schlüter & Weyer, 2019). For enterprises with high levels of car based work travels, SEC represent an opportunity to take steps toward zero-emission transport system. In the context of an organization, central questions are how to implement, adapt this in ways that make them attractive and acceptable. The situation calls for knowledge about how new and sustainable mobility practices can be established in organizations with many mobile workers, and what actions policymakers and business managers can take to facilitate this.

In this paper, we suggest that to understand the possibilities that the SEC represents for enterprises, it is necessary to look beyond technological features alone and theoretical assumptions about how and why this should be used among mobile workers. Instead, we need to look into the way these systems—usually involving different types of technologies and applications—operate in a real-life context in enterprises and how they can be adapted and interrelated to their ongoing routines and work tasks. We draw on research in the field of organizational innovations focusing on how the implementation and use of technologies emerges as a dynamic interplay between new and old material objects/artifacts and organizational practices. We suggest that this should be done by paying attention to the theoretical concepts of *affordances* and *community of practices*. On the one hand, the concept of affordance, recognizes how the materiality of an object favors, shapes or invites—and at the same time constrains—a set of specific uses. This approach recognizes that the technology does not determine how it is used; instead, the technology is understood

as a product of how it is perceived through the eyes of a potential user. In organizational contexts, affordances associated with artifacts and technology are linked to a complex web of cultural knowledge and conventional rules regarding their use (Leonardi, 2013). On the other hand, the concept *community of practice*, addresses how technologies like SECs are ‘social objects’ involved in the development of shared knowledge, meaning and identity as it is used within a dense network of coworkers (Lave & Wenger, 1991; Wenger, 2000). In the community of practice, practitioners ‘engage with the technology’ to explore its usefulness and seek to align it to their activities at work.

Drawing on the theoretical concepts outlined above, we suggest a framework that pays attention to the social dimension of technological innovations while avoiding a deterministic or voluntaristic approach to the technology. To denote the combination of a social practice and an affordances perspective, we use the term *community-based affordances*. This concept helps locate the ways in which the SEC-system is taken up by the users in a community of practitioners and the emerging affordances they evoke. Such emerging practices are often viewed as indicative of how technologies may develop in the future and in other organizations (Hargreaves, 2011; Jalas et al., 2017; Julsrud & Farstad, 2020; Røpke & Christensen, 2012); they also indicate what we may expect in terms of outcomes of the system related to environmental objectives (Evans et al., 2017). Hence, the object of this paper is to describe the community-based affordances that emerged when SECs were introduced in a community of professionals in a public sector enterprise (as a replacement for use of private cars) and the opportunity this represented for development of sustainable work mobility. Our ambition is to contribute to discussions of how sustainable mobility innovations like SEC systems can transform mobility behavior at workplaces and in enterprises so that more sustainable mobility routines can be established. In addition, we suggest a novel theoretical framework that can supplement the current stream of studies of mobility and organizational change concerned with technologies as parts of social practices.

In the next section of this paper (Section 2), we further outline our theoretical grounding; social practices theory and affordances. In Section 3, we present our two cases; a community of mobile advisers and a community of teachers. Both groups belonged to a county in Norway that implemented SECs to make work trips more efficient and sustainable. In this section, we also give an overview of all data and methods used. In Section 4, we provide evidence of five emerging community-based affordances that evolved via a step-by-step process in a community of mobile workers. Based on the findings, we further discuss the development community-based affordances, looking at how they can contribute to more sustainable work mobility, and actions that can be done to enable and sustain them in communities and organizations.

2. Theoretical background and framework

2.1. Affordances

The concept of affordances was initially coined by Gibson (1977), an ecological psychologist studying perception and

behavior (practice) among humans and animals. His position was that objects have properties, and animals and humans that use objects have specific physical characteristics and a host of needs. Any animal can perceive an object's features (e.g., its flatness or roundness), but the utility of those features—what they afford (e.g., walking on or rolling on)—is 'relative to the posture and behavior of the animal being considered' (Gibson, 1986, pp. 127–128). In a seminal work following up on this approach, Norman (1998) describes affordances with a sharper distinction between the perceived and actual (real) property of an object. Affordance is frequently described as a *relational concept* that recognizes that the potential usefulness and functionality of a technology is relative to different sets of actors and their needs (Hutchby, 2001; Zammuto et al., 2007). As an example, a fork or a knife in the setting of a meal invites a specific type of behavior, but the agent is free to use it in different ways—or not at all. As argued by Evans et al. (2017) an affordance describes 'the multifaceted relational structure between an object/technology and the use that enables or constrain potential behavioral outcomes in a particular context' (p.36).

Most early studies of affordances use this concept on an individual level, focusing on individuals' perceptions, but increasingly researchers apply affordances on the level of a social group or organization (Ellison et al., 2015; Gaver, 1996; Leonardi, 2013). Ellison argues that researchers need to examine and theorize their organizational affordances—that is, affordances that support the organizing of work and are collectively determined as coworkers negotiate meaning and create new structures for use. In a similar way, Leonardi (2013) draws a distinction between individual and *shared affordances*, where the latter is 'an affordance that is shared by all members of a group' (p. 752). Highlighting the intersubjective nature of the term, Schmidt (2007) introduces the term *social affordances* to capture the ways in which networks of social relationships enable and constrain technological capacities. In the context of an organization, an affordances perspective has been applied to recognize how the materiality of a particular technological application or system shapes or invites—and at the same time constrains—specific uses. Zammuto et al. (2007) suggest the term *affordances for organizing* as a bridging concept that emerges from the intersection of IT systems and organizational systems (p. 752), and they outline five such affordances, including the possibilities for virtual collaboration, visualization of work processes and mass collaboration. This moves the activities in which human actors engage with technology to the forefront, meaning that affordances are closely related to an ongoing social practice in a particular context.

2.2. Communities of practice

Seeing affordances through the lens of the social practice approach highlights the active process of taking technologies into use through participation. Here, affordances are not about technologies per se but about 'actions in the world that involve technologies' (Faraj & Azad, 2012 p. 255). Socio-material practices can be considered spaces where people are collectively engage with technologies to produce various

outcomes (Orlikowski & Scott, 2008). Framing affordances in the setting of a social network of users allows for paying close attention to social processes of communication, shared meaning and learning when analyzing technologies in organizations.

In an organizational setting, many technology-related activities take form in *communities of practice*—that is, 'groups of people who share a concern, a set of problems, or a passion about a topic, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis' (Wenger & Snyder, 2000, p. 4). The concept was initially developed by Lave and Wenger (1991) based on ethnographic studies of apprenticeship and learning among small, informal work groups, including midwives, tailors, naval quartermasters and meat cutters. These studies gave detailed accounts of the activities leading to 'full membership', a process that involved engagement in the social community through participation and situated actions over time. The concept was further developed by Wenger (1998), who applied it in the context of organizational learning, collaboration and change. He describes communities of practice as places for negotiation, learning, meaning and identity and identifies three dimensions of the relation by which practice is the source of coherence of a community. First, members *interact* with one another, establishing norms and relationships via mutual engagement. Second, members are bound together by an understanding of a sense of *joint enterprise*. Finally, over time, members produce a *shared repertoire* of communal resources, including language, routines, artifacts and stories.

As a framework for analyzing the use of technologies in an organization, implementation of technologies is part of the process community-based learning, taking place in day-to-day interactions. A prominent example of how a community of workers makes sense of technologies is Julian Orr's (1996) ethnographic study of technicians maintaining photocopiers. To handle the complexity of a range of different machines, customers' demands and various complex situations, improvisation and communication within the teams are crucial. Following Orr; 'the circulation of stories among the community members is the principal means through stay informed of the developing subtleties of machine behavior in the field' (p. 2). Hence, stories and narratives are not only central vehicles for joint knowledge sharing centered on a particular type of technology but also an expression of group identities and the meaning of their work in general. Following Pentland and Feldman (2007, p. 781) narratives represents a 'set of actions or events that embodies coherence or unity of purpose'.

2.3. A community-based affordances framework

In the case of the implementation of new technologies in an organization, new practices will emerge as the new technologies are taken into use in a community of users in a wider organizational and social context. It is the technology-in-use that gives forms to the affordances of the system and the possible transformation in work mobility in an organization. Here, we propose the concept of *community-based*

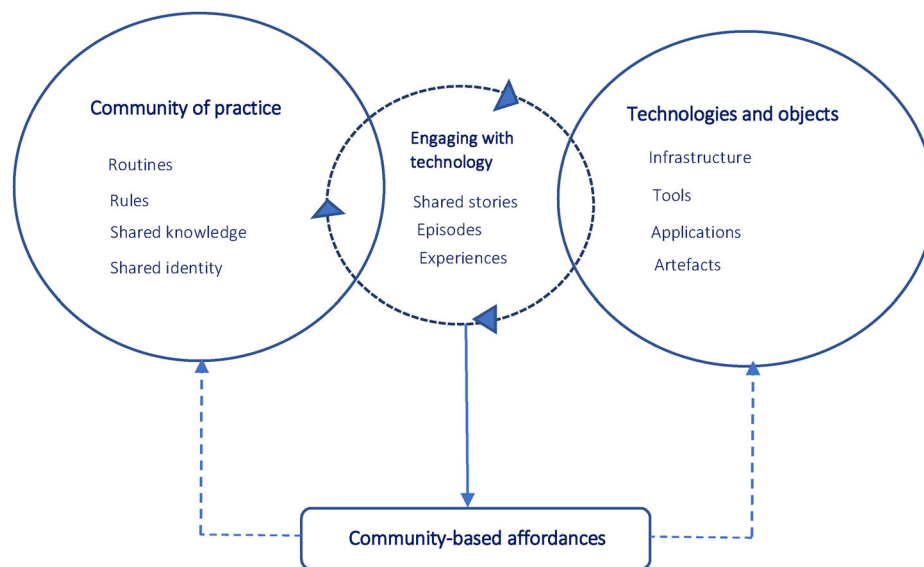


Figure 1. Theoretical framework for the development of community-based affordances.

affordances to highlight how affordances emerge and find their form within a community of users based on their day-to-day engagement with the technology. In short, community-based affordances can be described as the relational structure between a technology and the use, developed within a community of practice, that are enabling or constraining behavioral outcomes.

The framework illustrated in Figure 1 seeks to visualize four basic mechanisms that are in play when new transport technologies enter workgroups (communities), which are as follows: 1) The technologies in question, such as vehicle design, ICT-applications and infrastructures, have certain objective forms and functions that guide and constrain their use. They also have some pre-configured meanings, ideas and expectations when they enter organizations and groups, and these attributes influence how they are perceived in the social group. 2) The technology is taken up by a community of users in an organization, where other sets of practices and technologies are in used on a daily basis. Existing practices, involving work routines, rules for actions as well as shared senses of meaning and identity represent the immediate social and material environment for the new mobility technology. 3) The emergence and co-construction of affordances stem from the participants' engagement with the technologies, involving a series of experiences, episodes and narratives. This can be described as the development of 'framing', where the meaning of the technology occurs through communications and social interaction (Leonardi, 2011; Orlikowski & Gash, 1994).

Bringing together the concepts of affordances and social practice theory is not new in studies of organizational innovations. Building on Giddens' structuration theory, Orlikowski (2000, p. 407) uses the term 'technology-in-practice' to denote the ongoing enactments of a technology and the work of humans, who produce and constitute technology's structures through their social practices. Technologies-in-practice are 'the sets of rules and resources that are (re)constituted in people's recurrent engagement with the

technologies at hand' (p. 407). In a similar way, Fayard and Weeks (2014) suggests complementing technological affordances with Bourdieu's understanding of habitus. Other studies have emphasized that the relational nature of the affordance concept makes it useful as a lens to study the interplay between technologies and work practices in a more general way (Anderson & Robey, 2017; Costa, 2018). The novelty of the concept of community-based affordances is that it links affordances more closely to *community-based* social practices, and as such, brings the concept of affordances closer to the field of community-based learning in the context of an organization.

3. Case and methodology

3.1. The context

The cases analyzed in this study are two groups of co-workers, all employed by a county administration in Drammen, Norway. After a recent county merger, the *County of Buskerud* embraces almost a quarter of Norway's population². The council has its headquarters in Drammen, one of Norway's largest cities, and it is responsible for tasks that involve regional coordination and county monitoring. The core services are education, healthcare, transport and sports. The council also engages in support for the business sector and climate adaptation and mitigation. Related to the administrative and practical work involved in following up on their key tasks, many council employees make a high number of work trips in the region.

In 2016, the county council approached *B2B Cars*³, a commercial car-sharing company, for consultation to develop a car-sharing scheme that could be used by council employees and be available to both employees and the public for a fee after working hours. After consultation with

²In January 2020, Buskerud County was assimilated into Viken, which is one of 11 administrative regions in Norway.

³The name 'B2B Cars' is a pseudonym.

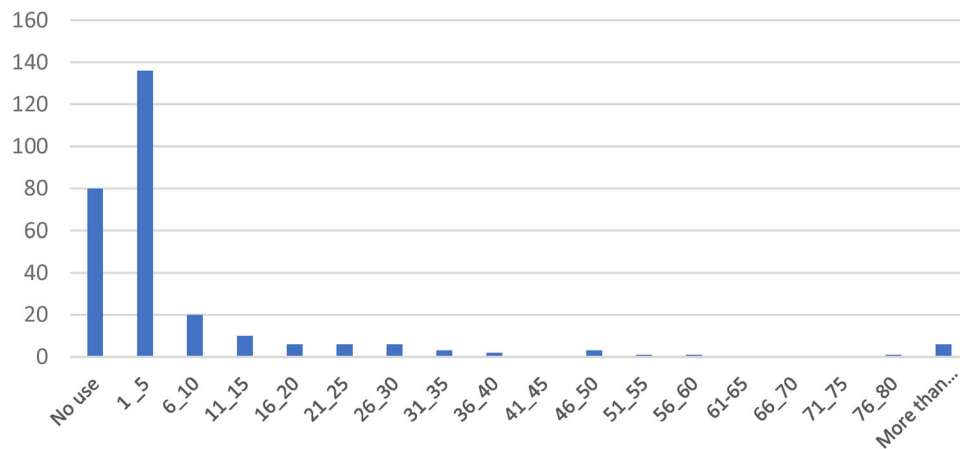


Figure 2. Total number of transactions per user of the SEC-system at the County (2017–2019).

B2B Cars and a round of bidding (which B2B Cars won), a pool of electric vehicles and (eventually) hybrid/electric vehicles were made available for all employees at the county council administrative headquarters. In addition, one car was made available at a local high school nearby. A few e-bikes were also purchased to be used for shorter trips in the local environment.

3.2. Technologies and policies

The technologies and applications involved in the pilot study included the following: 1) a pool of five electric and two hybrid/electric cars, 2) parking places with charging equipment outside the administration building and at one high school, 3) a booking system integrated with the shared calendar system at the county and 3) three shared electric bikes located at the administration building. The provider of the car sharing system ('B2B Cars') assisted with a service helpline and attended at a digital meeting with some of the employees in the first quarter of the project period. B2B Cars saw the county as an important client and engaged in the car-sharing pilot trial to gain experience in B2B car sharing in a public sector enterprise. The company had some previous experience with car sharing, but B2B car sharing was a new phenomenon in Norway at that time, and there were few actors in the market.

The managers in the county did not set strong directives for how and when to use the shared cars. The policy adopted was to recommend that employees use the SECs instead of private cars, but there were no sanctions for refusing to do so. Using the cars was voluntary, and during the first months of the trial, most employees refrained from accessing the cars. Despite the soft-policy approach, there were other measures taken to promote the programme. A year before the implementation, it was decided to start charging for the parking spaces outside the administration building, a service that used to be free for all employees. This caused much resistance and frustration among the employees at the county. To some extent, the decision to introduce the SEC system was understood as a remedy for the largely negative consequences of the new parking regime at the county. In addition, the objectives in introducing the

car-sharing system were to develop more sustainable transport behavior and to gain experience with operating a fleet of electric cars.

The system was installed ready to use in the first quarter of 2017 and employees could start register themselves as users. Over the three-year period 206 registered as users at the county, which included practically every employee and managers, yet 80 employees (40 percent) never actually used it (Figure 2)⁴. In the group of the users, approximately 68 percent had used it five times or less, and 31 percent 6 times or more.

3.3. The communities

The backdrop for the qualitative investigation, one year after the introduction, was a situation in which a team of *advisers* at the county council had started to use the SECs with a certain level of enthusiasm. The group involved 15–20 employees⁵ working with tasks related to coordination and follow-up of activities in different parts of the region. The region covers an area of 24 595 m², and employees sometimes needed to attend meetings more than 200 km away. In addition, a group of *teachers* working in two high schools near the county office had been introduced to the system. This was a more loosely connected group involving 10–15 employees conducting work travels regularly to follow up with students at different workplaces in the region. The teachers had access to one shared car at one of the schools, but they were also expected to use the car at the main pool in the county, approximately 300 and 500 m away from the schools. This group had started to use the system but done so on a limited scale. Before the introduction of the SEC-system, most employees mainly used their (fossil-fuelled) private cars for work travels, although a minor group also mainly used public transport.

The uptake of the system followed different paths in the two communities: While the first community of employees had come to explore different affordances, in the latter

⁴Data provided by B2B Cars based on their booking system.

⁵The exact numbers of group members were hard to determine since the size of the groups varied during the period of investigation.

Table 1. Data overview.

#	Gender	Age	Work position	Community*
1	F	60	Chief adviser	A
2	F	45	Chief adviser	A
3	F	55	Administration	D
4	M	55	Adviser/teacher	A
5	M	37	Senior adviser	A
6	M	55	Senior adviser	A
7	F	53	Senior adviser	A
8	F	55	Senior adviser	A
9	M	35	Manager, B2B Cars	C
10	F	35	Senior adviser	A
11	M	40	Teacher	B
12	F	30	Teacher	B
13	M	32	Teacher	B
14	F	30	Teacher	B
15	F	31	Teacher	B
16	F	26	Teacher	B
17	F	48	Chief adviser	A
18	F	35	Teacher	B
19	F	50	Adviser	A
20	F	42	Teacher	B
21	F	40	Adviser	A
22	F	62	County Director	D

*A = Advisory group; B = Teacher group; C = System provider; D = County manager, administration.

group, work and travel went on much as before. Thus, the main focus of our analyses in this paper is the practices and use of the car-sharing system among the adviser group. However, we also draw on analysis of the teacher group when discussing barriers to uptake of the system.

3.4. Methods and data

In this study, we rely on a *qualitative case study approach*. A selection of 22 employees at the county and one manager at B2B Cars were recruited for interviews at their workplace (Table 1). Eleven belonged to the group of advisers and eight to the group of high school teachers. These two groups were selected as they represented two communities of practice within the enterprises with relatively clear boundaries and work tasks and having different types of mobility. This approach allowed for a detailed understanding of the meanings that people inject into their everyday lives and practices, and as such, experiences related to their daily travels and their work at the county. An particular advantage of this approach is that it allows informants to bring in new aspects of relevance and contribute to the development of new concepts and theories (Eisenhardt, 1989; Yin, 2003).

The interviews focused on the informants' working situation, including the use of transport in their work, and their experience with the implementation process of car sharing. The data collection – including the recorded audios, transcribed interviews, field notes and memos – was facilitated by using NVivo, a software program for managing and analyzing qualitative materials. We followed an iterative analytical process, guided the theoretical concepts and allowing for further discoveries in the data along the way (Miles & Huberman, 1994). We started by coding all interviews focusing in particular on how the employees were engaging with the SEC-system. By coding of all shared stories, episodes and experiences, five distinct community-based affordances were defined.

All interviews were audio-recorded and transcribed verbatim to ensure accuracy. During the recruitment and interviews, all the informants were provided with information on the interview process, their rights as research participants and the data management plans. Ethical approval was secured from the Norwegian Center for Data Research prior to beginning the study.

4. Results: emerging community-based affordances

The interviews gave insight into a broad canvas of mobility practices, work routines, attitudes and understandings of using shared and electric cars and more. The analytical focus of this paper is the community-based affordances coming out of the engagement with the technology in the context of two work communities. In this section, we draw attention to the five affordances that emerged after approximately 20 months of use: replacement of private cars; customized use of vehicles; rapid reimbursement; co-riding to/from meetings and commuting mode reconfigurations.

4.1. Replacement of private cars

Promoting a switch from private cars to shared and electric cars was a main objective for the county, and the system was designed to make this expected transition as smooth and attractive as possible. The new cars and charging stations were placed outside the entrance at the county council, and all the cars had B2B Cars' colorful logo affixed to them. This made the system visible to those entering the building, and e-bikes were even placed in the entrance hall inside the building. The shared cars could be booked through a digital system integrated into the county's regular software for booking meetings and meeting rooms. Thus, the backbone of the of the system was technology and software that were relatively familiar to the employees, although electrical vehicles were new to most. This made B2B Cars and county managers expect that a transition to SECs should go relatively easily.

Despite the high expectations, initially, the system was not embraced with much enthusiasm in the groups. The scheme was seen as a response to the foregoing implementation of parking restrictions, which had been highly unpopular, and some described it as a measure to 'sugar the pill' rather than initiative to improve sustainability measures. In addition, it emerged that many had doubts about the usefulness of electric cars in general: One member said:

It was ostentatiously announced as something they were proud of. ... But there was much scepticism in the corridors, many saying, 'What! Electric cars will never work for us; we work in so many different places'. ... But there are always one or two fellows that bother to try it out and announce that it works well and 'I can help' you and so on. (19)

As illustrated by this statement, the cars were considered incompatible with the current mobility practices. However, the response also highlights that some more enthusiastic voices were important to counterbalance the rather hostile attitude by trying the system out and teaching others about it.

Despite early skepticism, after approximately one year, most advisers had accepted the system and used it regularly, usually once or twice per week. Ongoing learning during the implementation was viewed as critical to make the communities recognize and accept the SEC as a relevant replacement. This involved mastering the skills of driving electric cars, a practice that was unfamiliar to most employees, including the use of chargers⁶ at the headquarters and on the road. Risks and failures were illustrated with a description of episodes and stories:

I had a steep learning curve when I was in Sarpsborg [city approx. 107 km southeast of Drammen] because I borrowed a car at the County House, one of those Kias, a small Kia that looked very attractive. But that kind of range on a motorway is a bit challenging, and I got to experience and learn something new about charging along motorways. ... It was an overnight gathering, so I got to use three different fast chargers ... and it was totally new to me. (1)

Other unexpected obstacles occurred when using the cars during winter, related to much lower battery capacity and reduced ease of use. The cars were parked outside, and in the cold season, snow and ice sometimes covered the vehicles. One employee in the adviser group that used to walk to work from her home nearby commented,

The cars are sometimes all covered with snow and ice, and it means that I have to leave home 10 to 15 minutes early to walk to the car, and then add another 30 minutes to get the car ready. I reported this to the county council, but it didn't get much better. (6)

Despite the perceived lack of response, this and similar episodes have led to changes in the system, and after some time, a janitor was instructed to clear away snow and prepare the cars in the morning. However, the quotation above is interesting because it illustrates that the engagement with the technology could trigger learning processes beyond the community of practitioners.

The learning did not always come independently. Both managers and employees expressed the necessity of actively promoting learning within the community to make the system work. One employee in the adviser community said that there was a need to 'educate people' in the group on how to handle the cars. He illustrated this with an episode where the car had been dirty, and he spent time cleaning it up:

We are very different people—depending on what type you are, some are thorough and want it to be neat and tidy. At least when you pick up a rental car, you know that it will be clean and nice. And then [with the car-sharing scheme], you get into a car that looks like it has been transporting potatoes, right? And that isn't nice. (4)

In this quotation, the new SEC-scheme is compared to another well-known practice—renting—illustrating how the SEC system 'competes' with existing similar mobility practices.

During the pilot period, a compilation of experiences and episodes shared within the communities contributed to the

affordances of the system as a potential replacement for travels with private cars. In the group of advisers, this socio-technical arrangement was accepted and settled as a mobility practice that replaced the use of private cars. However, in the group of teachers, only two or three employees had taken this into use. The crucial barrier seemed to be the distance to the cars. They had to walk for 10–15 minutes to use the cars, and because of this inconvenience, few had tried it. There was also confusion about how and when to use the cars and the distribution of costs between schools and administration. As a consequence, a negative framing of this was evident, where teachers expressed distrust of the motives of the managerial board:

Why has the county started doing this? Because of some politician who wants to be seen as an environmental enthusiast. I think they argue that if there are cars here that we can borrow, we won't need parking spaces any more ... and then they can say we're environmentally friendly. There is probably some environmental certification measure stating that we must consider replacing ordinary cars with electric cars. (13)

In sum, the affordances of replacing private with shared electric was different for the two communities. The different pathways illustrate well how the technical features of the system do not determine whether it is fruitful to replace the use of private cars.

4.2. Customized use of vehicles

The SEC scheme consisted of a mix of electric and hybrid/electric cars. Whereas the electric cars were smaller and had a limited driving range, the hybrid/electric cars were mostly larger and had the possibility of bringing more luggage. In combination with e-bikes, employees could pick a vehicle for the meeting or event they were attending.

To obtain the appropriate car, it was necessary to book in advance or plan for using public transport, possibly in combination with the cars. After a while, the electric cars with the lowest emissions were typically used for shorter trips, while hybrid/electric covered longer trips. E-bikes were used extensively for ad hoc meetings in the city center, and there was no need to book them in advance. This arrangement was sensible from an emissions-reduction perspective, but the workers also found it exciting and convenient because it meant they could pick the car that best fit their travel needs and that they could try different types of vehicles. Switching between cars opened for efficient use of the vehicles, where the technology was adapted to the travel need.

Picking the right car requires knowledge about the capacity of the vehicle and how to handle different car models and equipment (chargers, charging meters, automatic gears). It turned out that electric cars represented a challenge for many who had not tried such cars before. Being unable to estimate the possible range of driving based on the charging meter in the car, so-called range anxiety, or the time it would take to recharge a battery at a station, was a source of a number of problems and difficult situations.

⁶The charging infrastructure for electric cars in Norway consists of a mix of public and private systems. At the time of the investigation (2017), the infrastructure for fast charging included the following: 648 CHAdeMO points, 595 CCS points, 47 AC Type 2 43 kW points, and 246 Tesla Superchargers.

Episodes where employees were stranded with uncharged batteries in various peripheral locations were common among the employees and presented as interesting, funny or warning stories in the department. One informant (7) told that she was going to a meeting in the county in the winter at one point, and as she drove, she discovered that the car was running out of power. She decided to stop in a local village, but she could not find a place to charge, so she continued to the nearest municipality office and charged for as long as she could until they closed. However, the car was still not sufficiently charged to reach her destination, so she tried to make it to the next village, where she knew there was a charging station. Unfortunately, the car stopped half-way there, and she had to call for a vehicle rescue team to drive her home. After this, she developed serious 'range anxiety', and it took a long time before she dared to try again.

Other functions and operating mechanisms varied between the models. One informant told us about an episode in which the handbrake was located in a different place than she had expected:

In one car, I couldn't find the handbrake, and it took me a long time to figure it out. The car became infamous for some time, that 'car with the handbrake', because it is a pedal handbrake and when it is pushed in, it is not visible. ... It took ten minutes of my time, and I had to drive extra fast afterwards. (Informant 1)

These stories were shared in the community and contributed to the general understanding of the risks related to the use of e-cars in the organization. However, they also contain important information about the necessity to develop knowledge about the cars and make plans for each trip. The affordances of switching between different cars emerged as individuals experienced and tried the cars, forming episodes and stories to be shared and discussed.

4.3. Rapid reimbursement

A key element in the SEC scheme was the digital booking system, which was linked to the regular meeting calendar software in the organization. This could be operated on users regular computer or by using a mobile application provided by the car-sharing company. In the same way as they booked and reserved meetings and/or meeting rooms, they could choose to book cars. They would then receive an access code as a text message, enabling them to use the right car with a car key. Almost everyone found this system easy and convenient:

Considering the bookings and that type of thing, it works very well; it takes the orders online, gives notifications by SMS and bookings, and that way, it works perfectly well. So, it's very simple and easy to book a car! (5)

Another employee expressed that it was 'just an ordinary app that you use to book cars like all the other apps you use to book things nowadays' (8). However, the digital booking also gave users a new kind of overview of their past travel routes, and their travel records could easily be linked to the travel reimbursement system in the organization. This gave them a (largely) unexpected benefit from automatization of the travel reimbursement procedure. Refunding the work trips was a task that many informants described as tiresome

and unnecessary use of time, but in the new system, this was done almost automatically as they registered their trips in the calendar system. One informant told of an episode earlier, when she had to use almost three days to complete the reimbursement because she had delayed it for a year. This was contrasted with the situation now:

As for now, I can just take all these travel expenses and put it into my phone, take a picture of it with my phone and put it in [name of the system] and delete it (...). So that's part of my motivation, because I don't have to think about it, I just log in and out and then that bill comes somewhere else. Very convenient.' (1)

The affordance of rapid reimbursement was based on a feature of the SEC system that was appreciated taken up by the community, and it soon became an established part of the work travel routines. However, a side effect of the new practice was that to secure the preferred car for their meeting, some started to book their cars far in advance. This resulted in episodes where other employees (who were less disposed toward long-term planning) had problems booking the cars they wanted, and this caused irritation. Hence, this community-based affordance was probably amplified by the affordance of selecting the most appropriate car, suggesting that there are important synergies between them.

4.4. Co-riding to/from meetings

Another implication of the booking calendar system was that employees could easily obtain an overview of who was booking the cars and those who were going to the same meetings. After a while, this feature made it common to ask those who were going to the same meeting if they should travel together, whether this was asked face to face or by e-mail. Many said that co-riding to meetings had become much easier to arrange, and according to some informants, the thresholds for asking (or inviting) people to ride share had become lower:

Last time I used a shared car was when I was attending a meeting at Jeløya [local village approx. 45 km southwest of Drammen] related to the new Viken region. I booked a car, and two colleagues joined. Co-riding has become very common, and it is very easy and informal. (2)

Before the SEC-pilot, most employees would take their own car to the meeting, so this new practice was clearly something that saved costs and reduced emissions from work travels at the county. However, the emerging co-ride practices provided the benefit (most of the time) of being able to have informal talks on the way. A chief adviser highlighted this as a new and unexpected quality of the system:

It's really not much fun to drive alone to Geilo [village 200 km north of Drammen], so I like to co-ride with colleagues if I can, and the staff seem happy, for three hours alone with your boss is very, very nice, then you can clear up a lot of things. So you become better acquainted. (1)

The quotation above highlights the experienced value of co-riding told from a managerial point of view, but regular employees also described positive experiences from the co-rides. This suggested that the co-riding practice could initiate more informal communication in the team and as such

improved possibilities for sharing information, ideas or stories.

4.5. Commuting mode reconfigurations

One consequence of the SEC scheme was that employees no longer had to bring their own car to work for the purpose of work travels. The affordance of the system for eliminating the need for using a private car during work hours showed that the system could provide affordances in other areas, which was important from a sustainability perspective. As the pilot progressed, alternative modes of traveling to and from work were tested. One informant said that he now finds it more convenient to bike to work, with the benefit of less wear and tear on his private car:

I find it easy to ride a bike to work and use the shared cars here. I think that this also pays off; it costs to add kilometres to your own car. I used to work as a consultant before, and then I drove a lot, and the car was worn out. (4)

For some employees, this led to lasting changes in work mobility habits. A middle-aged female employee had bought a new electric cargo bike, and she expressed enthusiasm and joy over being able to bike to work and avoid rush-hour car traffic. The benefits were also related to health issues and improved quality of life:

It gives me a better travel experience and increased 'freedom of movement'. I now choose to cycle and I often take a detour. Instead [of the main route], I choose 'the prettiest road'. (8)

This illustrates how relatively minor changes in mobility practices in one area (work mobility) could lead to transformations in behavior in related practices (commuting) and how the SEC-system offered other affordances that just replaced the private cars during work hours. However, for some the SEC-scheme had contributed to more radical lifestyle changes, such as living without a private car altogether. One informant told us that the system made this type of shift possible for her:

I worked for a year in Bergen [city on the west coast of Norway], and then I sold my car, and when I came back, they had started with this car-sharing scheme. And I thought it was great because I live in the city centre, and I thought, maybe I can do without a car then. I have the app on the phone, it is easy to go and book as soon as I know when the meetings are scheduled. (7)

The opportunity to commute without a private car undoubtedly had positive implications for GHG-emissions from the county, making it easier for employees to develop healthier lifestyles. The longer term impact for reducing vehicle kilometers and cutting emissions was not estimated in this project, but the findings suggest that the system had developed affordances that contributed to more sustainable work-related mobility in the county.

5. Discussion

As outlined in the theoretical framework, the development of community-based affordances comes through engagement

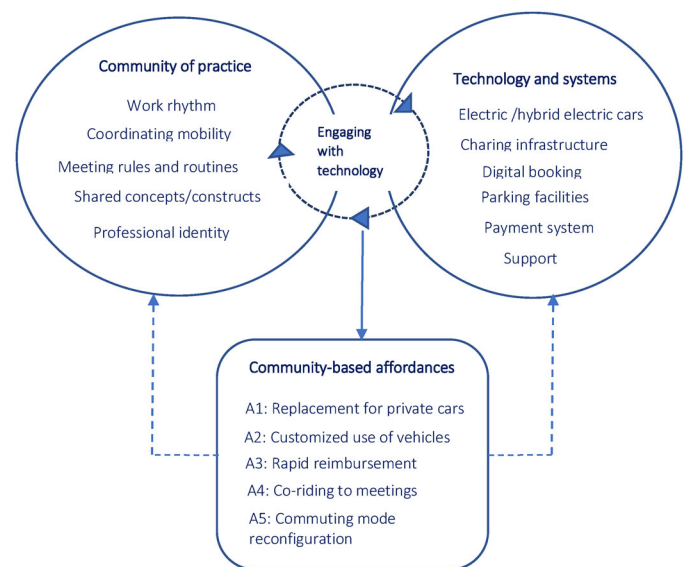


Figure 3. Development of community-based affordances for shared electric cars (SECs).

with technology in the context of a community of practitioners. Figure 3 summarizes the key processes addressed in the discussion. The assemblance of technologies and artifacts was becoming an integrated part of the mobile office workers' ongoing work practices via active engagement with the technology. These activities were constrained by and aligned with the routines and regularity of their work as mobile advisers in a public sector company. This included where and when the attained meetings outside the headquarters, their rhythm of longer distance mobility (going to meetings two to three times per week), the rules for documentation of task and transportation, the unwritten rules for doing the advisory work, their shared understanding of purpose of their work and role in the county and the society and more.

5.1. The development of community-based affordances

The emergence of the community-based affordances, located in the intersection between technologies and practices, was evident, for instance, in the affordance of co-riding to meetings. This was based on the new technological application where meeting-calendars were integrated with the car booking system, but it was also driven by a general understanding of the need for avoiding unnecessary driving, and that it was (in general) positive with informal talk during co-driving to meetings. Similarly, using the system to obtain simpler travel reimbursements was based on a particular technological feature, but it took hold because filling out travel reimbursement schemes was a necessary routine where rules were established. The skills and knowledge of a redesigned reimbursement routine came through the day-to-day experiences with the technology, as well as informal communication and learning within the groups. Thus, the affordances were products of the social interaction and sensemaking in the community, not individuals or the technology per se.

Affordances are not the same as outcomes, but they can over time generate different outcomes, whether intended or not (Evans et al., 2017). The described affordances suggest that SEC may contribute to sustainable mobility outcomes in three different ways: It can replacement of private cars for the shared and electric, it can initiate more co-riding to meetings, and it can enable for shifts to more sustainable commuting modes among employees. All these occurred in our study although the changes in the mobility practices developed slowly and needed much support and co-learning on the way.

Interestingly, there were also intentions in the system that were never realized. B2B Cars and the managers had assumed that the pool of cars also could be used outside work hours, both by the county employees and the public in general. This could have caused a larger substitution of trips with fossil-fuelled cars and generated more revenues for B2B Cars. This never happened. According to our informants, the paying system and the price schemes were difficult to figure out, and they could not see that they had a need for the option of using the cars outside work hours. Hence, this technological feature did not connect to any ongoing social practices in the communities and there was no real engagement with the technology.

5.2. Contribution to current research and theory

In the last decades, theories of affordances have emerged as a powerful conceptual lens emerged for studying the socio-materiality enacted when new technologies enter organizations and work groups. Recently, there have been several calls to build bridges between the strands of practice theories and social affordances (Anderson & Robey, 2017; Fayard & Weeks, 2014; Leonardi, 2013). Here, we have followed up on this and suggested that the concept of communities of practice can be combined with a relational view of technological affordances to give more weight to the social processes and community-based learning. Hence, it offers a nuanced framework for describing the development of affordances through socially embedded engagement with the technologies. The concepts of communities of practice and affordances complement each other because the first is more about the social processes involving technology and the latter more about the technologies in a social context. The focus on the technological environment, not only a single object, makes it applicable to analyze transport-related innovations that typically involve a variety of tools, systems and infrastructures.

Our work speaks to a stream of work in user-oriented studies of transport where shared mobility applications have increasingly been addressed (Dowling et al., 2018; Greene & Rau, 2018; Hislop & Axtell, 2015; Watson, 2012). The framework proposed in this paper also relates to organizational research concerned with how the adoption and use of new technologies and systems in organizations take forms as an entanglement of social and material factors (Ellison et al., 2015; Faraj & Azad, 2012; Hislop & Axtell, 2015; Leonardi, 2013; Orlikowski & Scott, 2008). The ‘community-oriented’ version of affordance theory that is applied in this paper contributes to this stream, suggesting a sharper edge on the

active co-creation of affordances through day-to-day practices and the production of meaning through episodes and narratives. Still, our ambition is not to suggest a totally new theory in this field but to combine these two concepts to give a richer and more nuanced analytical framework.

5.3. Facilitating the development of sustainable travel practices

The five community-based affordances can enable changes in social practices and support a shift to low-emission organizational mobility. An urgent question for policy-makers and organizational managers, then, is how to facilitate such a shift in a sustainable manner. Our results suggest that it is crucial to enable the development of affordances of this type of technology to give work communities *access to technologies* and room for experimentation. Affordances cannot develop without deep engagement with technologies, where this is aligned with—and adapted to—existing social practices. As in the case of the community of teachers, the key problem was simply a lack of accessibility and an opportunity to try the technology on an everyday basis. This created frustration, and in some cases, distrust of the managers.

Policymakers and managers can cultivate the development of community processes and trigger motivation and interest for using the technology by implementing various *supporting measures*. In the case of the advisers, a change in parking policy sparked an interest in alternative transport solutions. At one time, the administration at the county also took an important initiative in setting up a virtual meeting with the car sharing provider to clarify technical issues with the booking system. However, most of all, our study shows that it is crucial to avoid uncertainty and ambivalence in communities by providing clear information and instructions.

Community-based affordances take form in social groups where individuals are working together with similar tasks and share a common interest in what they are doing. Their sense-making, communication and negotiations are key elements in locating affordances where the technology is relevant for them. Yet, individual actors have different possibilities and interests for contributing to these processes, and earlier studies have found that *change agents* both deliberately and inadvertently influence the processes (Julsrud & Denstadli, 2020; Strengers, 2012). In both cases, we saw that some employees took on the role of change agents, helping to stabilize the user practices via support and learning. Supporting engaged users in the communities can be important as a strategy to facilitate active use.

6. Conclusions

For enterprises that currently rely on fossil-fuelled private cars for their work travels, the implementation of a pool of SECs can be an efficient way to reduce GHG emissions and local pollution from combustion cars. However, to reap the environmental benefits from this and similar transport innovations, it is crucial to look beyond the technological functionality alone and focus on the possibilities that unfold when taken into use in real-life settings. Through the lens of

a combined affordance and social practice approach, we have in this paper located central areas where a B2B car-sharing system can lead to transformation in work practices and travel behavior. Our investigation suggests that this can enable changes that are beneficial for environmental sustainability, as well as internal communication and work routines.

The results in this paper are based on two cases within one organization and a limited number of interviews. Hence, the results should be treated with caution. Via a qualitative study, the research has focused on exploring multi-faceted and dynamic processes of change as technologies are used in organizations rather than providing a template that is representative of a larger universe of cases. Studies conducted under other circumstances are likely to find slightly different types of affordances and outcomes, although the technology and work practices are more or less similar to the one described here. We would welcome studies that continue this line of research and further explore the affordances of transport-related innovation in communities and organizations.

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