

Identifying the barriers for diffusion of stationary car sharing in the Netherlands using an innovation system approach

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Abstract

Privately owned cars are causing negative externalities like pollution, CO₂ emissions and extensive use of public space. Car sharing can be seen as a solution to reduce these negative externalities. Still, a rapid transition from privately owned cars to shared cars is not taking place, given the number of shared cars in the Netherlands. An innovation system methodology is applied to identify the blocking mechanisms for diffusion of car sharing in the Netherlands. Assessing the performance by the stakeholders showed that car sharing has difficulty in competing with existing mobility solutions, such as the private car or public transport. Besides, there are also difficulties in turning knowledge, networks and markets in viable car sharing concepts. Barriers found in the innovation system for car sharing in the Netherlands perceived by all stakeholders are the lack of profitability of business models, limited accessibility/interoperability of car sharing services and an unequal fiscal level playing field for automobility. Future research should lead to identification of effects of solutions aimed at reducing these barriers.

Keywords: car sharing, innovation systems, innovation system functions, NIE, semi-structured interviews

1. Introduction

For the last decades demand for transportation has risen and now resources for satisfying this demand are under pressure. Private transport by car causes extensive user of public space in city centres. A case study research in Ireland by Rabbitt & Ghosh (2013) shows that car sharing can reduce these negative externalities. However, it is stated that car sharing only seems a feasible solution in dense urban areas. The numbers of shared cars in the Netherlands is currently limited to only 30.697 (CROW, 2017), while the goal set by the Dutch government is 100.000 shared cars by 2018 (Rijksoverheid et al., 2015). A literature review on car sharing as product service system solution showed a lack of knowledge in blocking powers active in the innovation system, which seem to be limiting the diffusion of car sharing in the Netherlands. This has led to the following research question:

What are the blocking mechanisms and policy issues that can be reduced to boost the diffusion of stationary car sharing taking an innovation system perspective?

The innovation system of interest in this research is the Dutch innovation system for car sharing. This implies that only relevant grey literature for the Dutch case is taken into account. Findings in academic papers abroad are not neglected, even if they are not based on the Dutch case. In the first place this is done, because these findings are generalised for the topic 'car sharing' and not for the specific innovation system of the country used in that academic research. Secondly, this research starts broad and should converge to barriers for the car sharing in the Netherlands. Therefore, the most important academic papers about shared consumption and car sharing were taken into account in order to reduce the chance of not identifying barriers in the current innovation system.

2. Theory

The innovation system framework presented by Kuhlmann & Arnold (2001) is applied to guide this research. Research by Williams (2007) supports the view that an innovation system approach can lead to identification of barriers for diffusion of car sharing. In this framework essential system components

for an innovation system are drawn. The development of the system innovation depends on the interrelation of the actors within this framework. It is assumed that blocks in the innovation system interact with each other and through choices, and actions the technology is utilized and diffused (Kuhlmann & Arnold, 2001). The framework consists of the following actor groups:

- Supply
- Demand
- Politics, policy and institutions
- Research & Education organisations
- Support organisations

The basis for this framework is that the actors presented in the framework interact with each other to develop and diffuse a technology. First, this framework stresses the idea that actors act according to the concept of bounded rationality (Simon, 1957). Bounded rationality suggests that actors take decisions under time pressure. Their rationality is limited by the fact that they are acting in a complex environment. Gathering information about all the possible decision options is an impossibility. Therefore actors tend to focus on sub goals lying within the specific actor's responsibility and losing the vision the overall goal of the multi actor playing field. Based on bounded rationality the key for economic performance is knowledge, learning and institutions. Secondly, it is assumed that there is historical path dependence in an innovation system. What actors in this system can do depends on previous efforts of themselves or other actors in the system. The structural analysis is important to analyse these previous efforts and apply theories related to institutions shaping the system (Dixit, 1996). Given the characteristics of the innovation system framework, the theories of New Institutional Economics (NIE) are used.

New Institutional Economics

In the innovation system framework by Kuhlmann & Arnold (2001) the relationships between actors are shaped through institutions. The fact that bounded rationality and path dependence are concepts forming part of this innovation system framework supports the idea of making use of NIE. The actor relationships in the innovation system for car sharing in the Netherlands are therefore analysed based on the three most important theories of New Institutional Economics: property rights, transaction costs and principal-agent theory (Coase, 1937; Williamson, 1975).

Within property right theory four economic property rights are defined. Those are the attributes defined by Furubotn & Pejovich (1974) as economic property rights:

1. the right to use the good
2. the right to earn income from the good
3. the right to transfer the good to others
4. the right to enforce property rights

These components can be used to define the relationships between the actors possessing the actors. The costs for monitoring and enforcing these economic property rights result in transaction costs. The second component of NIE. The origin and forms of transaction costs are specified by Williamson (1975, 1998). Opportunistic behaviour, bounded rationality and uncertainty are determinants of transaction costs specified in this case.

The last building block of new institutional economics is agency theory. Agency theory has been defined by Eisenhardt (1989, p. 59) as "relationships that mirror the basic agency structure of a principal and an agent who are engaged in cooperative behaviour, but have differing goals and differing attitudes toward risk". Human- and organisational assumptions in agency relationships in the innovation system for car sharing in the Netherlands can possibly hamper the diffusion.

Innovation functions framework

As the innovation framework by Kuhlmann & Arnold (2001) is more of static nature the functions of innovation systems framework by Hekkert et al. (2007) is used to map the processes in the innovation system which are underdeveloped or underperforming. There are seven innovation functions defined by Hekkert et al. (2007) determinative for the performance and phase of the innovation system:

- Entrepreneurial activities
- Knowledge development
- Knowledge diffusion through networks
- Guidance of the search
- Market formation
- Resources mobilization
- Creation of legitimacy/counteract resistance to change

These innovation functions are a response to approaches which focus only on the structure of innovation systems. Through the use of the framework of Kuhlmann & Arnold (2001) and Hekkert et al. (2007) both a structural and process approach is used to define the functional barriers in the innovation system for car sharing in the Netherlands.

3. Methodology

In Figure 1 the methodology for the case study is depicted in which step 2 covered the innovation system framework of Kuhlmann & Arnold (2001). The third step has been covered through the innovation function framework by Hekkert et al. (2007).

The weaknesses of case study research are the difficulties generalizing results and the subjectivity of the data collection and analysis processes (Darke et al., 1998). Through transparent choices in literature and methods replication of the research is made possible. Executing a case study is inherent to the research of innovation systems and identifying the failures and barriers in an innovation system. Added value of doing this case study also lies in increasing the empirical knowledge for different innovation systems and their dynamics. This is also one of the goals for Bergek et al. (2008) for providing their scheme of analysis. Lastly, the scheme of analysis by Bergek et al. (2008) provides visibility of all the steps taken to answer the main research question. All the steps taken in this case study are explained in the next paragraphs.

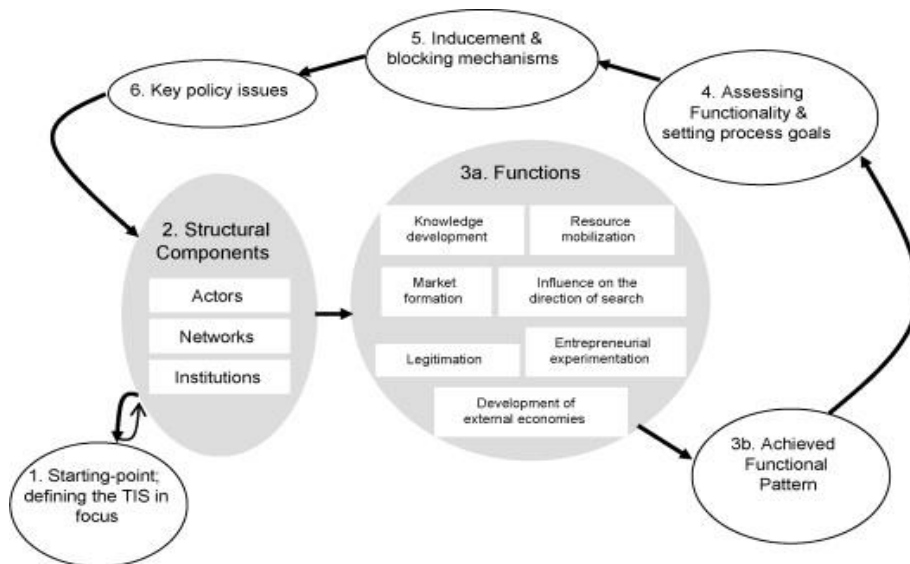


Figure 1 The scheme of analysis (Bergek et al., 2008)

4. Structural Analysis

Actors

Users of car sharing services perceive it as expensive (Vezzoli et al., 2015). Moreover, based on empirical research the potential demand is limited due to demographic characteristics, the context where people are living in and their personal preferences (Dias et al., 2017; Efthymiou, Antoniou, & Waddell, 2013). For politics, policy and institutions actors at national level in the Netherlands there is reticence about creating fiscal advantages favouring alternatives to private car ownership, possibly caused by the risk of electoral defeat for taking unpopular car restraining policies (Geels, 2012). On the other hand the dependence on the car industry for economic growth might form reticence for car restraining policies or fiscal advantages (Cosentino, 2009). Ultimately, based on previous programs the focus on national level seems on congestion reduction instead of getting more sustainable in the long term (Ministerie van Infrastructuur en Milieu, 2016). On the local level harmonisation of policies facilitating car sharing is lacking, resulting in significant variance in shared cars between cities in the Netherlands (CROW, 2017; Docherty et al., 2017).

For financial support car sharing providers are dependent on car manufacturers for increasing capacity of their services (Le Vine et al., 2014; Loose, 2010). Investment costs in a fleet are lowest for manufacturers. Car manufacturers are often fully/partially owner of the shares of car sharing services, which also creates a dependence on the car industry for future developments.

The quality of data for research and education actors is lacking as it is invisible to what extent car sharing is contributing to environmental goals in the Netherlands. There is only geographical data. Moreover, not all the sub models of stationary car sharing have seen growth since the beginning of the GreenDeal. Only peer to peer stationary shared cars have grown from 8.142 in 2014 to 24.779 in 2017, while other numbers remained stable (CROW, 2017).

Networks

The covenant set up by the Dutch government, the GreenDeal, is a network of collaboration between public and private parties. The goal has been to reach 100.000 shared cars in the Netherlands through collaboration in this covenant and creating awareness around car sharing (Rijksoverheid et al., 2015). Evaluating opinions of participants in this covenant helps to identify the barriers related to this collaboration.

The network of car manufacturers also have a stake in the innovation system. Research shows that a transition from private car mobility to shared mobility causes a loss of revenues for car manufacturers. A rapid transition is not in favour of the interest of the network of car manufacturers. In the research

by Spulber & Dennis (2016) it is stated that car manufacturers hedge this loss by participating in car sharing schemes and can influence the pace of transition.

Institutions

In the case of a shared cars boundaries between those rights become blurred. Starting with the right to use the good. This right is widespread among the users of the shared car. According to Bardhi & Eckhardt (2012) the fact that users only have the right to use the good leads to negative reciprocity. Users look for their own interest and act opportunistic. Users don't feel responsible for the asset and for the other users using the asset. Users act in their own self-interest. In the case of a privately owned car, the user is responsible for its own actions during the lifecycle of the car. Behaviour which lead to negative effects for the assets is directly experienced by the user.

Compared to the situation with a privately owned car all the economic property rights are owned by the car sharing provider. However, the cars are not necessarily owned by the car sharing provider. In the research carried out by Loose (2010) almost half of the large car sharing providers in the survey had collaborations with car rental and car dealership companies. In these constructions the economic property rights are not allocated to one actor. Both the car rental/dealer company and car sharing provider earn money through the provision of the car sharing service. In these configurations motivations and incentives need to be aligned in order to achieve the shared goals of involved actors and reduce negative reciprocity and opportunistic behaviour among owners of economic property rights (Bardhi & Eckhardt, 2012).

Taking a value proposition approach in new institutional economics there are more elements which add value or detract value. For a shared car you need to plan your trip in advance, make a reservation, sign a contract, pay directly etc. Some of the transaction costs are reduced by the introduction of ITS, namely the trust and reputational barriers. Still, making a trip requires more effort and time (transaction costs), which reduces the substitutability of a traditional car by a shared car. Improving the substitutability by reducing, the transaction costs for using a car sharing service is the key for shared consumption solutions to compete with existing alternatives (Henten & Windekilde, 2016).

Being able to reduce the transaction costs of your sharing services will accelerate the growth of your service. From an car sharing provider perspective, not owning a fleet, ITS should lead to a situation where your marginal- and transaction costs are close to zero. Implying that a new user connecting to your service, only an increase in revenues and not in costs will result. In theory this would create a high potential for growth, as profits increase. A constraining factor is the capacity of cars in this case. For internet based platforms, where demand and supply are connected via the system by the users, it is theoretically possible to create a "marginal cost society". Leading to a theoretic situation, in which it is economically feasible to offer the service for free (Rifkin, 2014).

Cohen & Kietzmann (2014) are addressing issues which hinder aligning incentives between public and private parties. They are stating that a pure reliance on the private sector to deliver the desired environmental and mobility impacts will fail. Introducing economic and noneconomic incentives may reduce agency conflicts and improve overall system performance. The improvement makes at least one individual or preference criterion better off without making any other individual or preference criterion worse off. Creating such a situation can be seen as a pre-condition for successful public-private cooperation (Furubotn & Richter, 2010, p. 389). Secondly, Cohen & Kietzmann (2014) state that there is a dearth of research of how shared mobility business models work and how the outcomes of these models can contribute to align incentives with key stakeholders. The conclusion in their research, to facilitate this alignment, is that the shared mobility business models move towards a model, in which the shared goods can be seen as merit goods. This would not imply that the goods themselves should change. Though, it would imply that public parties should get convinced about the merit good

characteristics of shared mobility. Unambiguous knowledge is required to see the impact on environmental and citizen goals.

In the car sharing provider- and user relationship human assumptions (bounded rationality, self-interest, risk aversion) and organisational assumptions (partial goal conflict among participants, information asymmetry between principal and agent) are forming structural barriers for car sharing according to Baggio (2015). The objective is to reduce the uncertainty of these assumptions to reduce the gap between the agents action and the expected results. According to Baggio (2015) this can be achieved by doing the following: “the principal should design a system of incentives able to align the behaviour of the agent with the principal’s interests and should establish mechanisms of monitoring and control providing valuable information enabling the evaluation of the agent’s actions.

5. Functional Analysis

As Bergek et al. (2008) and Hekkert et al. (2007) point out it is important to assess what the achieved functional pattern in the current innovation system is. It shows which innovation functions are performing well and which do not. In this case the achieved functional pattern is calculated through the frequencies of codes occurring in the respective innovation function. The frequencies are relatively scaled on a 0-1 scale. The maximum frequency scores 1 and the lower frequency are relatively scaled to the maximum value. If an innovation function is scored 1 it means that the interviewee mentioned more barriers to the related innovation function than to any other innovation function. The following experts were interviewed:

Table 1 Description interviewees and related TIS block

Block in TIS	Organisation	Date interview	Duration interview
National government (Politics)	Rijkswaterstaat	17-01-2018	55:46
	Ministry of Infrastructure and Environment	18-01-2018	41:27
Local government (Politics)	Gemeente Utrecht	30-01-2018	40:11
	Gemeente Rotterdam	06-02-2018	42:05
	Gemeente Den Haag	08-02-2018	45:00
Supply	WeGo	30-01-2018	40:43
	BMW Nederland	18-01-2018	45:56
	Louwman Dealer Groep	24-01-2018	41:48
Demand	Ernst & Young	06-02-2018	48:24
Support Organisation	Natuur & Milieu	02-02-2018	42:57
Research & Education	CROW	08-02-2018	51:01

The results of this achieved functional pattern are influenced by the subjective choices made by the coder to relate barriers to innovation functions. Additionally, it does not give an order of priority for the importance of the barriers. The importance and blocking power of barriers in the related innovation function cannot be given through this analysis. There will be also unobserved barriers as both the duration of the interview and size of the sample are limited. In conclusion, the achieved function pattern gives an overview the current phase of car sharing and on which’s functions focusing is need in the future based on the perceptions of the actors.

There were 68 unique barriers found in this innovation system. This resulted in the achieved functional pattern depicted in Figure 2. ‘Market formation’ and ‘entrepreneurial activities’ were the most underdeveloped innovation functions in the perception of the interviewees. To a lesser extent ‘knowledge development/diffusion’ and ‘guidance of the search’ were underdeveloped. Five unanimous barriers, mentioned by all the actor groups in the innovation system, have been found.

Firstly, there is a difficulty in creating profitable business models. Risk allocation in projects and time consuming sales processes are underlying factors for this barrier. There is also a lack of transferability of projects, which limits the ability to implement car sharing solutions in any situation without feasibility studies. Secondly, lack of scalability, partly related to the difficulty in creating business models, is limiting the network ability of car sharing services. It also limits the societal effects and visibility of these effects. Thirdly, the national fiscal policy is seen as barrier albeit different actor groups view this barrier differently. According to the governmental parties fiscal incentives can contribute to the diffusion of car sharing in the Netherlands. However, in their view it is not essential in this stage as the market size is too small for creating fiscal incentives. On the other hand the business parties have emphasized that in the current fiscal system there is no level playing field. Car sharing as mobility solution encounters resistance competing with other forms of automobility, because of the fiscal incentives users get in the current system. Fourthly, there is no push for behavioural change in the current market for automobility. Terms of employments are favouring the choice for car ownership/lease. Context factors, e.g. no parking pressure, no paid parking licenses, and the lack of accessibility of other mobility services than a private car limit the transition from private use to shared use of cars. Fifthly, the absence of insurance products is a barrier of minor importance according to the interviewees.

There were also barriers perceived by specific actor groups. Car manufacturers admit that shared mobility is new in their strategies or only seen as revenues next to car sales and may not harm those sales. Furthermore, operating a car sharing service is labour intensive caused by negative reciprocity and unfamiliarity among users. Local governments cope with undercapacity and unfamiliarity about car sharing and a lock-in effect of only applying mobility solutions they have previous experience implementing these. National- and local government state that there is a lack of integrating shared mobility in spatial development and other mobility services. They state that integration has high potential for actors outside the innovation system as real estate developers and energy companies as well.

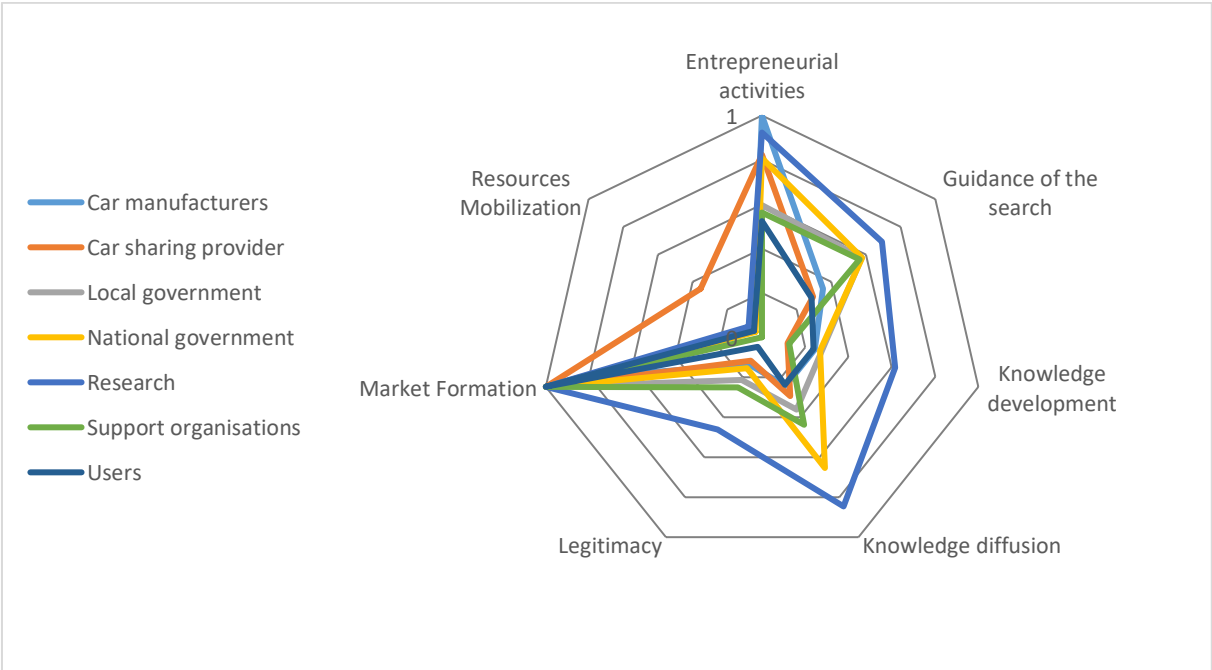


Figure 2 Achieved functional pattern in the TIS for car sharing in the Netherlands

Synthesis
Design barriers

The structural causes for the design barriers in the car sharing innovation system can be caused by the interdependence of the different subsystems as was stated by Barth et al. (2003). Design of the systems always have to comply to legislation for, e.g. data privacy (The European Parliament and The Council of the European Union, 2016) and liability issues in case of damages. According to the car manufacturers in the sample important structural causes for high operational costs and difficulty of creating business models.

Integrating all the subsystems into one platform owned by the car sharing providers offers advantages. It is easier to comply to legal and liability requirements as you have only one access channel to the platform. On the other hand, it decreases the opportunity of compatibility with other mobility services. It decreases the opportunity of exploiting the network value of the car sharing service according to the research organisation in the sample, also one of the key tasks for local governments according to Wockatz & Schartau (2015). According to Barth et al. (2003) and Williams (2007) reducing those structural barriers will improve accessibility and increase the ease of use, which are barriers mentioned by the interviewees.

According to the car sharing provider in the sample there is dependence on the car industry to scale-up your services. This supports the findings in the structural analysis of Le Vine et al. (2014) and Loose (2010). If the car industry will allocate more resources, e.g. funding, cars, technology, it will have positive impacts for car sharing providers. According to Spulber & Dennis (2016) the car industry currently sees car sharing not as a mobility solution they need to fully commit on, but as a mobility development they need to hedge for. If shared mobility will be the standard in the future the car industry already hedged for this development and have a position in this market. However, reducing this structural barrier might result in increased scalability and will possibly make the creation of new business models easier.

Finally, car manufacturers admit that the variability in negative reciprocity and demand for car sharing services among users, reduces the ability to transfer projects from one location to another (Bardhi & Eckhardt, 2012). The lack of harmonisation of policies for car sharing also limits the transferability of car sharing projects (Gemeente Amsterdam, 2017; Gemeente Rotterdam, 2016). These structural causes were mentioned by the car manufacturers as limiting the transferability of car sharing projects and hampering the creation of successful business models.

Organisational barriers

There is unfamiliarity among local governments in the Netherlands when it comes to car sharing according to the interviewees. According to the research organisation an important structural barrier is the poor quality of the data. It doesn't provide enough insights in societal- and economic effects of car sharing in the Netherlands. This was already observed in the performance dashboard for car sharing provided by CROW (also the research organisation in the sample) (2017).

Next to poor quality of data, there is a lack of internalising negative externalities of car mobility, which might cause a lack of action at local governments. There is an undercapacity among local governments according to local governments in the sample, which in some situation gives low priority to supporting implementation of car sharing.

Lastly, the lack of internalising negative externalities of car mobility. Parking is not regulated in throughout all the Dutch cities. It means in some cities public space for parking is seen as an open-access good. If these negative externalities are internalised in private car use, car sharing as mobility solution becomes financially more attractive. Niesten et al. (2017) stated that internalising negative externalities could also be achieved through collaboration on sustainability. Contracts between car sharing providers and local governments which in a way compensates for the additional value of shared mobility compared to private mobility.

Legal barriers

As Geels (2012) stated that there is reticence about creating fiscal advantages for alternatives to private car mobility, because of the danger of political defeat. In the current market the national fiscal policy does not create a level playing field. Next to a political defeat, a possible structural barrier is the dependence on the car industry for economic welfare (Cosentino, 2009). Making private car mobility less attractive could result in a loss of economic welfare.

Another possible barrier for the lack of national policies for car sharing can be the focus within the Ministry of Infrastructure & Environment. In the program 'Beter Benutten' the focus was on congestion reduction instead of making automobility more sustainable (Ministerie van Infrastructuur en Milieu, 2016). A shift in this focus could have positive impact on the functional barriers.

Contextual barriers

The contextual barriers mentioned in the interviews are parking pressure and political orientation. In the structural analysis the research of Dias et al. (2017) and Efthymiou et al. (2013) showed characteristics for which users were most probable to make use of car sharing services. According to the interviewees, next to these characteristics local governments can increase demand through creating a context for the use of car sharing services. If there is no parking pressure nor a political orientation towards sustainable mobility it will block the diffusion of car sharing.

Future trends

All interviewees were aware of these future scenarios sketched by Bert et al. (2016) and Spulber & Dennis (2016) and different consultancy companies. If the uncertainty of this structural barrier could be reduced it will certainly help to better define the future of car sharing. It would give actors active in the innovation system more insight in what current contributions for innovative mobility solutions are worth in the future.

6. Conclusion

In conclusion there are 68 barriers in the Dutch innovation system for car sharing, based on interviews with eleven experts. These barriers are primarily related to underdeveloped 'market formation' and 'entrepreneurial activities' functions and to a lesser extent 'knowledge creation/diffusion' and 'guidance of the search'. Barriers related to the market formation are, e.g. lack of fiscal advantages, no push for behavioural change, lock-in effects at local governments. Barriers related to the 'entrepreneurial activities' are, e.g. difficulty of creating profitable business models, lack interoperability, lack of transferability and lack of integration in spatial development.

The introduction of the GreenDeal in the Netherlands has contributed to reduce the unfamiliarity about car sharing as innovative mobility solution. However, unfamiliarity among users- and local governments still exists and limits the diffusion of car sharing in the Netherlands. The lock-in effect causes a reduced use of car sharing services in promising sectors as spatial development. Such an integration is seen as highly valuable by governmental interviewees. However, risk allocation is perceived as difficult in these projects by car manufacturers as it is a new way of selling mobility for them. A factor influencing this risk allocation is negative reciprocity among users. It is affecting the profits of car sharing providers, because this factor can't be determined in advance. It makes car manufacturers reluctant to participate on a large scale in such projects.

Car manufacturers also face other mobility transitions as autonomous driving, electrification and ridesharing next to shared mobility. They admit autonomous driving has higher priority than shared mobility. Through participating in small scale projects they hedge for possible future success of shared mobility and benefit from the learning effect. Car manufacturers do not fully commit to making car sharing the substitute of private car ownership. First and foremost it is private car sales and other forms of automobility like car sharing are in second place.

Internalisation of negative externalities of automobility is lacking in the Netherlands. National fiscal policy is not creating a level-playing field according to business actors groups and does not stimulate a

transition from private ownership to shared mobility. National government believes that the current market size is too small for creating fiscal advantages. Although, other structural causes as reticence to create fiscal advantages and risk of losing electorate may also cause reluctance for creating fiscal advantages in addition to a small market size.

The fact that market size is small also means that sustainability effects of car sharing in absolute terms are low. Visibility and verification of the effects of car sharing on a local level is possible to a limited degree. Especially, for small/medium governments where the context, e.g. no parking pressure and parking not regulated, is not as beneficial for shared mobility as in urbanised municipalities where these societal problems play a role. In urbanised areas there is a natural license to operate and facilitate sustainable mobility initiatives like car sharing.

7. Discussion and future research

The used research method resulted in data getting saturated after 11 interviewees. It also showed that non-monetary barriers exist next to monetary barriers. This research does not support the claim that diffusion in an innovation system can only be blocked by financial motivations. However, the research needs to be improved to reject or accept this claim. Improving this research requires multiple iterations of the structural analysis and subsequently new interview rounds. Iterations can expand the current list of barriers and broaden the actor perspective on the list of barriers. Additionally, a comparative analysis of the innovation system for car sharing to other innovation systems is missing in this research. Performing a comparative analysis can lead to a more robust answer of underperforming innovation functions. Through a comparative analysis a more reasonable development of the focal innovation system can be given. This can be achieved through a literature review on previously analysed innovation systems in comparable phases.

Increasing accessibility, interoperability and ease of use can be achieved through smart cards and mobility as a service applications according to findings in literature and opinions of interviewees (Blythe, 2004; Sochor et al., 2015). However, research need to be done on the feasibility of solutions of this kind. Estimation of effects for the Dutch car sharing innovation system need to be estimated through model- or scenario studies. Creating a level playing field on fiscal policies for automobility needs improved in depth analysis of weaknesses and opportunities for opportunistic behaviour in the current fiscal policy (Van Ast et al., 2006). Integrating shared mobility in spatial development is perceived as promising. Improved knowledge is required for successfully executing such projects by involved parties. Especially for business parties development of profitable business models for these applications need future research.

Structural barriers (Chapter 4)

Technical system

- Interdependence subsystems
- Lack of compatibility with other systems

Actors & Network

- Dependence on car industry
- Car sharing used for hed

Institutions

- Negative reciprocity among users
- Lack of harmonisation long- and short term incentives

Actors

- Quality of data is lacking
- Lack of harmonisation local policies

Institutions

- Lack of externalising neg. externalities

Actors

- Dependence on car industry for economic welfare
- Reticence for creating fiscal advantages
- Focus on congestion reduction

Institutions

- Lack of externalising neg. externalities
- Blurred ownership structures

Contextual barriers

Institutions

- Uncertainty about future trends in automobility

Blocking mechanisms (Chapter 5)

Creation of business models
Ops. car sharing time consuming
Lack of scalability
Lack of interoperability
Lack of transferability
Lack of integration in spatial development

Under capacity at local governments
Lock-in mobility solutions
Unfamiliarity among local governments

National fiscal policy
No critical mass
Private use unattractive
Absence of insurance products

Parking pressure
Political orientation

Ridesharing
Autonomous driving
Electric driving

Innovation Functions

Entrepreneurial activities

Market formation

Guidance of the search

Knowledge development

Knowledge diffusion

Mobilisation of resources

Legitimise

Inducement mechanisms (Chapter 6)

Mobility as a Service (MaaS) applications

- Increase interoperability
- Increase awareness/decrease unfamiliarity
- Increases possibilities to scale up
- Increases use of car sharing services

Incentivising through gamification

- Increases awareness around sustainable mobility
- Decrease unfamiliarity among users
- Increase use of car sharing services

Create a fiscal level playing field

- Increases behavioural push
- Decreases attractiveness of private car ownership

Increased internalisation of negative externalities in car usage

- Increases behavioural push
- Decreases attractiveness of car usage

Cooperation for integration spatial development and shared mobility

- Increase knowledge on this topic
- Provides assistance in development of business models

Develop Proof of Concept/action framework for local governments

- Increases familiarity
- Decreases lock-in effect for mobility solutions
- Increase transferability
- Decreases complexity and possibly less capacity needed at local government to set-up a project

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