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Business model design spaces in socio-technical transitions: The case of electric driving in the Netherlands

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ABSTRACT

Whereas research acknowledges the potential of business model innovation (BMI) to destabilize an existing regime, the impact of a socio-technical system in transition on BMI remains under-conceptualized. To advance work in this direction, this study expands the concept of a *business model design space* (BMDS), which describes the opportunities and constraints to design novel ways of creating and capturing value from niche technologies available at a given point in time in a transition. Illustrated with the case of electric vehicles in the Netherlands, we show how BMI are affected by and, in turn, affect this design space. We find that the policy and the science and technology dimensions of the socio-technical system form hard boundaries to the BMDS that niche actors cannot directly overcome via BMI. Yet, BMI can push the softer industry, market, and cultural boundaries of the BMDS by supporting niche expansion via coupling novel technologies to business models that (i) *conform* to the current regime, or that (ii) attempt to *transform* the regime. This paper offers an analytical framework that connects firm- and system-level to support the exploration of questions like how much novelty niche actors can introduce into a ST-system at specific points in a transition.

1. Introduction

Whereas transition research generally acknowledges the critical role of firms for either driving or hampering transitions, much potential remains to generate insights into how this interrelation functions (Loorbach and Wijsman, 2013; Wells and Nieuwenhuis, 2012). To conceptualize how firm behavior affects and is affected by socio-technical transition processes, scholars have pointed to the potential of connecting firm-level frameworks to transitions thinking (e.g., Sarasini and Linder, 2018; van Mossel et al., 2017). A highly promising framework in this regard seems to be the concept of a *business model*. A business model refers to the way a firm brings technology to the market, engages with user needs, and monetizes value (Baden-Fuller and Haefliger, 2013). As such, business models can function as intermediaries between firms and the wider socio-technical (ST-)system (Bidmon and Knab, 2018; Bolton and Hannon, 2016; Sarasini and Linder, 2018; Waes et al., 2018; Wainstein and Bumpus, 2016). As mediating devices between novel technology and the value network of a firm, business models are 'vehicles' for novel technologies to enter and disrupt the regime (Wainstein and Bumpus, 2016). Given this powerful role, *business model innovation* (BMI) has been ascribed high potential to impact and change "*the way people live, work, consume, interact with each other*" (Demil and Lecocq, 2010).

Against this background, many scholars have considered how the novel business models that niche actors, both entrepreneurs and incumbents, introduce to the market affect transition dynamics (Bolton and Hannon, 2016; Huijben et al., 2016; Palzkill and Augenstein, 2017; Schaltegger et al., 2016a; Wainstein and Bumpus, 2016; Wells and Nieuwenhuis, 2012). In particular, the research stream on *sustainable business models* has addressed the question how business models can help to promote systemic changes in prevailing patterns of production and consumption (Arevalo et al., 2011; Boons and Lüdeke-Freund, 2013; Schaltegger et al., 2016a; Wells, 2008). Given that the potential of BMI to *affect* transition dynamics seems generally acknowledged, it is somewhat surprising that the question how the design of novel business models *is affected* by ongoing transition dynamics has received less attention. Arguably, transition dynamics such as the destabilization of an existing regime often open up the opportunity to design new business models in the first place. Yet, the gradual nature of transitions also implies that this opportunity space continuously changes. Actors will have to design a business model that "fits" the current state of a transition. For example, a frequent explanation for the failure of the innovative battery-swap solution Better Place is that this business model had been ahead of its

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time and was unable to align with current market conditions (Noel and Sovacool, 2016). Yet, studies that consider not only the opportunities but also the constraints that arise for the design of new business models in a transition remain scarce. In a pioneering study, Huijben et al. (2016) have introduced the helpful concept of a *business model design space* (BMDS) to describe the options for new business model designs available to niche actors in a given regime and explain how such actors either *fit and conform* to or try to *stretch and transform* this space. However, as their study focuses on the interplay between regulatory regime and new business models, the authors relate the concept of a BMDS solely to legislation and regulation. This is arguably not the only regime dimension niche actors have to take into consideration when designing a new business model. Other dimensions of a ST-system such as culture or user preferences are also likely to affect the design of a new business model.

Based on these observations, this paper sets out to expand the concept of a BMDS to include the other dimensions of a ST-system, i.e. the science and technology, industry, user, cultural and policy dimension (Geels, 2004). We draw on business model research and the regime dimensions as conceptualized in commonly used transition frameworks such as the multi-level perspective (MLP) to conceptualize the BMDS. We then use the case of niche actors in the Netherlands who try to position new business models around electric vehicles (EVs) to discuss how these business models either *conform* to or try to *transform* the boundaries they meet when introducing BMI into a given selection environment. The ongoing transition to EVs makes for a useful case because EVs are a radical innovation[1] (Afuah and Bahram, 1995; Dyerson and Pilkington, 2005) that requires comprehensive changes along the automotive value chain, in complementary goods and services, as well as infrastructure and payment services (Bohnsack et al., 2014). We focus on the Netherlands as there are a lot of actors active in EV-related BMI (Bohnsack and Pinkse, 2017; RVO, 2017) and because, although the country is generally one of the pioneers in EV adoption (IEA, 2018), actors pushing EV-related BMI still meet challenges when bringing such solutions to the market in an ongoing transition.

Further insights into the interplay between niche business models and transition dynamics are important, because they might provide insightful explanations for open questions in transition research, such as why certain technologies set in motion wider transformational changes while others do not (Berkhout et al., 2004). Looking closer at the business models that are used to immerse technology into a regime can aid the understanding why and how technologies break through. It makes the boundaries transparent that niche actors have to consider when deciding on the degree of novelty their business model can have in order to survive. As such, the BMDS is a concept that allows to show how BMI can contribute to stability or change in a ST-system, i.e. by fitting-and-conforming to the regime or stretching-and-transforming it (Smith and Raven, 2012).

By offering a better understanding of how firms attempt to create and capture value during socio-technical transitions, our work contributes to the emerging field of inquiry on the role of business models in socio-technical transitions (Bidmon and Knab, 2018; Bolton and Hannon, 2016; Huijben et al., 2016; Palzkill and Augenstein, 2017; Waes et al., 2018; Wainstein and Bumpus, 2016). Specifically, our study makes two contributions to this literature: First, we broaden the conceptualization of the BMDS (Huijben et al., 2016) to include all the dimensions of a ST-system. Second, with the case of EV-related BMI in the Netherlands, our study highlights how the concept can be applied for research at the interface of business model and transition research. For future research at the interface of business model and transition research, the concept of the BMDS is a useful analysis tool that directly responds to calls for conceptual frameworks that allow scholars to establish a link between firm-level actions and the wider ST-system (Sarasini and Linder, 2018; van Mossel et al., 2017).

2. Conceptual framework

To conceptualize the BMDS, this section first introduces basic concepts from the literature on ST transitions and niche empowerment (Smith and Raven, 2012). It then describes BMI in the context of transitions and conceptualizes the boundaries that should define a BMDS.

2.1. Socio-technical transitions and niche empowerment

Research on ST transitions analyses gradual, long-term changes in the way societal functions such as transport, energy, housing or health care are fulfilled (Geels and Schot, 2010). A ST understanding of transition processes builds on the notion that technology and societal processes are inherently intertwined. That is to say, technology is seen as embedded in a ST-system, which consists of interrelated actors, institutions and infrastructure, and is defined by a shared societal function, such as transport (Geels, 2004). Transitions, i.e. shifts from one ST-system to another, therefore do not only involve technological change, but also change in other system elements such as policy, industry structure, user practices and cultural meanings (Geels, 2004).

Common transition frameworks such as the MLP (Geels, 2004) build on similar key concepts, such as the technological niche or the ST-regime (Markard et al., 2012). In essence, they conceptualize transitions as multi-phase and multi-level processes that come about through interactions between three levels: the niche, regime and landscape. *Niches* are defined as “protected spaces” that shield path-breaking innovations from the mainstream selection environment, so that niche actors can nurture their development (Smith and Raven 2012, p.1025). *Regimes* maintain the stability of a ST-system by providing “the semi-coherent set of rules that orient and coordinate the activities of the social groups that reproduce the various elements of socio-technical systems” (Geels, 2011, p.27). Local regime adaptations may be possible, but a radical deviation from basic regime rules is difficult for actors (Fuenfschilling and Binz, 2018; Geels and Schot, 2010). Yet, changes at the level of the *landscape*, a set of deep structural trends, social values, or worldviews, may destabilize the regime and create windows of opportunity for niche innovation to expand, become part of, or even replace the current regime (Geels et al., 2016).

A *ST-system* is formed by different dimensions such as science and technology, industry, culture, market and regulation (Geels, 2004). In analogy to the concept of a technological regime (Rip and Kemp, 1998), the ST-regime refers to the dominant cognitive, regulative and normative rules governing the configuration and interplay of these dimensions (Geels, 2004). They are institutionalized in the form of standards, laws and regulation as well as behavioral norms and values. For niche innovation, the current regime thus constitutes a strong selection environment. Broader diffusion will inevitably depend on its ability to align to the current regime or, alternatively, its ability to alter it significantly and induce technical, regulatory, behavioral and societal change. The way niche innovations that radically differ from the current regime are empowered, can therefore also affect which transition pathway will emerge (Geels et al., 2016; Smith and Raven, 2012). For example, Smith and Raven (2012) argue that actors can affect the institutional selection environment in two ways, i.e. through “processes that make niche innovations competitive within unchanged selection environments (*fit-and-conform*) or [through] processes that contribute

[1] Radical innovation destroys both the usefulness of architectural and component knowledge (Henderson and Clark, 1990; Tushman and Anderson, 1986). The destructiveness of an innovation differs along the supply chain of an innovation. Afuah and Bahram (1995) argue that the EV is competence destroying for suppliers, producers (although a lot of assembly-competence remains useful) and providers of complementary technology (infrastructure), but less so for the consumer. This paper shows that the level of competence destruction for the EV user depends also on the associated business model innovations.

to changes in mainstream selection environments in ways favorable to a path-breaking niche innovation (*stretch-and-transform*)" (p.1025). These two processes support different transition pathways; fit-and-conform incorporates the niche innovation into the regime's selection environment, while stretch-and-transform aims to change this selection environment. Similarly, we will argue that when deciding on how to position and configure a new business model, niche actors may aim for more or less radical regime change.

2.2. Business models and business model innovation

Business models are commonly defined as "the rationale of how an organization creates, delivers and captures value" (Osterwalder and Pigneur, 2010). Yet, existing business model frameworks differ in how many elements they regard as central to a business model (for an overview see, for instance, Massa et al., 2017). For instance, the common business model canvas by Osterwalder and Pigneur (2010) suggests nine elements, whereas other authors have suggested four (Johnson, 2010; Johnson et al., 2008) or three (Bohnsack et al., 2014; Schaltegger et al., 2016b; Wells, 2016; Yunus et al., 2010) elements as central to a business model. Reviewing the extant literature, however, minimum consensus seems to exist that, at its core, a business model describes the *value proposition*, the *value network*, and *value capture*, i.e. the revenue-cost model of a business (cf. Bohnsack et al., 2014; Demil and Lecocq, 2010). In this paper, we therefore rely on these three basic elements to conceptualize a business model.[2]

- *Value proposition*: The value embedded in the product or service offerings of the firm.
- *Value network*: The partners and suppliers and the management of network relationships to fulfill the value proposition.
- *Value capture*: The revenue model and cost structure of the firm as well as the distribution of profits across the value network.

The innovation of a business model, BMI, can then refer to small adaptations or radical changes such as shifting from buying a product to paying for its usage (e.g. car ownership vs. car sharing) (cf. Bohnsack and Pinkse, 2017). Similarly, literature uses the term to refer to changes in an existing firm's business model as well as to the creation of entirely new models of value creation and value capture by new ventures (e.g. Massa et al. 2017: 432).

BMI involves actors searching for trade-offs between different technology performance characteristics (e.g. battery size and range vs. car costs) for the optimal value proposition, means of capturing this value, and value networks to produce it as efficiently as possible. This is a learning process that can be seen as a form of market experimentation and the crucial step in bringing a technology to the market (Schot and Geels, 2007; Weber et al., 1999). From the literature on business models and entrepreneurship, it is also known that this process involves "*significant trial and error, and quite a bit of adaptation ex post*" (Chesbrough, 2010). Firms trying to innovate their business model will try to find the business model configuration that offers the best '*fit*' to current market conditions and user preferences. However, current literature does not yet provide many insights into the question how, for instance, niche actors take decisions on how to configure a novel business model in the light of the opportunities and constraints their external environment offers. It does support, however, that positioning a new business model in the market is not an easy endeavor. This is because the business models that currently prevail in a market have become instantiated in contracts, investments, subsidies, jointly used infrastructures, financial structures as well as expectations, behaviors, common interests, and routines between actors (e.g., Bidmon and Knab, 2018).

2.3. The business model design space

To explore the co-evolution between BMI and the firm's external environment, we place the firm in the context of the ST-system. Huijben et al. (2016) introduced the concept of a BMDS to contextualize BMI in the "regulatory regime" and define its boundaries by the "mainstream regulations and niche shielding instruments" that determine "all the legal business model design options available to niche actors" (p. 2). We argue that the confinement of the BMDS to the regulatory regime is unnecessarily limiting and that the concept should be expanded to include all the dimensions of the ST-system. This is because it is not only the *policy* dimension that enables and restricts the options for new business model design, but all dimensions of the ST-system (Geels, 2004).

First, the *science and technology dimension* determines what technology and knowledge is available to create and capture new value along the value chain. The *industry dimension* affects the business model's value network by reflecting the presence and willingness of others along the supply chain to collaborate or compete in the niche. The *cultural dimension* reflects the cultural values that new value propositions have to align with; it determines for example what the public believes with regard to the (environmental) impact and meaning of a value proposition. Finally, the *market dimension* reflects user preferences and determines which value propositions and revenue models can be offered. Consequently, we refer to the BMDS as the boundaries in which a niche actor operates in a ST-system and that enable and constrain the possibilities for designing BMI.

For BMI in the niche, the BMDS reflects the opportunities and constraints of developing a viable business model. On the one hand, opportunities in the BMDS for designing such a business model arise from landscape pressures, which create windows of opportunity to meet customer needs that the regime does not yet fulfill. When adopted at larger scale, this will *expand the niche at the cost of the regime*. The restraints or barriers in the BMDS for designing a business model are, on the other hand, imposed by the regime's mainstream selection environment that the niche is still unable to comply with. These barriers, present in each of the system's dimensions, may trigger niche actors to develop business models that will *expand the niche by making it more similar to the regime*. In line with the literature on the strategic behavior of firms within transitions (Huijben et al., 2016; Loorbach and Wijsman, 2013), we expect that firms can pursue two types of strategies to 'move' within the BMDS:

1) Overcoming the restraints to niche expansion by *developing niche products and services in ways that conform to the regime.* This includes maintaining a value network with established industry players, and exploiting methods of value capture and value propositions that fit-and-conform to the regime's mainstream selection environment, in order to become part of that regime.
2) Exploiting opportunities for niche expansion by further *developing the benefits of the niche products and services over those of the regime*, in the context of unmet landscape pressures. This includes developing value networks with new entrants from different industries, exploiting methods of value capture and value propositions that stretch-and-transform the regime's mainstream selection environment, in order to replace the regime.

The availability of these two types of strategies is unlikely to be the same across all the dimensions of the ST-system. Arguably, a ST-dimension such as *policy* is somewhat harder to influence through BMI than a dimension such as *markets and users*. Therefore, we introduce the

[2] We use this rather simplistic definition because we seek to conceptualize the role of business models within the wider ST-system rather than to elaborate on the interplay of their elements. Using a definition that represents "minimum consensus" among scholars should also ensure that further research can easily connect to (and refine) our propositions.

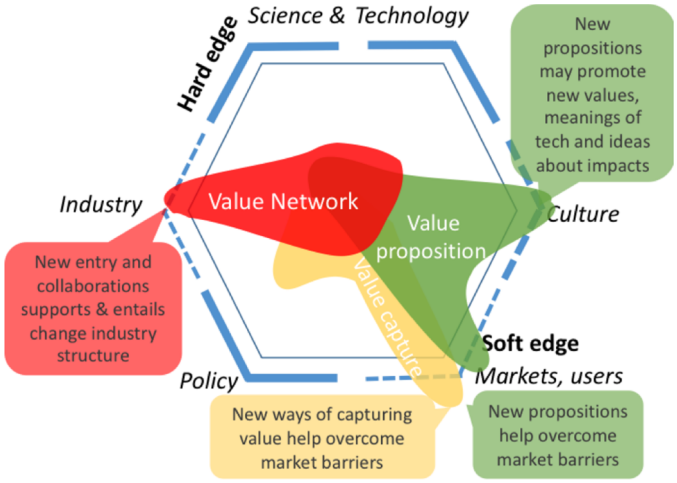

Fig. 1. Conceptualization of BMI within the Business Model Design Space. Soft edge: Regime dimensions BMI can directly affect; Hard edge: Regime dimensions BMI cannot directly affect (only through other, i.e. innovation and political influence, strategies).

differentiation between 'softer' and 'harder' edges for BMI (see Fig. 1). With '**soft**' and '**hard**' we refer to the malleability of these dimensions through firms' BMI-related actions.

Fig. 1 displays a conceptual model of the BMDS, in which any business model is represented by its value network, value proposition and value capture components. It is indicated how these components can potentially affect the boundaries of the BMDS.

As Fig. 1 shows, we argue that the ST-dimensions *industry, culture*, and *markets and users* can directly be influenced through BMI. For example, BMI that succeed in providing substantial value to the customer while generating profits for the firm may convince other firms along the value chain to join a new value network or even trigger competitors to invest in the niche (Bidmon and Knab, 2018). Convincing industry partners to form new value networks that produce the niche technology in efficient ways or to take more forceful measures through mergers and acquisitions (Bohnsack et al., 2014) directly expands the *industry* dimension of the BMDS. Smith and Raven (2012) argue that firms can also link niche technologies to existing or new societal norms, values, and meanings to change public perception. New business models' value propositions can effectively support the legitimacy of a novel technology, its impact on society and its associated use cases (Bidmon and Knab, 2018). Therefore, BMI affects the ST-system's *cultural* (cognitive) dimension. Most fundamentally however, new business models aim at creating and capturing value for and from the customer through new value propositions and revenue and cost models (Teece, 2010). To this end, BMI aims to overcome barriers to adoption of the niche innovation, impacting the *market* dimension (Bolton and Hannon, 2016; Wainstein and Bumpus, 2016; Wüstenhagen and Boehnke, 2008). The sharing-economy-based business models of Uber and Airbnb, for example, illustrate the consequences BMI can have on user behavior, cultural perceptions around ownership and, indirectly, policy making (Frenken and Schor, 2017). By introducing a novel way of connecting service providers and users, they have changed urban transport and travel and made users more receptive to peer-sharing in other domains. Their business models also challenged policy makers to revise regulatory frameworks, thereby reshaping the BMDS for other actors (ibid.).

In turn, dimensions such as *policy* and *science & technology* form 'harder' edges that firms cannot expand directly through BMI. Firms can influence these dimensions through non-BMI strategies, for instance, the *science & technology* dimension can be developed through corporate innovation strategies (R&D) and the *policy* dimension through political influence strategies (e.g. lobbying) (Wesseling et al., 2015). Firms can use BMI to exploit loopholes in policy, and thereby effectively stretch the regulatory regime in favor of niche expansion, but they cannot directly change formal regulation (Huijben et al., 2016).

To summarize, BMI is more likely to push some of the 'softer' edges of the BMDS, notably the *market, culture,* and *industry* dimension, to find new possibilities for creating business models.[3] Table 1 briefly summarizes the impact of the ST-dimensions of the BMDS on BMI and how BMI may stretch and transform this BMDS.

Table 1
Relationship between the dimensions of an ST-system and niche-related BMI.

Regime dimension	Importance for BMDS	Edge for BMI based on firms' influence on dimension
Markets and users	User preferences determine which value propositions and value capture will be commercially successful	*Soft edge*: new value propositions and ways of capturing value may overcome barriers to adoption and consequently alter markets
Culture	Cultural values and perceptions about the technology determine which value propositions are accepted	*Soft edge*: new value propositions can help to change public values and ideas about the niche technology and its impacts
Industry	The industry structure determines the level of competition, which affects the value capture and determines the possibilities to collaborate along a value network	*Soft edge*: new value networks may impact industry structure
Policy	The regulatory environment determines which value propositions are legal; informative policies determine which value propositions are legitimate; financial policies affect which value can be captured	*Hard edge*: cannot be influenced through BMI; only through corporate political activities
Science & Technology	The technological performance, the availability of complementary technologies, and infrastructure determines which value can be proposed and captured	*Hard edge*: cannot be influenced through BMI; only through corporate R&D activities

In the following, we illustrate the BMDS and the arguments we have made thus far with the case of EV-related BMI in the Netherlands.

3. Method

The case of EVs in the Netherlands provides a good illustration for our argument that the concept of the BMDS should be expanded. The Dutch EV niche is amongst the most developed worldwide, in terms of diffusion (IEA, 2018), policy support (Wesseling, 2016), and charging infrastructure density (IEA, 2018; McCarthy, 2018). It is also a market in which many entrepreneurial ventures are actively pushing EV-related BMI (Bohnsack and Pinkse, 2017). However, although EVs are taking-off in this sense, we cannot yet speak of a full transition to electric mobility. Thus, the case serves well to illustrate the barriers and opportunities in an ongoing transition that shape the BMDS for niche actors trying to position EV-related BMI.

To study the interaction between EV-related BMI and the BMDS, we built on two datasets.

[3] Bolton and Hannon (2016) have described this process for two Energy Service Companies and label it system building. They build on the Large Technical Systems approach which argues that system components need to be aligned to create a "seamless web" (Hughes, 1986).

First, we mapped out the ST-system around EVs in the Netherlands by compiling a document database including media sources, academic studies analyzing the automotive regime, online databases on EV and infrastructure diffusion, policy documents and government-commissioned studies (obtained through our collaboration with the Dutch innovation agency RVO), and technology outlooks (notably by the IEA). These documents were acquired by searching databases on keywords related to the ST-system dimensions and EVs. We focused our efforts on the period 2009–17, as this marks the period in which EVs started gaining traction (Wesseling et al., 2014). This desktop research placed the Dutch EV developments in the global context, as particularly the industry, science, and technology dimensions have a strong global orientation (Wells and Nieuwenhuis, 2012). To get a more in-depth understanding of the possibilities for EV-related BMI, we then complemented this database with a systematic collection of brochures and websites of the twelve car manufacturers on the Dutch market that offer EVs. To better understand key developments in the different dimensions of the ST-system and the barriers that inhibited EV-related innovation, we also conducted interviews (lasting 60 min on average) with 17 experts on EV-development in the Dutch market. These experts constituted a representative sample of the system, including local and national government institutes (3), a public innovation agency (2), firms across all stages of the industry supply chain (6), knowledge institutes (2), an industry association (1), an EV (2) and a biofuel (1) interest group. Combined and cross-referenced to ensure reliability, this database allowed us to establish a solid understanding of the opportunity space for EV-related BMI on the Dutch market.

Second, we conducted interviews with firms trying to work within this opportunity space, i.e. position EV-related BMI on the Dutch market. In selecting these firms, we aimed to include a broad spectrum of EV-related goods and services, ranging from EV sharing to payment services. A further criterion was that someone from executive management or experienced employees with knowledge of their firm's external environment and capable of steering decision making was willing to talk to us. This resulted in a total of 14 firms. Table 2 gives an overview of these firms, the interviewees' position, and their business models.

Questions in the semi-structured interviews with firm representatives focused on recent developments in each ST-dimension, how these affected their business model, and what, if any, they saw as their impact on such developments. Our knowledge on the ST-system developments resulting from the first database allowed us to contextualize and also verify what interviewees explained to us (e.g. which barriers they met in bringing their new business model to the market).

To analyze the data, we combined a deductive approach with an inductive approach (Miles and Huberman, 1984; Saunders and Lewis, 2012). First, we used a thematic coding approach (Saldaña, 2015) to deductively code for the factors in the ST-system that affect EV-related BMI. In the qualitative data analysis tool Nvivo, we created data "bins" for the single regime dimensions and business model components to structure the data (Baxter and Jack, 2008). In a second step, we then used a more inductive, relational coding approach (Saldaña, 2015) to uncover how the EV start-ups and car manufacturers configured their business model in response to the conditions they met in their environment. Next, we then clustered whether, for instance, a new business model sought to conform to current user practices or tried to change them, or whether a business model sought to align to current value networks or aimed to establish new value networks among previously disconnected sectors. According to their purpose, we then categorized the firms' actions into fit-and-conform tactics and stretch-and-transform tactics. The Appendix lists examples for each tactic.

4. Empirical illustration: EV-related BMI in the Netherlands

In this section, we discuss how EV-related BMI affect and are affected by the different dimensions of the Dutch automotive ST-system. The Appendix provides a detailed overview of examples and evidence for different fit-and-conform and stretch-and-transform BMI strategies, which we summarize below.

4.1. Market

In line with the literature on EV consumer perceptions (see e.g. Lee et al., 2014; Miao et al., 2014), our interviewees revealed that as long as the basic attributes (i.e. driving range, purchase price, charging time and availability of charging infrastructure) are not perceived as being competitive with an ICEV, advantageous attributes like sustainability and lower fuel and maintenance cost are often insufficient to foster market adoption. Consequently, EV buyers in the Netherlands are almost exclusively businesses and (semi)governmental organizations, as they profit from the fiscal policy incentives (RVO, 2018b, 2017) and from displaying the organization's "greenness" (Hoen and Jacobs, 2016). Fiscal incentives for private users are marginal, but likely to improve under the upcoming Climate Agreement (Klimaatakkoord, 2018). We found that the firms orient their BMI-efforts at user behavior in two ways;

First, BMI can be aimed at overcoming the drawbacks of EVs in line with predominant user preferences and without affecting user behavior, by proposing that EVs can be used in similar ways to a gasoline car, with less or no relative disadvantages. Examples include measures underlining value propositions that increase driving range and flexible car use; that reduce up-front purchasing costs, risks of battery depletion,

Table 2
Overview of 14 interviewees on EV-related BMI.

Firm	EV-related business model	Role
Buurauto	Sharing EVs with acquaintances	Founder
Eco-Movement	Mapping all (semi-)public charging facilities, providing real-time pricing and availability information. Mainly for B2B purposes.	Founder
E-Car Cell	Sharing EVs with acquaintances	Founder
EC-Rent	Renting EVs for special occasions, such as weddings or events	Founder
Elmonet	First and only Benelux importer of the Th!nk Nordic (the first serial produced EV)	Founder
FastNed	Offering fast charging services	Founder
Greenflux	First exploitation of public semi-fast charging services; now business to business (smart) infrastructure technology supplier and back-office management systems of these systems	Founder
Jedlix	Offering (vehicle-2-grid) smart charging services that exploits differential electricity prices and avoids grid congestion	Business developer
Mister Green	Offering high-end EVs for operational lease and exploitation fast charging stations	Founder
Movenience	Offers payment systems for charging stations	Manager business systems
Renault	Offering EVs with leased battery; supporting vehicle-2-grid (V2G-)based BMI through consortium	Zero Emission consultant
Stichting E-laad	Consortium-funded to resolve EV charging issues. First offering charging services; then providing interoperability between all charging systems; now V2G smart charging	Project manager
Streetplug	Offering charging stations that can hide under ground	Sales executive
WeDriveSolar	Offering integrated service of shared EVs, powered by locally generated renewable energy, and aims to exploit differential electricity prices through smart charging	Founder

maintenance costs and low resale values; and that ease on-the-go charging, the most extreme being exclusive and partially free use of Tesla's fast charger network. Our interviews with, for instance Renault-Nissan, confirmed that this type of BMI is aimed at taking away customer's concerns regarding EV adoption. The brochures and websites showed that business models that highlight these measures frame their value propositions as clean alternatives to gasoline cars, without the disadvantages that could be expected from electric driving; thereby trying to *fit-and-conform* to the existing institutional user demands.

On the other hand, BMI can also be aimed at changing user behavior in ways that benefit EV attributes. One example is that of value propositions incorporating dashboard tools to trigger efficient driving and improve the all-electric range. For instance, Buurauto, E-Car Cell and WeDriveSolar all moved into a value capture model around EV sharing to reduce upfront costs and exploit the EV's lower operational costs. Each company stressed the importance of social connectedness in their value proposition around 'sharing with neighbors' and the benefit of 'social control' as well as the use of apps to govern proper destination charging behavior (recharging the EV upon return). Similarly, WeDriveSolar aims to capture value from (fast) smart destination (dis) charging[4] and is even more reliant on this switch from on-the-go refueling to destination charging. These BMI have, on a limited scale so far, been successful in *stretching-and-transforming* user behavior associated with car use in ways that support the attributes and image of electric driving. These behavioral changes constitute a more radical change in the user dimension of the ST-system around car-based transport.

4.2. Culture

Car use is characterized by deeply rooted feelings of autonomy and freedom (Geels, 2012), which conflicts with the perceived range anxiety for EVs. Also, the car is traditionally regarded as a representation of social status (Altenburg et al., 2016). Two types of status can be gained from EVs; an expression of wealth, power or "coolness", which conforms to the predominant car culture, or an expression of a sustainable lifestyle that transforms the existing car culture (Noppers et al., 2014).

We identified several BMI-related actions by which niche actors appealed to the first type of status. They emphasized the importance of autonomy and freedom, thereby *fitting-and-conforming* to the existing norms and values around car-based transport. One example is the use of information gatherings and extended test-drives to let consumers experience that range anxiety is not as problematic as they perceive the issue. Similar options are provided by incumbents that offer to test drive an EV for a day or a weekend. FastNed, for example, framed its fast-charging-based value proposition as "*providing EV users the freedom to drive their EV without concern for range anxiety*" (translated from Dutch). Tesla's value proposition revolves around a status symbol of coolness and wealth. Interviewees indicated that Tesla had a profound impact on the symbolic meaning of EVs that enabled also EV rental startups to focus on the same symbolic value and that triggered charge point suppliers to refocus their value proposition on 'cool', high-end solutions, such as home underground chargers.

Yet, there were other business models that tried to *stretch-and-transform* this dimension of the BMDS by tapping further into the emerging norms and values of sustainability that are changing the cultural regime around car-based transport. Elmonet, for example indicated that providing complementary prints or stickers for EVs to emphasize that these vehicles have zero emissions, was an important success factor. Another example is WeDriveSolar's framing of truly sustainable driving; i.e. shared and powered by locally generated, clean electricity. Furthermore, the value propositions that incorporate dashboard tools to trigger efficient driving seek to trigger not only a change in user behavior, but also a different way of thinking about the impact of driving on the environment (Meelen et al., 2019).

4.3. Industry

The Dutch car industry structure has been changing considerably in terms of new entrants, and in terms of networks as it has become more intertwined with the ICT and electricity sectors. The industry's economic value is, compared to other countries, relatively low (Wesseling, 2016) and focuses particularly on downstream activities (RVO, 2017). Nevertheless, international car manufacturers have used the Netherlands as an early test market for (PH)EVs, because of its fiscal policies, infrastructure, and EV support system. Similarly, numerous Dutch startups have developed value propositions related to electric driving, e.g. around different types of normal, fast and smart charging infrastructure, real-time charging apps, and payment methods. By 2016, these EV-based activities accounted for 3700 FTE jobs (ibid.) and all interviewees expected this number to continue to grow rapidly, with availability of personnel being the major barrier to supplying the accelerating EV and infrastructure market.

In terms of the value networks that have emerged around electric driving, we identified various collaborations that aim at *fitting-and-conforming* to the predominant regime structure. One example is the network of Dutch grid operators that initiated startup E-laad to develop solutions to prevent grid destabilization from mass EV charging. FastNed's business model is threatened by the consortium of car manufacturers rolling out a competing European ultra-fast charging network. This new value network enabled the spreading of costs and risks across firms and it increased the chances of broader support in potential standardization-'battles' (cf. Bakker et al., 2015). The threat of foreign organizations with more resources and networks is typical to Dutch startups, and has contributed to a wave of takeovers by multinational energy and investment companies[5] (RVO, 2017). Interviewees also indicated that they tried to stay ahead of international competition through continuous innovation, resulting in what some called an "innovation spiral", as the innovation investments are difficult to earn back at this early EV market stage. Eco-movement, for example, indicated they protected their value proposition from the threat of car companies incorporating charge point information into their business model by offering increasingly advanced charging information, including real-time prices.

Other collaborations, in turn, aim to *stretch-and-transform* the existing industry structure more radically, for example by connecting previously unconnected sectors. One example is the collaboration between Renault-Nissan and the Amsterdam Arena for 2nd battery life use in a soccer stadium. Similarly, WeDriveSolar developed a new value network across various sectors (i.e. automotive, IT, electricity generation and infrastructure) to support their value proposition of a locally RET-powered EV sharing service and Jedlix (electricity grid management) indicated they were contracted by Tesla (automotive) to manage their superchargers.

4.4. Policy

The policy dimension shapes a significant part of the BMDS. Various supportive policies, such as municipalities banning ICEVs from the city

[4] They intend to capture value from stabilizing the electricity grid (this is expected to generate economic value in the future when high shares of renewables lead to volatile electricity supply) and from variable electricity prices, by discharging electricity from EVs when the price is high and charging when the price is low.

[5] E.g. Newmotion, Jedlix, Pintpoint, EVBox and E-traction have been taken over by Shell, Renault, Total, ENGIE, CN Tanhas group and Meridiam, respectively.

Table 3
Hypothesized relationships between system dimensions and niche-related BMI .

ST-system dimension	ST-system dimension's effect on BMDS	BMI's effect on ST-system dimension
Markets and users	User preferences determine what value propositions and value capture mechanisms will be successful	Direct (soft edge), as barriers to adoption may be overcome through new value propositions and ways of capturing value that: • *Fit-and-conform* to existing user practices, e.g. mimicking existing technology's use cases; or • *Stretch-and-transform* existing into new user practices and habits
Culture	Cultural values and perceptions about the technology determine what value propositions are deemed legitimate	Direct (soft edge), as new value propositions can help change public values and ideas about the niche technology and its impacts, in ways that: • *Fit-and-conform* to existing values and ideas about a technology's use and its impacts • Help *stretch-and-transform* new values and ideas about the impact of a technology
Industry	Industry structure and competition affect value capture mechanisms and possibilities of collaboration along a value network	Direct (soft edge), as the industry structure changes due to new value networks that may: • *Fit-and-conform* to existing structures, through internal product/service development, acquisition of new entrants by incumbents, collaboration along existing value chains; or • *Stretch-and-transform* existing structures, through collaborations with new entrants or across previously unconnected sectors
Policy	The policy environment determines what value propositions are legal, legitimate, and what value can be captured	Mostly an indirect (hard edge), as societally desirable BMI may result in supportive policy adaptations; BMI may also help niche actors to better exploit existing policy
Science & Technology	Technological performance, availability of complementary technologies, and infrastructure determines what value can be proposed and captured	Indirect (hard edge), as the technology itself does not change, while technology perceptions may change because of successful BMI and trigger more R&D investments

center, public procurement, and national RD&D subsidies opened up opportunities for the EV niche to grow. Particularly the extensive financial policy support for electric mobility in the Netherlands (RVO, 2018b) triggered new business models. EC Rent for example, started their EV leasing service specifically because of these policies. Interviewees indicate that to optimally benefit from policies, car manufacturers would at times also tweak their EVs (e.g., weight, price) to match specific policy categories. This is common practice also for ICEVs and exemplary of fitting-and-conforming to a given policy regime. Renault-Nissan also supported their customers in applying for fiscal incentives. These examples illustrate how BMI aim to *fit-and-conform* to the policy regime.

Some firms also attempted to *stretch-and-transform* policy and particularly the many regulatory hurdles that have impaired EV-related BMI, such as disproportionally high tax rates for public and for smart charging (PwC, 2017). Startup Elmonet, for instance, teamed up with NGO Urgenda to successfully lobby for a regulatory change that would legally allow for EV sales in the Netherlands. Another startup, Streetplug, lobbied successfully with the Dutch charging infrastructure knowledge platform to legalize their value proposition around underground charging. As opposed to Huijben's et al. (2016) findings for the energy sector, we, however, found no examples where BMI stretched policy support for electric driving to unintended or gray applications areas. Although political influence strategies were used to transform the policy dimension, the new business models themselves conformed to given policies.

4.5. Science & Technology

The first EVs were introduced to the Dutch market in 2009 (RVO, 2018a). Over the past decade, the limited battery range of these vehicles was partly overcome by significant technical developments that reduced battery costs and increased energy density (IEA, 2018). In addition, technological developments in ICT, renewable energy technology, smart grids and charging technology spurred innovation and enabled new business models (ibid.). For instance, a breakthrough in fast charger technology led to the first fast-charger-based business models in 2012 (IEA, 2016); the bourgeoning of competitively priced renewable energy technologies fostered value propositions around locally charged EVs (e.g., WeDriveSolar); and cloud technology enabled entrepreneurs to develop value propositions around navigational and driver tools. For instance, E-Laad stated that, as the science and technology dimension developed over time, they had changed their business model from providing charging services to facilitating interoperability between different charging systems and eventually (vehicle-to-grid) smart charging.

Policy makers and innovation agencies we spoke with (e.g. RVO, 2017) also indicated that new business models had influenced the perceptions of technologies, resulting in more Research Development & Demonstration (RD&D), investments by private investors (i.e. mostly made available by investments and loans in and takeovers of the startups) and public investors (in terms of government RD&D subsidies and public procurement for innovation). Particularly, they mentioned the increasing focus on smart charging. The success of new business models can therefore also indirectly trigger advances in the Science and Technology dimension.

5. Discussion & Conclusion

In this paper, we have used the case of EV-related BMI in the Netherlands to illustrate how BMI affects, and is affected, by ongoing transition dynamics. To aid this analysis, we have introduced the concept of the BMDS that defines the boundaries to business model innovation (BMI) available to firms trying to create and capture value from niche technologies, based on the opportunities and barriers in a given selection environment. We define this selection environment by the market, cultural, industry, policy and science and technology dimensions of the socio-technical system in which the firm operates. We argue that the concept of a BMDS is not only useful for assessing the opportunities for BM design available to niche actors at any given point in time, but also for understanding the repertoire of actions available to firms, i.e. 'the art of the possible'. Our analysis confirmed that some BMI try to fit-and-conform to existing market structures by proposing and capturing value in ways that align with mainstream user preferences and practices, for example by framing electric driving as a clean alternative to gasoline cars, without compromising on other service characteristics, like range or comfort. Other new business models, however, have stretched-and-transformed user behavior associated with car-based transport in ways that support the attributes and image of electric driving. Similarly, some new value propositions fit-and-

conform to existing norms and values regarding car use, trying for example to create a cool image for electric cars or reduce range anxiety. Other value propositions stretch-and-transform the cultural regime, triggering the public to think differently about sustainable car use. Different BMI strategies were also found to fit-and-conform or stretch-and-transform existing industry structures, as summarized in Table 3.

An interesting finding that the case study revealed is that the policy and science and technology dimensions were not transformed directly through BMI. This stands somewhat in contrast to prior work that has, for instance, shown that start-ups might try to stretch-and-transform given policy regimes by taking advantage of 'gray areas' (Huijben et al., 2016). The presence of fit-and-conform and stretch-and-transform tactics in different transition contexts and the prevalence of firms attempting to fit-and-conform versus stretch-and-transform the BMDS through novel business models, thus seems like a promising venue for further research. Future studies could take a more comparative approach to investigate the contingency factors that the choice of a fit-and-conform and stretch-and-transform approach depends on. For instance, the BMDS may be perceived differently by different types of actors, depending on their ability to pursue radically different business models. Incumbents have a larger resource base than startups, which may enable them to invest, for example, in new value propositions. At the same time, incumbents' BMDS may be more restrained by dependencies on established networks, large employee pools, and cognitive frames defined by existing ways of doing things (van Mossel et al., 2017). How 'hard' or 'soft' actors perceive a particular edge of the BMDS is likely to differ and might potentially influence their approach to BMI.

The framework proposed in this study responds to calls for analytical perspectives that connect firms' actions and transition dynamics (Bidmon and Knab, 2018; Farla et al., 2012; Sarasini and Linder, 2018; van Mossel et al., 2017). We argue that the BMDS is a useful concept for studies that want to assess how firms use business models as a mechanism to either stabilize the status quo or provoke change. The degree to which a novel business model tries to push the boundaries of the BMDS can arguably make a difference in terms of the impact on ongoing transition dynamics. The literature on *transition pathways*, for instance, distinguishes between different levels of radicalness of ST-systems change (Geels et al., 2016). It distinguishes whether a transition proceeds by gradual regime replacement or through sudden disruption. Business models that maintain a value network with established industry players and develop niche products and services in ways that conform to the regime, will most likely support a less radical transition pathway (Geels et al., 2016; Geels and Schot, 2007). In turn, business models that exploit the opportunities for niche expansion by further developing the benefits of the niche products and services over those of the regime will most likely support a more radical transition pathway (Geels et al., 2016; Geels and Schot, 2007; Smith and Raven, 2012).

Arguably, the BMDS does not remain static over the course of a transition but develops continuously as the ST-system transforms. Thus, the comparison of the BMDS at two different points in time might also be insightful to understand the progress of a transition and how changes in the regime 'open up' windows of opportunities for new business models. Using the concept of a BMDS might thus be valuable for researchers to dissect more precisely why or why not certain business models succeed or fail at different moments of a transition.

Finally, the specific case we used to illustrate the conceptual differentiation between the fit-and-conform and stretch-and-transform nature with which BMI can help to expand the BMDS also allows us to point to some practical implications. Our analysis indicated that some regulatory barriers impaired EV-related BMI and hurt the frontrunners. It is important that policy makers anticipate the unintended impacts their policy measures may have on BMI. Sales incentives, for example, may reduce the high up-front costs of EVs, but they could also discourage market-based solutions to this adoption problem, like pay-per-use schemes. Finally, there is also an opportunity for policy makers to steer user practices, norms, and values by supporting new business models that facilitate sustainable system change. In general, it should be noted that, although EV diffusion is picking up across developed countries, differences in important national factors like policy support and population density remain (IEA, 2018; Kanger et al., 2019; Wesseling, 2016). Yet, some elements of BMDS are also globally similar; car manufacturers are global players operating in international networks (Wesseling et al., 2014), users perceive the car as a symbol of status and freedom worldwide (Geels, 2012), and EV consumer preferences are rather homogeneous across countries (Liao et al., 2017). Hence, the generalizability of single-country case studies to the technological field, broader transport sector, and even to other clean technologies with similar adoption barriers (notably high up-front costs) and where norms and values are important (Wainstein and Bumpus, 2016), needs to be critically assessed.

CRediT authorship contribution statement

Joeri H. Wesseling: Conceptualization, Methodology, Formal analysis, Data curation, Writing - original draft, Writing - review & editing. **Christina Bidmon:** Writing - review & editing. **René Bohnsack:** Conceptualization, Methodology, Formal analysis, Data curation, Writing - original draft.

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Appendix

Sample data for fit-and-conform vs. stretch-and-transform tactics per regime dimension

	Examples from the case of EV-related BMI in the Netherlands, retrieved from interviews and brochure analysis
Market: Fit-and-conform	
New value propositions enabling EV use as 'normal' car	-Volkswagen enhanced their EV value propositions by trading-in the EV for a normal car for long-distance trips -Tesla provided different long-range battery pack options for extended range and focuses on pricier high-end car segment -BMW sold an optional range extender to increase the car's range
Value propositions and new ways of value capture to lower economic risk perception of EV purchase	-Most car manufacturers offered extended powertrain and battery capacity guarantees and free or low-cost maintenance services to lower customers' risk perception -Nissan and Renault offered alternative payment structures, such as leasing the battery

Value propositions enabling EV on-the-go charging as a 'normal' car	-Eco-Movement maps charging facilities and provides real-time pricing and information on their availability -FastNed and Mister Green offer a network of fast chargers across the Netherlands and are expanding abroad -EV models that can fast charge
Market: Stretch-and-transform	
Value propositions around dashboard tools to incite efficient driving	-More or less all EV models have dashboard tools aimed at changing users' driver behavior in a more sustainable way
EV sharing	-Buurauto, E-Car Cell and WeDriveSolar all moved into a value capture model around EV sharing. They all express the importance of social connectedness in their value proposition – 'sharing with neighbors' – and the benefit of 'social control' on proper charging behavior -Tesla has a car-sharing button (which Buurauto, E-Car Cell and WeDriveSolar do not consider a competitive threat, as Tesla has no car sharing community and they do) -Jedlix offers energy management services developed specifically for larger shared EV fleets
BMI making destination charging solutions more attractive	-Streetplug offered smart payment services to serve corporate customers that wanted automatic, reimbursable payment -Streetplug forecasted and exploited the trend in demand from 'pioneers showing off eye-catching early charge points' to the perception that chargers are ugly and lose their pioneering status by offering underground charging points -Installation of home/work chargers to unburden users (e.g. Smart EV, Ford Focus EV, Chevrolet Volt) -Providing EV drivers with plug-adaptors to enhance charger-EV compatibility (e.g. Ford Focus EV or Opel Ampera)
Capturing value from smart charging	-WeDriveSolar intends to capture value from quick (de)charging of EVs to exploit variable electricity prices
Moving towards Mobility-as-a-Service	-Nissan offered "Mobility Pack" which was a partnership with Hertz, EV (Leaf) drivers received a Hertz Gold Plus Card to make free use of a fast train (ICE) for 3 weeks per year
Culture: Fit-and-conform	
Value propositions to reduce range anxiety	-To reduce range anxiety, EC Rent offers to plan charging routes to skiing trips for the Tesla's they rent out (this was before navigational tools could do this internationally). -'To reduce fear of the unknown', EC Rent allows for extended test drives -Information gatherings and extended test drives, by e.g. Tesla and Renault-Nissan
Position EV as a 'cool' status symbol	-EC Rent used the Tesla because it was the only car considered as not just 'green', but also 'cool' -Streetplug positions their solution as 'sexy' and 'hip' in the private market – building on the Tesla legacy
Value propositions aligning to existing car regime's notions of freedom	-FastNed frames its fast-charging-based value proposition as "providing EV users the freedom to drive their EV without concern for range anxiety"
Culture: Stretch-and-transform	
Value propositions emphasizing the clean driving of EVs	-Elmonet offers complementary stickers and wrapping that express the car's lack of emissions; they didn't supply a single EV without stickers or wrapping -WeDriveSolar frames its mobility service as truly sustainable driving, highlighting the car sharing and that it runs on locally generated, clean electricity -FastNed puts solar panels on their fast charging stations to emphasize the sustainable source
Industry: Fit-and-conform	
Incumbents acquiring new entrants to internalize their value network	-Newmotion, Jedlix, Pintpoint, EVBox and E-traction and Elmonet have been taken over by Shell, Renault, Total, ENGIE, CN Tanhas group, Meridiam and Autobinck, respectively
New collaborations between incumbents	-Consortium of car manufacturers rolling out a European ultra-fast charging network
New collaborations across previously connected sectors	-Network of Dutch grid operators initiated E-laad to develop solutions to prevent grid destabilization from mass EV charging
Industry: Stretch-and-transform	
New collaborations across previously disconnected sectors	-Renault-Nissan collaborates with Amsterdam Arena for 2nd battery life use in a soccer stadium -WeDriveSolar developed a new value network across various sectors (i.e. automotive, IT, electricity generation and infrastructure) to support their value proposition of a locally RET-powered EV sharing service -Greenflux collaborates with dozens of EV-related companies (mostly component suppliers and backoffice support) to set international standards like the Open Charge Point Protocol, which is crucial for their business model and export -Energy supplier Delta approached Movenience, a company arranging automatic toll payments, to develop and process payment service for their charging infrastructure -Jedlix collaborates with car manufacturers and energy suppliers to capture value in creating grid flexibility (this business model is expected to become more profitable when EV and renewable energy adoption increases)
Cutting dealerships and showrooms out of the value chain	-Elmonet successfully approached customers directly, mostly at public events and through network with NGO, instead of using showrooms. After Elmonet was sold-off to incumbent Autobinck that did use the showroom model, the company went bankrupt. -Tesla sells EVs directly to the consumer -As opposed to conventional lease companies that rely on commission per cars from car manufacturers that they have close ties with, Mister Green takes no commissions but captures value from margins on operational lease services
New collaborations involving independent new entrants	-EC Rent used crowdfunding to get started; after this success other investors became interested -Elmonet starting cooperation with Think Nordic and demanded e.g. trained personnel -Jedlix (electricity grid management) was contracted by Tesla (automotive) to manage their superchargers worldwide
Policy: Fit-and-conform	
Start EV business to exploit policy	-E-Car Cell was developed through an international innovator project to stimulate EV in peripheral residential areas -EC Rent started EV rental to exploit Dutch financial policy schemes (80% of their sales depended on these schemes) -Greenflux moved from a research organization to a smart infrastructure technology supplier to exploit policy support
Tweak cars to fit policy support	-Incumbents tweaked their EVs (e.g. weight and price) to match specific policy categories
Support users in applying for financial policy incentives	-Renault-Nissan supported their customers in applying for fiscal incentives as this could be perceived as unknown and complex
Policy: Stretch-and-transform	

No BMI were found, interviewees did highlight their political influence activities	*Only political influence strategies (attempted to) effect regulatory and policy change in order to enable BMI, e.g.;* -FastNed unsuccessfully lobbied and sued the government in order to be able to sell food, drink, and toilet services at their charging stations -StreetPlug lobbied successfully with the charging infrastructure knowledge platform to enable their value proposition around underground charging -Elmonet (first supplier of EVs in the Netherlands) successfully lobbied together with NGO Urgenda to implement regulation legally allowing EV sales in the Netherlands -ECarCell lobbied for purchase subsidies for private EV drivers (will not be implemented until 2020)
Science & Tech: Fit-and-conform	
S&T developments enabled new value propositions	-Technological developments led E-Laad to change their business model from providing charging services to facilitating interoperability between different charging systems and eventually (vehicle-to-grid) smart charging -IT developments enabled navigational tools by Jedlix and Eco-Movement -Future substantial increases in EV-range would also threaten the business cases of companies providing charge-point navigational data, as they expect the market for on-the-go charging to decline while using EVs to stabilize the grid creates BMI opportunities for back-office management
S&T developments enabled new means of value capture	-IT developments enabled app support in car-sharing-based value capture by WeDriveSolar, EC Rent and Buurauto which allows them to ensure that users charge their car upon return, preventing the use of penalties -Internet-of-Things results in increased accessibility of data and smarter data, which enables Jedlix (electricity grid management) to enhance their value proposition -Apps enabled EC Rent to price per minute
Science&Tech: Stretch-and-Transform	
No BMI were found	n/a

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