

# Governance of Dockless Bicycle Sharing

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## Abstract

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*Bicycle sharing systems* (BSS) of foreign and Dutch origin are showing increasing interest in entering Dutch municipalities. The launch of several systems in Amsterdam and Rotterdam caused nuisance and a substantial part of society objected against the initiatives in the summer of 2017, after which the systems were banned. The actual added value of these systems in terms of *public values* are uncertain. The so-called shared systems are regarded as a product-service economy rather than sharing economy initiatives, resulting in private interests that come into play. In this article, we explore the public values related to BSS by conducting *interviews with municipalities* and comparing the public-private understanding in relation to other sectors of the economy. The analysis implies that public space (quality, control & no commercialization), the costs for municipalities, quality of bicycles and mobility (public transport addition & flexibility) are dominant public values, which are not automatically secured by private companies. To understand the actual functioning and adoption of a BSS in society, in-depth research on the user perspective of the systems and identifying ‘second business models’ driving the international expansion of BSS companies are an area for further research.

*Keywords: Product-service economy, Dockless bicycle sharing systems, Public values, Smart mobility*

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## 1. Introduction

During the last two decades, bicycle-sharing systems (BSS) have been implemented all over the world. Fishman (2016) stated that there were only 11 cities with a BSS in 2004 and that this number increased to a total of more than thousand systems currently operating worldwide (DeMaio, P., Meddin, 2018).

Shaheen (2016) defined bicycle sharing as part of the sharing economy and international media reported on the sharing economy in combination with BSS. Vice (2017) stated in an article that shared bicycles are a part of the sharing economy in which shared products and services are central. This would mean that people can reduce costs by using the same product as their neighbours. Roland Berger (2014) estimated that the total

bicycle sharing market can generate 5.3 billion dollars in revenue by 2020.

The first scheme was introduced in Amsterdam in 1965 and was called ‘the white bicycle plan’, which was, in fact, a societal statement with a highly symbolic value to draw attention from the authorities at the time (Gemeente Amsterdam, 2017b). However, the plan was soon cancelled due to vandalism and theft.

At the same time, many research concerning BSS identify the scheme of 1965 as the core idea on which later programs have been built (Shaheen, Martin, Chan, & Cohen, 2014). In 1993, the second generation BSS was introduced in Copenhagen, whereby people could unlock the bicycle using a coin (Shaheen, Guzman, & Zhang, 2010). The third generation incorporated more

technology and docking stations were developed to which the bicycles could be returned. The first system of this kind was implemented in 1996 in Portsmouth, England (DeMaio, 2009). Most initiatives of these generations were financially supported by authorities or were later on handed over to non-profit groups who could operate these systems (Vogel, Greiser, & Christian, 2011). Fietsberaad CROW (2017) created a shared bicycle definition that is also adopted in this article:

*'Shared bicycles are bicycles that are offered at limited costs for a short period of time in a network in public space and are accessible 24/7 to potential users'*

Technology like smartphones, smartcards or credit cards drove the systems towards more advanced technological systems (Garcia-gutierrez, Romero-torres, & Gaytan-iniestra, 2014). This resulted in mostly Asian based companies like Ofo and Mobike, who included QR codes to unlock free-floating bicycles (ECF, 2017). These bicycles can be returned at any publicly accessible location within the operating area of the service. This means people are able to freely use the bicycle most suitable for their origin and destination.

Dockless BSS can also incorporate geofence technology, as can be seen in figure 1. This geofence technology limits BSS-users to park bicycles outside of the 'geofence'. So besides free-floating BSS, there is geofenced BSS. Both are dockless appearances.

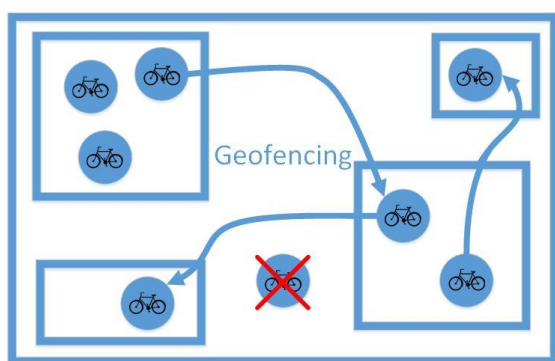


Figure 1: Geofenced dockless BSS visualised

In the summer of 2017 multiple operators started their operations in Amsterdam and Rotterdam. These systems were the first of their kind to start in the Netherlands since the invention of bicycle sharing in Amsterdam.

This introduction came unexpectedly for the authorities and inhabitants were also surprised by the sudden emergence of shared bicycles on the streets. Not all citizens welcomed the systems, due to the limited available parking facilities, nuisance and sidewalk obstructions caused by the new bicycles (Fietsberaad CROW, 2017).

The unforeseen implementation of bicycles without any knowledge about the functioning of the system within the municipality also raised political questions (Gemeente Amsterdam, 2017a). As a result, the authorities ordered to remove all the shared bicycles out of the city of Amsterdam and decided to regulate the bicycle sharing scheme in the future, which resulted in a market consultation (Gemeente Amsterdam, 2017b).

To realise a good understanding with BSS operators and implement a beneficial BSS for society as a whole, the main question in this article is:

*What are the most dominant public values in conflict with private values, regarding dockless bicycle sharing systems?*

This article will have the following structure: In the second section, the literature of the sharing economy and public values is explained. The third section will elaborate on the research method, which are structured interviews to identify conflicts with private interests. In section four the results of the research are presented. A conclusion will be drawn in section five.

## 2. Sharing economy and public values

As mentioned in the introduction, BSS is regularly mentioned and identified as part of the sharing economy. Frenken, K., Meelen, T., Arets, M., Van de Glind (2015) developed a framework in which so-called sharing economy initiatives can be assessed critically. They identified three aspects

that must be present, to be really part of the sharing economy:

- Sharing must be about a *consumer-to-consumer* relation.
- Sharing must grant *access* rather than transfer ownership to one another.
- Sharing must contain *physical resources* that are used more efficiently. It is not about delivered services by people.

If only two of these aspects take form in the initiatives considered, it can be part of a related economy, knowable as the *on-demand economy*, *second-hand economy* or *product-service economy* (Frenken et al., 2015).



Figure 2: Application of Frenken et al. (2015) framework

In figure 2 several initiatives are situated and visualized in relation to the applicable economy. Every type of economy is represented in relation to bicycles on the market. Mobike, an example of a dockless BSS, is identified as a product-service economy initiative in this figure. Because a private company is involved, bicycles are owned by the company and this platform can add value in terms of *improved access* to bicycles instead of private ownership. In addition, schemes like Mobike offer potential opportunities to make more *efficient use of physical assets* like bicycles.

Besides potential positive aspects of bicycle sharing, the involvement of commercial parties

comes with *private interests*. This might involve the selling of user data, commercialization of public space or limiting company expenses (Sprout, 2018), which can conflict with existing public values in society.

Moore (1995) was the first researcher to give a definition of public values and described it as “managerial success in the public sector with initiating and reshaping public sector enterprises in ways that increase their value to the public in both the short and the long run.” Veeneman & Koppenjan (2010) gave substance to public value by stating that public values are expected to be secured by society for all inhabitants and that these values can be very abstract and specific in form. In addition, public values are deeply desired needs and wishes fulfilled by the public sector, private companies or on behalf of the public sector (Charles, de Jong, & Ryan, 2011). That leads to this research definition of public value:

*Public values are needs and wishes of inhabitants for the short and long run, pursued by authorities and can be abstract and operational’*

### 3. Research method

The research method used for this article is using a qualitative approach by conducting interviews with municipal experts in the mobility domain. By using structured questions for all interviews, the interviews resulted in the identification of public values to confront with the private values of BSS operators.

Nine structured interviews with municipalities in the Netherlands were carried out. The interviewed cities were selected based on their interest or experience in the field of bicycle sharing. All approached cities were signed up for a meeting at CROW concerning BSS (Fietsberaad CROW, 2017). The focus of the selected cities was very urban to moderately urban cities, on which Dutch municipalities are defined in terms of address density (KiM, 2015):

- [1] Very urban: an average of 2500 or more addresses per km<sup>2</sup>

- [2] Strong urban: an average between 1500 to 2500 addresses per km<sup>2</sup>
- [3] Moderately urban: an average between 1000 to 1500 addresses per km<sup>2</sup>

The selected cities are presented in table 1. All interviews were carried out in a timeframe of two weeks in March 2018. Questions were sent a day in advance, so the interviewees became little aware of the questions asked. This was considered beneficial for the quality of the interviewee's answers. The interviews were recorded, transcribed and coded to obtain results.

**Table 1: Selected municipalities for this research**

City	Urbanity	Inhabitants
Rotterdam	1	634.660
Den Haag	1	526.439
Groningen	1	202.636
Tilburg	1	213.804
Eindhoven	1	226.868
Leeuwarden	2	108.667
Enschede	2	157.864
's-Hertogenbosch	2	152.411
Houten	3	49.300

The structure of the interviews was based on prior literature research to identify important foreign BSS topics and possible effects during the implementation and operations of a BSS in a city.

After the interviews are transcribed and coded, public values are defined, counted for times mentioned by interviewees. This result in a list of public values. After this, private interests are identified and assessed on the public values. This results in the most prominent conflicts based on times mentioned by representatives of municipalities. These public values are substantiated with private interests by an interview with an operator in combination with public hearings to identify their standpoints (Gemeente Den Haag, 2017).

## 4. Results

All interviews were analysed and transcribed. This resulted in the identification of 10 main themes of

interest for municipalities in relation to BSS. These were *Mobility*, *Public space*, *Functionality*, *Users*, *Stakeholders*, *Data*, *Costs*, *Regulation*, *Sustainability and cycling culture*. These themes will shortly be addressed.

Municipalities want to maintain or at least strengthen the current Dutch *cycling culture*. It is uncertain to what extent these BSS will be able to do that. They also want BSS to be an addition or likely option for users in terms of *mobility*. Especially in terms of being a last-mile solution for public transport, but also a potential first-mile solution to a public transport hub. Municipalities struggle to what extent BSS can commercialize *public space* and what fees they can ask from operators to use public space. Also, they are uncertain about how enforcement can still control the public space because orphan bicycles are already a big concern for cities. *The functionality* of the system is important, the quality of bicycles can differ among operators. Since Dutch people are used to high-quality personal bicycles, BSS bicycles should meet certain standards. The functionality of the system also contains fleet size, because it influences the available bicycles for potential users. For *users*, it is important that systems can become part of a future Mobility-as-a-service (MaaS) solution, for which interoperability is crucial. MaaS should integrate future mobility modes into one application or service. Private responsibility versus the responsibility of the operator should be clear in terms of potential penalties for users. It is also highly valued if BSS is useful for inhabitants and not dominantly for tourists. *Stakeholders* like traditional bicycle rental companies don't want unfair competition. *Data* generated with BSS should become available for municipal analysis and GDPR *legislation* should be conformed to. Municipalities have multiple possibilities to regulate the market in terms of general local regulations, service level agreements, permit requirements, prohibit or price incentives similar to sufferance tax used for terraces. Municipal costs for enforcement of wrongly placed bicycles and extra parking facilities should also be a point of attention when costs are calculated for implementation.

From these main themes, the public values identified are presented in table 2.

**Table 2: Identified public values**

Public value	# mentioned
<b>Mobility</b>	
Flexibility	8
Public transport addition	7
MaaS integration	6
Increase bicycle usage	3
<b>Public space</b>	
Quality of public space	9
Control of public space	8
No commercialization of public space	8
<b>Sustainability</b>	
Air quality	6
Use of active modes	4
Circular economy	2
Sustainable image city	2
<b>Data</b>	
Information	6
Smart cities	3
Privacy	1
<b>Costs</b>	
Public facilities	7
Parking spaces	6
Corporate responsibility	6
<b>Users</b>	
Interoperability	5
Personal responsibility	3
Social inclusion	2
<b>Functionality</b>	
Quality of bicycle	7
Availability	3
Fleet size	3
<b>Stakeholders</b>	
Use by inhabitants	9
Use by commuters	4

Based on the interview with operator Flickbike and the public hearings in The Hague (Gemeente Den Haag, 2017) about experiences with bicycle sharing in Rotterdam and Amsterdam, the public values are confronted with the following private interests: *Make profit, Limit company costs, Maximize the number of users, Maximize the number of bicycles (with respect to their business model), Maximize freedom to use public space, Use motorized vehicles for*

*redistribution, Limited transparency to competitors and municipality, no commercialization of public space, city-wide implementation of bicycles and open to interoperability.*

**Table 3: Private values**

Private value
Make profit
Limit company costs
Maximize the number of users
Maximize the number of bicycles
Maximize freedom to use public space
Use of motorized vehicles for redistribution
Limit transparency to competitors and municipality
Commercialization of public space
Collect user data
City-wide implementation of bicycles
Open to interoperability

Most of these private values apply to operators in general, only city-wide implementation is not always the case, some focus on a specific area of the city or only focus on connection with public transport. Openness to interoperability applied to nine of eleven operators in the Netherlands. Not all operators signed the intention agreement to exchange information for other operators, which would facilitate and provide the starting point for future Mobility-as-a-service integration (Enigma, 2017).

This resulted in the following dominant conflicts between public values for society and private interests of operators.

- Public space (quality, control & no commercialization)

The use of public space is an essential part of the operations of a BSS since this is the ‘point of issue’ of the service and provides 24/7 accessibility for potential users. This is driven by the operator’s drivers to maximize fleet size and maximize freedom to use public space, which results in utilizing public space for commercial practices. An increased fleet results in orphaned or unused bicycles at unwanted locations for the municipality and causes nuisance and obstructions if the system is not used by a

significant part of society. This means that the utilization rate of the BSS fleet should be in line with the number of bicycles allowed in public space. In addition, advertising on bicycles can be of importance for the business case of operators. This type of commercialization of public space is often unwanted by authorities to secure the quality of public space.

- Costs municipality

The municipal parking facilities and general cycling infrastructure were used freely by the operators during their introductions in the Netherlands. Some operators did not notify the authorities before they entered the city. This happened because no legislative frameworks required such a notification for dockless operators. The costs for handling wrongly parked bicycles, handling complaints of citizens and pressure on public parking facilities were not regarded as the responsibility of the operator. As the operator's interest is to keep their costs as low as possible and maximize their profit, they simply ignore these effects if not addressed or regulated by municipalities.

- Quality of bicycles

The interview with Flickbike learned that a miscalculation was made regarding the necessary quality of the bicycle. Many bicycles malfunctioned bicycles on arrival (7%) or were vandalized during the period of operation (10%) (Kumanikin, 2017). In interviews with the municipalities, this was also mentioned regularly as a point of concern. Also, some municipalities experienced the impact of the inferior quality of these bicycles: broken, rusty bicycles and uncomfortable usage. This has a major effect on the acceptance and adoption of the systems. Since trip costs are not the only way to make a profit, but also user data can be part of the business case, the quality of bicycles is not automatically guaranteed by operator values. Municipalities value higher quality bicycles in public space, as part of the larger mobility system besides public transport. Therefore, quality assessments or standards can be part of a permit scheme.

- Mobility (Public transport addition & flexibility)

Operators have an incentive to become a mobility option for potential users. They see the city as an operating area and mainly focus on hotspots for potential users. Flexibility in terms of a free-floating fleet is also a big advantage for the operator since they do not have to reserve parking space. Also, they can offer this flexibility as a benefit of their offered service to the user. But, the operators are not mainly focused on becoming an addition to the existing public transport system. Rather they will become a part of mobility as large as possible to maximize revenue. Therefore, the public value of becoming an addition to public transport is partially conflicting with private values, if not facilitated well by authorities. An increased flexibility for users, in terms of city-wide implementation and parking freedom by users, automatically increases the risk for authorities in terms of orphaned bicycles and use of public space.

It must be acknowledged that not all public values conflict with private interests. For instance, the value of society to become a service for inhabitants rather than tourists did seem the case for users of Flickbike in Amsterdam, 85% of the users were living in the Netherlands and 15% were tourists (van Waes, Münzel, & Harms, 2018).

## 5. Conclusions

The research question presented in the introduction of this article was:

*What are the most dominant public values in conflict with private values, regarding dockless bicycle sharing systems?*

To synthesize on the results in section four-a concise answer will be formulated to this question.

*Public space* (quality, control & no commercialization) – BSS should not impact and decrease the quality of public space negatively. The maximum number of bicycles and freedom to use public space could be regulated by the authorities, using permits or geofence technology.



*Costs municipality* – Measures to cope with BSS should distribute costs made by municipality fairly. This could be effected using permit fees or sufferance tax. Handling of wrongly parked bicycles can increase the pressure on municipal expenses. Authorities could evaluate these costs to calculate these costs to operators revenue and business models. Also, the use of public space by the BSS fleet can be calculated in terms of operating area or spatial impact per bicycle.

*Quality of bicycles* – BSS should make sure the quality of shared bicycles matches the Dutch standard in terms of bicycle comfort, sustainability, durability and ergonomics, in order to become a suitable alternative for the Dutch user. Quality assessments or standards can help safeguard this public value.

*Mobility (Public transport addition & flexibility)* – Measures to cope with BSS should make sure that the BSS becomes part of the ‘bigger picture’ of mobility options and is assessed in combination with the public transport network. This can be accomplished by making BSS part of a concession or allocating space near public transport hubs.

Flexibility is a value to users on one hand, but on the other hand authorities want to limit the impact of flexibility in terms of wrongly parked bicycles and bicycles at unwanted locations.

The findings of this research are generalizable in the Dutch context. Dutch municipalities were interviewed for this study, these were of different size and from different regions. During interviews, many issues came to mind, which lead to saturation of answers. Nevertheless, foreign cities can benefit from the insights if similar public values conflict with private interests.

More insight into the functioning of BSS is necessary, further research should focus on actual user data of operators in the Netherlands. To understand the actual functioning and adoption of a BSS in society, in-depth research on the user perspective of the systems and identifying ‘second business models’ driving the international expansion of BSS companies is an area for further research. Other welcome research topics are the implementation and evaluation of governance measures.

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