Cycling as a Service assessed from a combined business-model and transition perspective

Abstract

Cycling-based mobility services or 'Cycling as a Service' (CaaS) have recently expanded in number and scale in the Netherlands. In contrast to most other CaaS studies to date, cycling has a high modal share of transport journeys and relatively strong institutions in the Dutch context. However, these supportive features have not translated into straightforward success for CaaS providers. Instead, responses to CaaS providers have varied widely, from tolerance to opposition. In this study we employ a combined business model and transition perspective to investigate this variation and its implications for CaaS in Dutch urban mobility systems. We present a typology of business models and analyse it using an adaptation of Hoogma's fit-and-stretch framework for strategies in emergent niches. CaaS business models are classified in terms of this framework, and their transitions potential analysed. Our findings clarify the strategies used by niche actors to operate within established cycling regimes.

Key Words

Cycling as a Service, Mobility as a Service, business model, shared mobility, sustainability transitions, bike sharing

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1. Introduction

Cycling as a Service (CaaS), referring to services such as bikeshare that provide users with temporary access to a bicycle, has been promoted around the world as a low-carbon form of urban mobility that is cost, energy and space-efficient. Considering that transport's share of global carbon emissions is at 23% and rising, CaaS's potential to combat climate change on an urbanising planet is significant (World Bank, 2017) However, despite the Netherlands' strengths as a leading cycling nation with a long history of cycling innovation, Dutch cities have lagged behind their developed-world counterparts, especially in Western Europe, in their adoption of city-wide public bikeshare systems, which have long been the face of CaaS elsewhere (Alpkokin, 2012; KiM, 2016a; van Goeverden and Godefrooij, 2010). In many cities, the promotion of these systems, often with public subsidy or incentives, has been intended to pioneer a mainstream, everyday cycling culture (Goodman et al., 2014). In Dutch cities, in contrast, a mainstream cycling culture already exists, along with a supportive legal environment and physical infrastructure (Fishman, 2016; KiM, 2016b) However, despite these favourable conditions, CaaS in the Netherlands has until recently been largely limited to the rail station-based *OV-Fiets*[1] bike hire system.

It was only in the period 2015-2017 that CaaS operators began to enter the Dutch urban mobility market en masse (van Waes et al., 2018) This period provides an instructive case of an innovation that has largely developed and matured in historically low-cycling contexts, interacting with a mature and socially embedded cycling context. The Dutch case also makes for a compelling study of CaaS operators' strategic responses to this environment. Understanding why CaaS lagged in its introduction to the Netherlands, and why individual CaaS operators met with varying levels of opposition from other actors, may yield a more nuanced understanding of its prospects in the future of Dutch urban mobility. These prospects are particularly important in light of the country's stated aim to further raise cycling levels and improve the integration of cycling with other mobility modes, in pursuit of a sustainable mobility transition (Bertolini et al., 2015; KiM, 2018). These observations may also contribute to theoretical conceptions of how firms bring shared mobility innovations to specific markets (Manders et al., 2018) by creating and capturing value for various stakeholders. Business models are one unit of analysis that can help analyse and compare CaaS firms, as well as how they interact with other, more established incumbent actors, and shape outcomes that affect other firms.

[1] OV-Fiets is an example of a back-to-one (B21) system, meaning that rides should terminate at the same docking station at which they started. Back-to-many (B2M) systems allow the user to terminate a ride somewhere other than the starting point. Although OV-Fiets does technically permit B2M usage, a penalty equivalent to more than 2 times the cost of a ride is levied for this.

The variations among CaaS business models in the context of ongoing urban mobility transitions are only beginning to be conceptually unpacked. Van Waes et al. (2018) address the case of CaaS in the Netherlands, using a co-evolutionary approach to industry emergence to determine the upscaling potential of various CaaS business models. Other, more general studies of CaaS in the Netherlands include Van Zessen (2017) who analysed the spatial effects of bikeshare and its potential for integration into urban public transport systems, in order to project various pathways for CaaS development in the Netherlands. Outside of the Netherlands, the business models of CaaS providers, as well as other shared mobility services, have been investigated by Cohen and Kietzmann (2014) who focus on the relationship between mobility service providers and local government.

Scholars have also considered CaaS in terms of the role it might play in a wide-ranging and deep-seated transition towards more sustainable, lower-carbon forms of urban mobility. CaaS, mostly in the form of bikeshare, has been analysed from a sustainability governance perspective in London (Akyelken et al., 2018) while Spinney and Lin (2018) offer a critique of the transformational potential of dockless bikeshare systems in Shanghai.

From a theoretical perspective, the nexus between business models and transitions has been explored in generic terms (Bocken et al., 2014; Boons and Lüdeke-Freund, 2013; Evans et al., 2017; Schaltegger et al., 2016)... and, more specifically, in connection with sustainable mobility (Hildermeier and Villareal, 2014; Abdelkafi et al., 2013; Wells, 2013) and shared mobility (Castillo-Manzano et al., 2016; Cohen and Kietzmann, 2014; Lan et al., 2017; Sarasini and Linder, 2017). Such a conceptual integration can help transitions scholars with a more detailed understanding of the mechanisms by which firms can influence innovation processes (Boons and Lüdeke-Freund, 2013). For business model researchers, transition approach allows for a more robust account of the macro context in which organisations operate, including the potential of internal business model decisions to influence this macro context and, in turn, affect the firm internally (Wirtz et al., 2016).

However, despite sustained calls for further conceptual integration between the two fields, this literature is at an early stage, and is largely characterised by single case studies (Bolton and Hannon, 2016; Huijben et al., 2016; Sarasini and Linder, 2017; Schaltegger et al., 2016; Wainstein and Bumpus, 2016). With one exception provided by Bidmon and Knab (2017, 2014, 2018), it does not yet provide an integrated lens that can elucidate key questions arising from cases such as CaaS in the mature cycling context of the Netherlands. These include the actual strategies and means used by organisations to bring such an innovation to market, and how these strategies can be accounted for in transitions terms; or the potential effects of an organisation’s business model on its environment. While the empirical field of

energy offers some work in this area[2], it has not yet been shown to what extent these insights are applicable to mobility services, given their distinct relationship with factors such as public space, and with the conventional bicycle's unique status as a 'new-old' technology[3] (Bijker, 1997; Vivanco, 2013). In this article, we attempt to address this gap by means of the following research question:

How can the conceptual integration of business models and sustainability transitions help to explain the case of CaaS in the Netherlands in 2016-2018?

In this paper, we combine insights from transitions and business models to create an analytical framework that will help to address this question and contribute to the discussion underway in this journal (e.g. Sarasini and Linder, 2017).The paper is composed of seven sections. Following this introduction, section 2 presents our theoretical framework. In section 3 we set out our methods, while our case is described in section 4. Sections 5 and 6 respectively present and discuss the results obtained. In section 7 we conclude and offer recommendations for further research.

2. Analytical Framework

Socio-technical transitions and strategy

In the context of mobility, Geels (2012) defined a socio-technical transition as a major shift in the configuration of elements that make up the mobility system, including technology, policy, markets, consumer practices, and infrastructure. Socio-technical transitions theory offers a powerful lens to study the emergence and development of radical innovations within stable socially-embedded technical systems, and how they produce or prevent fundamental change (Geels, 2002; Wieczorek and Berkhout, 2009). It does so by seeing socio-technical systems as a hierarchy of three analytical levels of increasing structuration (Giddens, 1984). These are the niche, a protected space within which radical innovation occurs; the regime, a dynamically stable alignment of established practices and rules; and the landscape, an exogenous source of influences outside the short-term control of system actors (Geels, 2012).

In socio-technical transitions approaches, actors in general "think strategically and try to further their interests" (Geels and Schot, 2010, p. 50); however, as meso-level theories,

[2] For example, Bolton & Hannon (2016) contrasted the transitions approach with two other systems views in analysing energy industry business models in the UK. Huijben et al. (2016) focused on fit-and-conform and stretch-and-transform strategies used by energy firms to contend with regulatory regimes. Wainstein & Bumpus (2016) investigated lock-in in the decarbonising of electrical power systems, concluding that business models can be drivers of transitions irrespective of technology.
[3] This refers to the safety bicycle's fundamental technological stability between the late 19th century and the present, which Bijker presented as a key example of technology stabilisation and closure.

these approaches do not focus on the micro-dynamics of individual actors, and the determinants of their actions. Yet in recent years, scholars have called for closer attention to the critical role played by individual organisations in societal transitions, in pursuit of what Wells (2013) terms “more detailed causal mechanisms” for transitions theories (Bidmon and Knab, 2018; Boons and Lüdeke-Freund, 2013). In his development of structuration theory, a key influence on transitions research, Giddens (1984) had earlier recognised this need to integrate macro- and micro-phenomena to better account for the dynamics of structural change, and identified the concept of ‘unintended consequences’ as a bridge between the intentional actions of actors, and the unintended results of these actions within their context. Mintzberg and Waters (1985, cited by Hoogma [2002]) use the concept of strategy, which they define as a “pattern in a stream of decisions”, to differentiate between patterns of decisions that are realised as intended (deliberate strategies) and patterns realised despite, or in the absence of, intentions (emergent strategies). The interplay between the deliberate strategies of individual niche actors and their unintended consequences thus adds up to an emergent pattern at the niche level.

The ‘emergent’ nature of the strategies used by niche actors to introduce novel technologies is described by Hoogma (2002, p. 15) in his heuristic model of niche development in the electrical vehicle industry. As such, Hoogma offers an analysis not of the deliberate strategies developed by actors before launching a product into the market, but of the emergent strategies that result when an initial deliberate strategy is confronted with and mediated by the dynamics of the niche, regime and landscape. The deliberate strategies created by actors are derived from their observation that a given technology promises certain advantages over the current regime. Hoogma develops the concept of the fit between these strategies and the constraints of the existing regime, and differentiates between different dimensions on which innovations can be a better or worse fit with the regime. In this framework (Table 1), Hoogma concentrates on two strategically important articulation processes that occur in niche development. The first of these is the *technology choice and design* process, by which a technology is given form and articulated (including such factors as its optimal design and production method). The second is the process that establishes the innovation’s targeted *use environment*, or the application domain for the technology (including such factors as user preferences, required infrastructure, and regulatory environment).

To these dimensions, Hoogma applies a typology of product strategies developed by firms, drawn from management literature and developed within the Strategic Niche Management literature, namely *fit-and-conform* and *stretch-and-transform* strategies (hereafter ‘fit’ and ‘stretch’ respectively) (since developed further by Raven et al., 2016). ‘Fit’ strategies seek to

fit into and conform to existing mainstream practices within an unchanged selection environment. 'Stretch' strategies aim at the transformation of incumbent regimes through the development of new practices and institutions, thus changing the selection environment.

Table 1: Typology of emergent introduction strategies for electric vehicles (Hoogma, 2002)

Technology choice and design / Use Environment	Fit & Conform	Stretch & Transform
Fit & Conform	Selective Substitution	Leapfrog design for substitution
Stretch & Transform	Market differentiation	Exploration of a new regime

Comparison between two niche development processes (the two dimensions) and two strategies ('fit' and 'stretch') produces a 4x4 matrix in which the following four composite strategies appear:

- *Selective substitution*: both the technology and use environment conform to the existing regime
- *Market differentiation*: the technology remains close to the regime, while promoters target a use environment that differs significantly from the regime
- *Leapfrog design for substitution*: the use environment remains close to the regime, while the technology develops into a substantially different form
- *Exploration of possible new regime*: both technology and use environment depart significantly from the regime

As the title indicates, Hoogma argues that these 'emergent strategies'[4] are a result of the interplay of deliberate actor strategies with their context, namely dynamics within the niche, and those between the niche and regime, as well as landscape influences.

[4] The emphasis this framework places on the introduction of new innovations is suited to the early phase of the development of CaaS in the Netherlands, since most firms sampled have entered the market within the last 2-3 years.

Business models and strategy

The connection between business models, a relatively new field of study, and strategy, which has a much longer history in management literature, has given rise to a large literature. Reviewing this literature, Massa et al. (2017) find that, while there may be distinct differences between the concept of strategy and that of the business model, business models are themselves an expression of strategy, while also being an extension of established business strategy approaches, particularly its theories of value creation and capture. The tools provided by business models, such as their ability to articulate specific differences in how value is created for users and other actors under different business models that all use the same underlying technology, offer an important advantage compared to traditional strategy approaches in management literatures (Afuah, 2014), which have tended only to focus on the implications of technological advantages for the strategic position of producers.

While a consensus definition of the term 'business model' has not yet emerged in this relatively young and fast-growing field, surveys such as Zott et al. (2011) point towards emerging points of agreement. These include that the business model is a new and distinct unit of analysis that: can be represented through typologies and taxonomies; that is centred on a focal firm, but transcends firm boundaries to incorporate their networks; and that is both a vehicle for innovation and a subject of innovation. We here adopt a definition of the business model provided by Teece (2010, p. 179) that stresses that it is simultaneously a value proposition presented to the customer(s) or user(s), as well as a description of what organisations do to deliver that value:

> A business model articulates the logic, the data and other evidence that support a value proposition for the customer, and a viable structure of revenues and costs for the enterprise delivering that value.

Zott and Amit (2010) have further emphasised that business models not only transcend organisations as cognitive representations, but are boundary-spanning in objective terms, since they require a degree of alignment between actors both within and beyond the field of activity of the focal organisation (such as financial institutions and regulators). In this sense, business models can provide a conceptual connection between the internal dynamics of organisations and the external conditions in which they operate.

Teece's description of business models as a value proposition, plus the means to deliver on that proposition, emphasise the potential of the business model, and the value proposition, to serve as a means of differentiation between firms (Payne and Frow, 2014). This differentiation is strategic in nature; for example, Chesbrough and Rosenbloom find that initial business models, before firms enter markets, serve as a kind of proto-strategy (2002). Casadesus-Masanell & Ricart define the business model of a firm already in operation as "an

expression of the firm's *realised* strategy" (2010, p. 195). This reference to 'realised' strategy suggests a similar emphasis on how an organisation's strategy is mediated by context, to that developed in Hoogma's concept of 'emergent' strategies above, where the product strategies of niche actors are mutually shaped by the specific context of the niche and regime.

An integrated business models-transitions analytical perspective

In this paper therefore we suggest that selected aspects of business models and transitions research can be usefully combined based on their common element of strategy. Due to the diversity of interpretations of the concept of strategy used within both literatures, we limit ourselves here to a broad definition of strategy derived from the strategic management literature, as "the means by which organisations meet, or seek to meet, objectives. There can be a strategy for each product or service, and an overall strategy for the organisation" (Thompson, 1993, p. 2).

Specifically, we make use of Hoogma's 4x4 matrix to analyse the value propositions of CaaS firms in the place of Hoogma's *use environment* dimension in Table 1. As the value proposition is the offering that an organisation presents to users and other stakeholders, it approximates the role of the use environment targeted by niche actors in Hoogma's model, such as projected applications, user preferences and marketing approaches. This element, in particular, can complement transitions approaches to the niche by highlighting sources of competition within the niche, such as niche actors' attempts to respond to and compete with each other's value propositions. Boons & Lüdeke-Freund state that the value proposition reflects a "business-society dialogue concerning the balance of economic, ecological and social needs as such values are temporally and spatially determined" (Boons and Lüdeke-Freund, 2013, p. 13). As such, the value proposition is the element of a business model that most directly addresses users[5], making for a salient comparison with the technology choice and design dimension, which also directly targets the specifics of user needs.

The resulting integrated framework (**Error! Not a valid bookmark self-reference.**) creates a typology of four combinations of 'fit' and 'stretch' emergent patterns along the axes of technology choice and design, and the value propositions of the firms that bring these technologies to market. In this Value Proposition/Technology Choice framework, firms in the category *Fit-Fit* have chosen a value proposition that closely conforms to existing user

[5] In comparison, and despite their great heterogeneity, the remaining categories used in the business model-sociotechnical transitions literature tend to be more restrictive in scope, such as the *supply chain*, which involves suppliers, or the *customer interface*, which concerns only customers (Boons & Lüdeke-Freund, 2013).

expectations, combined with a substantially familiar technology, meaning that these firms can be considered closely aligned with the regime.

Table 2: Value Proposition/Technology Choice Strategies, adapted from Hoogma (2002)

Technology choice and design / Value Proposition	Fit & Conform	Stretch & Transform
Fit & Conform	**FIT/FIT:** Selective substitution	**FIT/STRETCH:** Leapfrog design for substitution
Stretch & Transform	**STRETCH/FIT:** Market differentiation	**STRETCH/STRETCH:** Exploration of a new regime

Firms in the *Fit-Stretch*, combines a technological 'stretch' with a 'fit' business model, and represents firms that have used a familiar value proposition, such as commercial advertising on vehicles, to bring a technologically novel innovation to market. *Stretch-Fit* refers to firms that are offering a service that is familiar and established in technological terms, through the vehicle of a novel value proposition. Lastly, *Stretch-Stretch* includes firms that aim to reconfigure the cycling regime around their offering, using novel value propositions and novel technology.

3. Methods

Our methodological approach has been shaped by the limited literature on CaaS in the Dutch context. This motivated the use of the case study method (Yin, 2014), consisting of a desk study, followed by interviews with the sample of CaaS providers. The desk study aimed to delimit and define the concept of CaaS in the context of large Dutch cities, in light of the heterogeneity of the services they offer. It further aimed to establish a list of all the providers of CaaS operating within the Netherlands, along with preliminary data on their business models and value propositions, and on the technological choices that had been made in the development of their service(s).

We employed three data collection approaches in an iterative manner appropriate for heterogeneous and emerging fields, in which delimitations are in constant flux (Greenhalgh and Peacock, 2005). Firstly, the scientific literature on CaaS was reviewed for relevant articles by means of a Scopus search[6]. Secondly, a LexisNexis search was conducted for articles in the Dutch-language press related to CaaS issues using the term 'deelfiets' (*shared*

[6] Using the terms 'bike OR bicycle AND share OR sharing AND netherlands OR dutch', 32 journal articles were obtained and reviewed.

bicycle, bikeshare)[7]. Lastly, a Google Search was conducted for bikeshare firms mentioned in the scientific literature and Dutch-language press review, as well as using the search terms above in both English and Dutch. This search continued until saturation had been reached in terms of new information.

The interview phase aimed to verify and expand on this data. Questions were developed iteratively using Castillo-Montoya's Interview Protocol Refinement Process (2016) and Osterwalder's Business Model Canvas (2004) due to the latter's level of detail and emphasis on value propositions. Supplementary questions addressed the design of the service (such as the specifications of bicycles and digital and physical supporting infrastructure) (see Table 5 List of Interview Questions in Appendix). Emphasising strategy as a link between these categories as set out in our theoretical framework, we then classified the value propositions and technology choices of each provider in terms of their fit with the existing cycling regime. We draw on the value proposition analysis criteria developed by Anderson et al. (2006, cited in Bohnsack and Pinkse, 2017) to establish the extent to which these propositions differ from those already on offer within the regime. Interviews were requested with the full sample of CaaS firms listed during the desk study, in order to obtain a comprehensive view of the field; of these, 15 took place (see Table 4 List of Interviews in Appendix), lasting approximately 60-75 minutes each. The answers were transcribed and then used to tabulate each provider's value proposition and technology choices.

4. Case Description

Turnheim et al. (2015) in their regime analysis of the Dutch mobility system make use of transitions insights to describe a dominant automobility regime and two subordinate regimes, that of public transport and cycling. The cycling regime is structured by several strong stabilising forces, such as: a high-density dedicated infrastructure market; well-developed civil society organisations such as the *Fietsersbond*; an established cycling retail, manufacturing and repair industry; a socially embedded cycling culture; high modal share for cycling; and cycling expertise in the public sector, especially in local government. In contrast, Turnheim et al. note only a few cracks, tensions or problems acting to destabilise the regime, which were characterised as of limited influence (such as bicycle theft in cities). While Turnheim et al. do not include pressure on urban public bicycle parking capacity in this list, they note that the creation of such capacity has been an important achievement and a source of synergy between cycling and public transport. Van Zessen (2017) however, identifies pressure on public bicycle parking capacity, whether in dedicated facilities or on open public space, as a central concern in the Dutch urban mobility system. This pressure

[7] The 310 exact matches were refined to 40 sources from newspapers, magazines, and specialist mobility blogs and websites, such as that of the Fietsersbond, covering the period 2015-2018.

continues to grow despite decades of public investment in such capacity, mostly provided cost-free or heavily subsidised. Van der Spek and Scheltema (2015) ascribe this to its lack of management as a scarce resource, leading to a Dutch phenomenon whereby much formal parking capacity is taken up by abandoned or little-used second bicycles[8], necessitating costly and constant monitoring, while the obstruction of public open space by informally parked bicycles has been a longstanding challenge in Dutch cities (van Goeverden and Godefrooij, 2010).

Turnheim et al. also note that the Netherlands is almost unique among developed countries in that cycling constitutes a regime within the mobility system, rather than a niche; this stability is reflected in a cycling modal share that is high but has remained stable for decades, at roughly a quarter of all passenger trips and a tenth of passenger-kilometres (KiM, 2018). Private bicycle ownership is a deeply socially embedded practice within this regime, and in turn helps to define Dutch national identity and culture (Kuipers, 2013). In contrast, CaaS constitutes a socio-technical niche because it provides access to bicycles that are owned by service providers, using a business model that Wittmann (2017) terms 'usership', rather than the private ownership that is the norm within the regime.

The CaaS niche

The common emphasis on usership of bicycles across CaaS providers distinguishes them from the cycling regime in a number of ways. These include the many regulatory ambiguities common to shared mobility services, such as pre-existing local bylaws that render dockless bikeshare technically illegal (Cohen and Kietzmann, 2014; Frenken, 2017). Another example is the tendency among CaaS providers, of both bike share and bike leasing, to use a business model that 'bundles' support services, such as bike repair, into their offerings, in ways that reshape or replace users' relationships with powerful actors in the cycling regime, such as bicycle retailers and local repair shops. At the same time, the potential of CaaS to facilitate intermodal mobility may, in some instances, support other regimes in ways that run counter to the interests of private cycling (Gebhardt et al, 2016; Jonuschat et al, 2015), leaving it "caught between regimes" in the words of Parkhurst et al. (2012, p. 308). An example of this might be bikeshare schemes connected to car parking garages, that enable the ongoing use of the car to reach city centres (Villwock-Witte and van Grol, 2015), in competition with (for example) a door-to-door trip via the bike-train combined mode (Kager and Harms, 2017; Rottier, 2018).

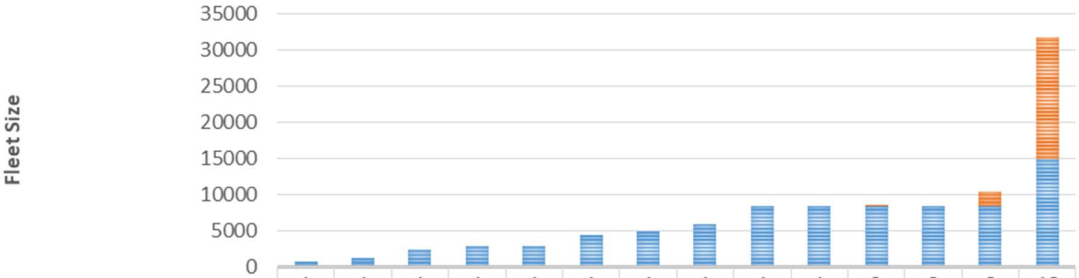
[8] 'Second' bicycles here refers to the tendency of regular train commuters in the Netherlands to maintain one or more inexpensive bicycles in cities they commute to regularly, since bicycle parking is usually cost-free and conveniently located. However, this can result in underutilisation of well-located bicycle parking capacity.

CaaS thus constitutes a niche distinct from, and in some ways competitive with, the Dutch private cycling regime; these distinctions and sources of competition may be described as differences in its business model. The case of CaaS in the Netherlands presents a contrast with the business model used for CaaS, usually in the form of bikeshare, in many European cities, where it has been promoted and invested in by private and public actors as a way to spearhead the creation or revival of local cycling cultures (Goodman et al, 2014; Tironi, 2015). This is particularly true of the highly successful dock-based, city-wide and often advertising-funded bikeshare schemes set up in cities like Lyon and Paris (Huré, 2017), or the dockless bikeshare schemes more recently pioneered in Shanghai (Spinney and Lin, 2018) and Singapore (Shen et al, 2018). In all of these cases, CaaS services achieved rapid expansion in the absence of an established cycling regime.

In the Netherlands, Oldenziel and Ploeger (in press) describe the traditional bicycle hire industry that had developed in the Netherlands over decades up to the mid-2000s: bicycles could be hired on payment of a time-consuming transaction involving a cash deposit and presentation of identity documents, and had to be returned to the same provider at the end of the trip. They also describe how some of the elements of this business model persisted in the design of the OV-Fiets system, a rail station-based system that gradually subsumed the regime's bike hire system for commuter use. Until approximately 2015, the OV-Fiets remained the only sizeable CaaS system operating in the country, although it essentially only supported bike hire trips originating and ending at the same railway station.

By 2016, however, other new forms of bikeshare started to enter key urban markets in the Netherlands at scale, largely concentrated in the country's two largest cities, Amsterdam and Rotterdam. *Figure 1* shows the non-OV-Fiets fleet (in orange) rising above a negligible level for the first time in 2016, and by the next year, surpassing the OV-Fiets fleet; the number of firms in the CaaS market also increases abruptly from 2 to 13 over 3 years. The rapid growth achieved by these systems in a mature cycling market suggests that, despite the success and unique features of the Dutch cycling system, its existing offering left some needs unmet (van Zessen, 2017); however, these needs were difficult to ascertain using using transitions approaches. Examples of these might include last-mile trips from public transport other than rail, since very few bus or tram stops have OV-Fiets docks; or short intra-urban journeys, particularly in peripheral areas where the existing public transport offering may be limited, or where maintaining a private bicycle may be challenging (for example, due to a lack of safe parking).

Figure 1: Evolution of bicycle fleet size and number of firms in the bikeshare market of the Netherlands, 2004-2017



No. of Firms	1	1	1	1	1	1	1	1	1	1	2	2	8	13
Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
All Other Bikeshare Fleets											150		1895	16755
OV-Fiets Fleet	800	1300	2500	3000	3000	4500	5000	6000	8500	8500	8500	8500	8500	15000

The period following 2016 also saw an increase in public opposition to CaaS, largely directed at the dockless systems and expressed through many press editorials, public statements by local government leaders, and articles in the print and online press (Adrianne, 2017; Echt Amsterdams Nieuws, 2017; Koops, 2017; Tour de Force 2020, 2017; Trouw Editorial, 2017; Verkade, 2017) In Amsterdam, a temporary ban was enacted on dockless bikeshare in August 2017, pending the development of a new policy (Gemeente Amsterdam, 2017) while in Rotterdam, these systems were allowed to continue under revised conditions (Gemeente Rotterdam, 2018) One of the most frequent justifications for this policy response, particularly in Amsterdam, is CaaS's impact on urban public bicycle parking capacity, which has long been under great pressure in urban centres (van der Spek and Scheltema, 2015) This suggests that safeguarding the interests of (private) cyclists, such as access to parking capacity, has been an important driver of official responses to (dockless) CaaS, and that the relationship between CaaS and stakeholders of private cycling is a key determinant of CaaS's future, although further research is needed to investigate this correlation.

5. Results

Given the developments and the limitations of both the transitions and business models approaches to clarify the controversy on their own, we applied our integrated analytical framework of value proposition/technology choice fit-stretch framework to CaaS providers' technology choices and value propositions. Here we discuss our empirical results after we establish a contextual definition of CaaS in the Netherlands, present our sample of CaaS providers, and apply our framework to their technology choices and value propositions.

In the scientific literature, bikeshare is a well-studied concept (Fishman, 2016) and generally refers to systems that grant access to a bicycle in increments ranging from 10 minutes to a one or more days. In contrast, bike leasing, another form of bicycle usership, is little studied;

where the term is not used interchangeably with bike leasing, it mostly occurs with reference to e-bikes (as a means of promoting their uptake despite a high purchase price) (Flüchter, 2014; Park and Yoon, 2015). Moreover, bike leasing mimics the freedom and responsibility of private cycling use, while bikeshare requires the user to locate a bicycle but releases the user from responsibility for their bicycle as soon as a ride ends. However, we found that the two services were most often discussed as part of the same set of potentially disruptive innovations in the Dutch national press (Duursma, 2017a; Homan, 2017) For this reason, we define CaaS in the Dutch context as *the set of services that provide access to a bicycle on a usership basis in time increments of between 10 minutes and 30 days*.

Drawing on academic literature, press coverage and web search content, including new bikeshare policy documents (Gemeente Amsterdam, 2017; Gemeente Rotterdam, 2018) we compiled a list of organisations which had provided some form of CaaS service in the Netherlands in 2015-2017. These were: Cykl, BimBimBike, Donkey Republic, Dropbyke, E-bikeToGo, Flickbike, Gobike, Haagsche Stadsfiets, Hello-Bike, HopperPoint, Keobike, Mobike, Nextbike, Obike, OV-Fiets, Spinlister, Studentbike, Swapfiets, Urbee, and USP Campusbike. For these organisations, we used interview responses to tabulate a list of value propositions and technology design choices qualified and contextualised by the specific circumstances of each provider.

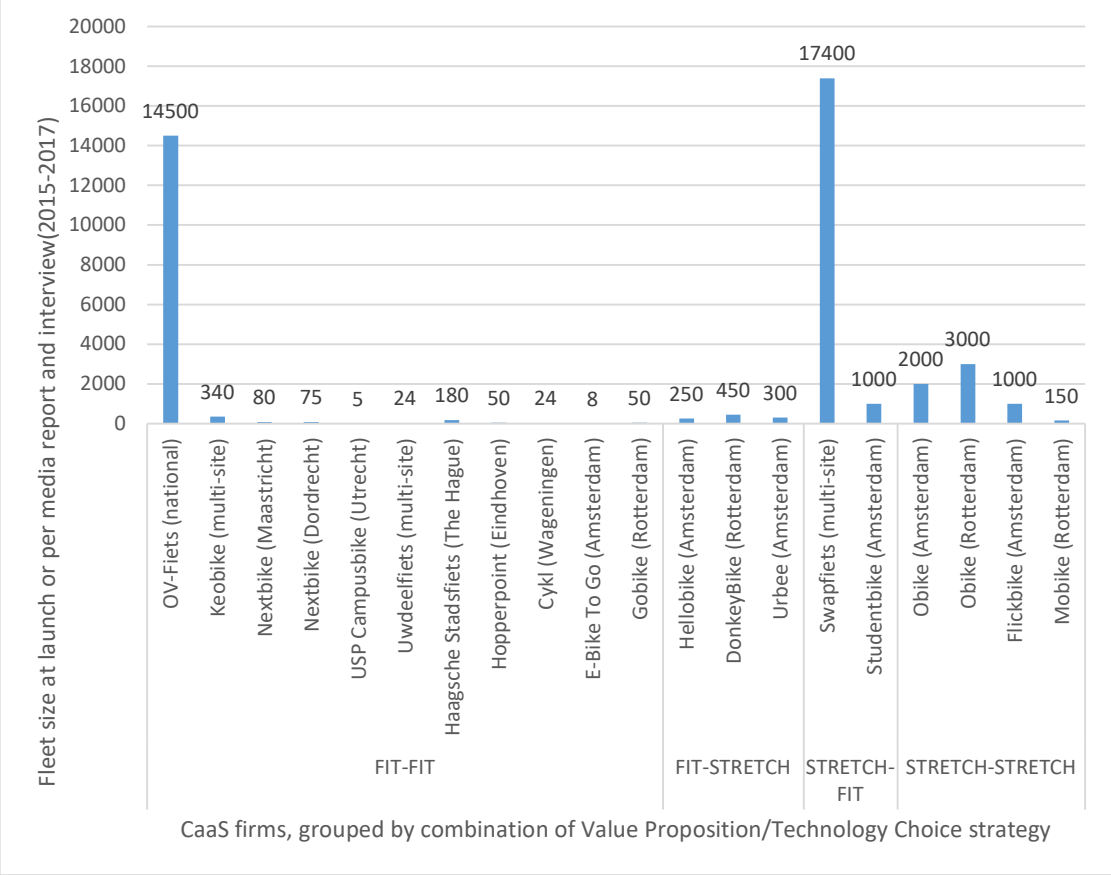
Our interview round verified this business model data, from which we derived each organisation's value proposition. Technology choice data emerged from specific questions relating to fleet and system design. The value propositions in our sample can be analysed along a number of dimensions, using distinctions such as conventional versus motorised bicycles, systems which store their bicycles on public versus private land when not in use, systems that support trips that do not terminate at their starting point, and systems that are formally integrated with other mobility modes versus those that stand apart. In addition, fleet size data emerged as an important proxy for the overall performance of each service, as it was available from public sources for all firms, whereas data such as ridership figures, turnover or profit, were not disclosed.

Table 3: Fit (F) or Stretch (S) strategies in Value Propositions and Technology Choice and Design, for selected CaaS providers in the Netherlands

CaaS Providers *(Fleet Size)*	**Value Proposition**	**F / S**	**Technology Choice and Design**	**F / S**
OV-Fiets *(14500)*	**Back-to-one (B21) bike share of up to 24h for rail users (with option of 2 extra bikes) at all NS railway stations and some other locations with common smartcard**	**F**	**Rail station- hosted, dock-based system with simple bikes.**	**F**
Keobike *(340)*	**Dock-based bikeshare for users of local public transport provider via app**	**F**	**Dock-based system with smart bikes unlocked via app.**	**F**
Next-bike *(75+80)*	**B2M dock-based bikeshare for users of local public transport provider via app or by phone and card**	**F**	**Dock-based system with smart bikes unlocked via app.**	**F**
USP Campus-bike *(5)*	**B2M dock-based bike share for up to 72 hours via app, but only within a campus area.**	**F**	**Dock-based, dockless-enabled smart bikes unlocked via app.**	**F**
Uwdeelfiets *(24)*	**Bikeshare allowing one-way trips within each of several operating areas around Amsterdam, located and unlocked via an app.**	**S**	**Dock-based bike share with smart bike, unlocked via an app.**	**F**
Haagsche Stadsfiets (180)	**B2M bike share based at manned rental points via internet, phone or Whatsapp**	**F**	**Dock-based rental with tourism focus**	**F**
Hopper-point (50)	**B2M GPS-equipped bikeshare within Brabant city centres, via app.**	**F**	**Dock-Based Bikeshare on Public Land**	**F**
Cykl (24)	**B2M bike share within a campus via app run on a modified open-source platform.**	**F**	**Dock-Based Bikeshare on Public Land**	**F**
E-Bike To Go (8)	**B21 e-bike share across the Randstad offering higher-speed bike rides with geofencing via app and corporate reporting of rides**	**F**	**Dock-Based E-bike Share on Private Land**	**F**
Gobike (50)	**B21 e-bike share**	**F**	**Dock-Based E-bike Share on Private Land**	**F**
Obike (2000+3000)	**B2M dockless, last-mile bike share with blanket coverage of city centres, with deposit**	**S**	**Dockless Bike Share on Public Land**	**S**
Flick-bike (1000)	**B2M dockless bike share in Amsterdam via app**	**S**	**Dockless Bike Share on Public Land**	**S**
Mobike (150)	**B21 dockless bike share in Amsterdam via app.**	**S**	**Dockless Bike Share on Public Land**	**S**
Hello-bike (250)	**B2M bike share based within an urban business district using geofencing via an app**	**F**	**Dockless Bike Share with Geo-fencing**	**S**
DonkeyBike (450)	**B21 e-bike share outside AMS city centre via an app**	**F**	**Dockless E-Bike Share on Private Land**	**S**
Urbee (300)	**B21 e-bike share across AMS based at places of business via an app**	**F**	**Dockless E-Bike Share on Private Land**	**S**
Swapfiets (17400)	**A 'Netflix model' for cycling: maintenance and replacement of one bicycle on monthly rolling lease for flat fee.**	**S**	**Bike Leasing on (User's) Private Land**	**F**
Student-bike (1000)	**Cost-free cycling as a service monthly rolling lease in exchange for exposure.**	**S**	**Bike Leasing on (User's) Private Land**	**F**

Table 3 presents 18 different CaaS firms classified by the ‘fit’ or ‘stretch’ strategy evident in their value propositions and technology choices, as measured against the cycling regime in the Netherlands prior to the advent of CaaS providers. When the same firms are sorted by fit/stretch quadrant, the variation in fleet size among the CaaS firms becomes apparent, as shown in Figure 2.

Figure 2: CaaS fleet size by Value Proposition/Technology Choice Strategy



The overall image of the CaaS niche at an early phase in its development consists of two elements. The first is a long tail of small to very small, geographically dispersed service providers in the Fit-Fit group, mostly operating without competition, except from the OV-Fiets system. The second are three clusters of larger fleets: the established OV-Fiets system, highly aligned to the public transport regime; Swapfiets and Studentbike, the leasing firms that mimic the regime norm of private bicycle ownership; and the cluster of Stretch-Stretch firms. The latter group, although severely affected by the Amsterdam temporary ban on dockless bicycles, succeeded in putting relatively large bicycle fleets into circulation in a short timeframe. These will be discussed in turn.

Fit-Fit

The OV-Fiets offers a good example of a provider that has consciously pursued a fit-and-conform pattern in both its business model and choice of technology. This strategy, which Hoogma (2002) terms *selective substitution*, can be seen in the OV-Fiets system's initial design, its subsequent incremental evolution, and in its steady growth. Ploeger and Oldenziel (in press) describe how the OV Fiets system brought 3rd-generation back-to-one bikeshare to the market in 2003, approximately 12 years before the advent of 4th-generation CaaS. The system was a combination of technologies that were more than a century old (standard Dutch bicycles), recently established (the railway operator's passenger smart card), and novel (web-based communication of fleet data). The OV-Fiets business model was shaped by its parent company's decision to absorb existing bike hire firms already present at Dutch stations, and persuade them to accept lower fees in exchange for a greatly expanded user base; its minimum 24-hour ride increment is also an inheritance from these legacy business models (OV-Fiets interview, 26/04/2018). In technological terms, the OV-Fiets was defined by its durability and simplicity rather than its novelty, although innovations such as e-bikes have been trialled. The OV-Fiets' selective substitution strategy was also shaped by its parent company's scepticism as to its ability to break even, which was only achieved recently, after 15 years of operation (OV-Fiets interview, 26/04/2018)[9].

Firms with a similar strategy of closely integrating bikeshare offerings with existing public transport concessions and the full agreement of local government are Keobike and Nextbike. Also included in this group are the many small operators who either provide a comparable value proposition and a technology choice that closely resembles the regime, or who are so small and geographically limited (to a single town or campus) that they reach a very limited audience. For these firms, mostly limited to physical docks and the regulatory processes required to secure them, the OV-Fiets presents close competition and a great scale advantage, with its 400 station-based docks and annual ridership of more than 3 million; in consequence, their fleet sizes are in many cases limited (by apprehensive local governments) to well below what many firms would otherwise operate (Nextbike interview 08/12/2017, Gobike interview 12/04/2018).

Fit-Stretch

This group consists of firms that have pursued a fit-and-conform business model combined with a novel technology, such as geofencing[10] (Hellobike) or e-bikes (Donkeybike, Urbee). In this case, our framework has been particularly useful in capturing within this group firms that

[9] When capital investments are taken into account.
[10] Geofencing refers to the designation of virtual docks visible through an app.

initially adopted a business model 'stretch' strategy and subsequently reorganised themselves in pursuit of a 'fit' in response to regime challenges. This is particularly true of Donkeybike, a dockless operator initially using open public land in Amsterdam to store its fleet between rides. When the city imposed a ban on the storage of dockless bikeshare fleets in the public realm in August 2017, Donkeybike responded by withdrawing from public land and securing permission to store its fleet on a series of public premises sited around Amsterdam. Donkeybike thus ensured its continued operation, but, due to the cost and scarcity of private land in central Amsterdam, this came at the cost of greatly curtailing its availability across the city, and therefore its value proposition (Donkeybike interview, 07/02/2018).

A second example in this group is the geofencing model of Hellobike, which 'fits' into local governments' existing legal framework by conforming to existing legislation governing public open space, but deploys novel technology to avoid the investment costs associated with the placement of physical docks. Hellobike also enjoys a degree of local government support that is rare in the CaaS niche, with a direct mandate from a local authority in charge of Amsterdam's high-rise business district.

Stretch-Fit

This group consists of bike leasing providers who combine technologically familiar bicycles with highly innovative business models. In the case of Studentbike, students receive a bicycle (covered in advertisements) cost-free, provided that they cycle a minimum average number of kilometres per day. While Studentbike includes considerable innovation in business model terms through a gamification element that rewards users for completing tasks that result in greater exposure for the advertisements on their bikes, its size and therefore impact has been consciously limited by its operators (Hellobike interview, 08/11/2017). In contrast, Swapfiets has achieved spectacular growth in fleet size, surpassing the OV-Fiets within 2 years of its founding. It has done so by combining a novel value proposition, which has been termed 'Netflix for bikes' (Meijers, 2018) in reference to its flat-fee subscription model, with an ostensibly traditional product, the classic Dutch city bicycle.

While Swapfiets bikes in fact contain a degree of discreet innovation, mainly to improve service life, the system does not fundamentally depend on smartphone access and its value proposition to its target group, students, is distinguished by services such as rapid maintenance, repair and replacement of lease bicycles. Swapfiets' offer of a bicycle that users store at home and use like a private bicycle on a rolling month-to-month lease sets it apart from other CaaS offerings in the sample, most of which offer bikeshare and provide short-term mobility options for urban travel. However, Swapfiets is priced so competitively,

with a monthly subscription equal to around 4 OV-Fiets trips or one day's use of a Donkeybike, that some users may find it economical to take out more than one subscription even in a city they visit occasionally, since bicycle parking is free, and any wear and tear to the bicycle (from storage in free bicycle parking, which is usually open-air) is not for their own account. It is this immense upscaling potential, and the addition of services that reposition cycling as a 'service' separated from responsibility for the bicycle as an object, that justify the inclusion of Swapfiets in the CaaS sample.

Stretch-Stretch

This group includes the dockless bikeshare operators that store their fleets on public land between trips, such as Obike, Flickbike and Mobike. These systems depend on novel technologies such as remote locking and geo-location on bicycles, as well as smartphone-based platforms, and their rapid advent in 2015-6 is associated with advances in performance and a fall in price for these technologies (Lan et al., 2017; Spinney and Lin, 2018) These technologies, in turn, underpin a business model that could not have existed before geo-location, smartphones and remote locking: that of the free-floating, one-way bikeshare system, in which users themselves decide where and how to park the bicycles they have used. This business model, far more than any other in the CaaS sample, positions all of public open space as bicycle parking capacity, to be monetised by private CaaS providers.

The firms in this group have also been most closely associated with the negative externalities of bikeshare, such as the perceived saturation of public bike parking capacity in Dutch cities (Adrianne, 2017; Duursma, 2017b; Verkade, 2017) and highly publicised outcomes in their home markets in Asian cities and elsewhere (Lan et al., 2017; Spinney and Lin, 2018; Vlaskamp, 2017). These firms' approach to public space may be intrinsically associated with their business model; Obike representatives have stated in the press that launching at scale is essential to their system, which "only works with a bike every 200m", according to a company spokesperson (Voermans, 2017).

In addition to their innovative technological offering, these firms tend to operate a service that is technically illegal under most Dutch cities' bylaws[11], meaning that early attempts to secure a regularised status with local government led instead to a tolerance policy on the part of the city (which continues in Rotterdam, but was abruptly withdrawn in Amsterdam). This willingness to enter a market in spite of regulatory ambiguity and associated risk exemplifies a stretch-and-transform business model strategy.

[11] Known as the APV or *Algemeen Plaatselijke Verordening*.

6. Implications of CaaS providers' fit-and-stretch strategies for the niche

Analysis of a sample of CaaS providers in the Netherlands in terms of technology choice and business model 'fit' or 'stretch' strategies has yielded a definition of CaaS in context, and established what combinations of strategies niche actors have deployed in this early phase of niche development. However, the question remains of whether CaaS providers' strategies have had discernible effects on the niche as a whole, and whether a value proposition (or broader business model) perspective can provide a conceptual link between the micro-level dynamics that may have determined these strategies, and dynamics within the CaaS niche and cycling regime that may affect individual firms.

Our finding is that CaaS in the Netherlands presents a correlation between two elements: value propositions and their approach towards the commons resource of public open space and bicycle parking capacity; and CaaS technologies that obviate physical docking infrastructure. Firms that have pursued 'fit' strategies in how their business models use public space, by limiting themselves to physical docking infrastructure depending on formal permission from local government, have generally failed to achieve significant scale in Dutch cities, resulting in high resident-to-bicycle ratios and system coverage that seldom extends beyond city centres to the peripheries, where transport choice is most limited. OV-Fiets is no exception to this rule, since it is based on private land owned by the railways, and is in almost every case accessible only in the centre of a given urban area. Some CaaS providers that have robustly pursued a 'stretch and conform' strategy, and proceeded to launch in the face of regulatory ambiguity and a degree of public backlash against perceived saturation of bicycle parking capacity. These providers have also found their operations limited by greater scrutiny in Rotterdam (Gemeente Rotterdam, 2018) and a temporary ban in Amsterdam (Gemeente Amsterdam, 2017), one of the country's largest markets with considerable symbolic power (Nextbike interview, 08/12/2017). While these firms' operations continue to expand in Rotterdam and other centres, the losses associated with Amsterdam's temporary ban may be considerable (Echt Amsterdams Nieuws, 2017; Teuling, 2017) and their reach into regional cities, towns and rural areas is at present minimal, meaning that their contribution to mobility choice clusters around dense urban centres, where mobility choice and congestion are already high.

In contrast with the restrictions and opposition*s* experienced by these two groups of CaaS providers, non-bikeshare firms such as Swapfiets have achieved rapid upscaling and avoided controversy by closely mimicking the dynamics of the Dutch private cycling regime. As such, the legitimacy of Swapfiets users' access to public bicycle parking capacity has not been significantly challenged in public discourse, even when these individually anonymous but collectively visually distinct bicycles saturate public spaces, such as in student

neighbourhoods. However, while Swapfiets' bicycle fleet conforms closely to the traditional image of urban Dutch bicycles, its business model has the potential to disrupt the Dutch cycling regime. For example, acquiring a Swapfiets may remove a growing number of users from frequent contact with neighbourhood bicycle retailers and repair services, since these needs are met centrally. Since Swapfiets also faces no significant regulatory barriers, and since institutional tools for governing mobility services are largely limited to the lens of public space, its continued growth could also produce a situation in which a sizeable portion of a socially influential group, students, are habituated to 'usership' rather than ownership of bicycles. These attitudes may diffuse through society, further normalizing shared mobility (Parkes et al., 2013) When compared to the many small operators who reach a very limited number of users, and the limitation of even the large OV-Fiets system to a simple and consistent value proposition, this influence may be very significant.

The correlation between public space impact and CaaS business models has historical roots that may also account for certain second-order effects. For example, the Dutch state (with renewed focus since 1975) has undertaken to provide well-located capacity for parking private bicycles in Dutch cities, usually at great expense but almost always cost-free to users (Ministerie van Verkeer en Waterstaat (Netherlands), 2009; Turnheim et al., 2015, p. 37). The precedent of free bicycle parking meant that CaaS business models could not engage with an established method for determining fair financial compensation for use of a city's public space. The OV-Fiets system and its parent company conformed to and thereby reinforced this aspect of the private cycling regime in a way that poses a significant barrier to the upscaling of later CaaS business models, especially dockless systems. For example, dockless operators are excluded from a wide area around Amsterdam's central station in the city's new draft bikeshare policy (Gemeente Amsterdam, 2017), while other providers already find it prohibitively expensive to find private land in central Amsterdam from which to operate (Donkeybike interview, 07/02/2018). By occupying the most profitable urban locations while other providers are subject to limited access, the *OV-Fiets* system may thus constitute more of a barrier to other providers than its ostensibly non-overlapping use case at first suggests. This is especially likely given the slim profit margins in bikesharing (OV-Fiets interview, 26/04/2018).

In late 2018, no CaaS provider has yet emerged that offers a city-wide bikeshare service of the kind long established as yet another mode of public transport in Paris and London, or the ubiquitous free-floating systems of Singapore and Shanghai. Users who seek usership of a shared bicycle for last-mile connections from a bus stop, or to make a spontaneous trip between two peripheral points in a Dutch city, either face the absence of any CaaS service, or the need to register with many different CaaS providers, as all remain limited to single

locations or a handful of smaller locations. The transition potential of the CaaS niche as a whole has therefore not yet been realised, despite calls by experts for the state-led creation of common digital infrastructure platforms for shared mobility services (Panozzo, 2017; Stratta et al., 2017) and a recent memorandum of understanding between various operators resolved to work towards interoperability for users between these systems (Puylaert, 2018) Several interviewees party to this memorandum noted in interviews that they would only participate in such a platform, given the sensitive data exchange involved, if required to by local or national government. This is most true for firms in the Stretch-Stretch group, such as Obike and Mobike, which have already emerged in academic studies of their home markets as highly resistant to data sharing with local government, despite user bases numbering many millions (Shen et al., 2018; Spinney and Lin, 2018)

7. Conclusion

The Value Proposition/Technology Choice framework adapted from Hoogma (2002) suggests that growth of CaaS has been strongest where service providers have most closely conformed to aspects of the existing cycling regime, such as OV-Fiets and Swapfiets. However, the firms that departed furthest from the regime, the Stretch-Stretch dockless firms that launched at significant scale all at once, are the next most successful group, barring heavy losses for those present in Amsterdam. Considering that, with the exception of Flickbike, the other two Stretch-Stretch firms belong to parent companies with vast financial reserves and user bases, it is interesting to note that these firms did not significantly alter either their bicycle fleet (in size and specifications) or their value proposition to prepare for the shift from a low-cycling context to one in which (private) cycling itself constitutes a regime.

The four distinct patterns of change shown in the Value Proposition/Technological Choice framework better facilitate application to our empirical case than the three-part model of Bidmon & Knab (2018), because all four patterns are directly comparable to each other, being defined in terms of both value propositions (and therefore business models), and socio-technical transitions. In contrast, Bidmon & Knab's three-part model conflates both novel and existing business models into one category in relation to the commercialise technological innovation; we find that the differences between novel (or 'stretch') and existing (or 'fit') business models, as expressed through value propositions, are both distinct and a significant influence on outcomes for niche actors.

Combined with a case study, this framework explains a degree of opposition to certain CaaS providers that exceeds that those providers seem to have anticipated themselves, to the

extent that they did not alter either their value proposition or technology choice in moving from their home markets to the Dutch context.

More research is required into the exact means by which the cycling regime and local government have interacted, if at all, in order to bring about varying responses to the rapid arrival of CaaS firms in the Netherlands. Yet our findings suggest that the means by which common resources crucial to cycling are governed – most particularly public bicycle parking capacity, but also data infrastructure, common service standards, and other issues – are seldom articulated in a way that enables experimentation and innovation, especially at scale, and by private sector actors.

Our framework addresses the question of how using a strategy framework to compare value propositions and technology design choices developed by niche actors can contribute to both business models and transitions research.

A business model perspective reveals the very different commercial constraints facing actors that have made similar technology design choices, such as the firms that must position a bicycle every 200m in order to deliver on a strategy first developed for Asian cities, versus another dockless operator's geofencing agreement with local government that limits scale and profitability but provides regulatory cover. The more detailed business model aspects revealed in interviews on the subject of interoperability also clarify why firms have been slow to develop a common user platform, which is puzzling if seen from a transitions perspective alone. In turn, a transitions lens succeeds in explaining why firms with ostensibly similar business models, producing similar results in cities in terms of parking congestion and visual impact, have faced widely different outcomes, some succeeding in legitimising themselves as adjacent to the existing regime, and others branded as an alien presence.

The adapted fit-and-stretch framework used here could be extended through the substitution of many other dimensions, such as government policy and regulatory frameworks, to map the development of strategies within the niche. While this paper makes a contribution to the field of qualitative studies of business models from a transitions perspective, more research is needed in the burgeoning and fast-changing empirical field of shared mobility, particularly where the technologies deployed interact with incumbent mobility cultures, and particularly where those technologies are 'new-old', for which part of their promise lies precisely in their simplicity and technological stability.

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Appendix

Table 4 List of Interviews

No.	Date	Interviewee	CaaS Provider
1	**08/11/2017**	**T**	Hellobike, Studentbike
2	**08/11/2017**	**J**	Keobike (Keolis)
3	**08/11/2017**	**J**	EbikeToGo
4	**03/11/2017**	**R**	Obike
5	**03/11/2017**	**V**	Flickbike
6	**03/11/2017**	**M**	UwDeelfiets
7	**08/12/2017**	**F**	Nextbike
8	**04/12/2017**	**H**	Haagsche Stadsfiets
9	**13/12/2017**	**I**	Whim/Maas Global
10	**07/02/2018**	**R**	Mobike
11	**27/02/2018**	**C**	Hopperpoint
12	**12/04/2018**	**J**	Gobike
13	**26/04/2018**	**K**	NS/OV-Fiets
14	**07/02/2018**	**R**	DonkeyRepublic
15	**12/01/2018**	**E**	Cykl

Table 5 List of Interview Questions

Interview Question
1. Could you briefly describe the service(s) you provide?
2. Who are your users?
3. Do you see your service as a complement to private bicycles, or a replacement for them?
4. Do you work with partners to provide your services?
5. What activities do you undertake to provide and maintain your service?
6. What factors determined the design of your system elements [bicycles, docks]?
7. Could you describe your value proposition?
8. How do you engage with your users?
9. What factors determined the design of your payments and costs structure?
10. Apart from fees for rides, do you have any other significant revenue streams?
11. Under what circumstances and in what areas would you be willing to cooperate with other CaaS providers?
12. What would need to happen for you to integrate your service with other mobility modes?
13. Do you have any formal relationship with the public sector?
14. What could the public sector do to improve your position as a firm?
15. Under what circumstances would you be willing to contribute financially for public goods/upkeep of public spaces that are necessary for cycling?
16. Do you think that your firm has a role to play in fighting transport poverty, or increasing access to mobility?
17. Do you trade user data with third parties?
18. What factors determined the design of your network?

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