

# HOW INSTITUTIONAL ARRANGEMENTS IMPEDE REALIZATION OF SMART ECOSYSTEMS: THE CASE OF DOOR-TO-DOOR MOBILITY INTEGRATORS

*Research paper*

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## Abstract

*Technical progress has enabled companies to offer smart services. In the mobility sector, emerging door-to-door (D2D) mobility integrators promise to provide highly individualized, dynamic, and context-aware mobility service by bundling different mobility services, such as car-sharing and public transport. These D2D mobility integrators are well-positioned to facilitate access and use of non-private car-based mobility and thus to contribute to solutions to major challenges facing cities around the world, such as traffic congestion and air pollution. However, D2D mobility integrators struggle to attract mobility providers to their service ecosystem.*

*This research applies the concept of legitimacy, which originates from institutional theory, and service-dominant (S-D) logic to analyse the current embeddedness of mobility providers in service ecosystems and the underlying institutional arrangements as a possible barrier to entering into a D2D mobility integrator service ecosystem.*

*An exploratory study with German mobility providers was conducted. Our empirical results show that embeddedness in already existing service ecosystems, in particular, reduces their need to gain market legitimacy and for the legitimacy of the new type of smart cooperation. These lead to a lack of cooperation with D2D mobility integrators.*

*Keywords: Institutional Theory, Legitimacy, Service-dominant Logic, Smart Mobility.*

## 1 Introduction

Cities around the world are confronted with the challenge of creating new mobility paradigms in order to improve the living conditions of their citizens and to preserve the environment for future generations. Currently, private car use constitutes a large share of total mobility (TCI Röhling Transport Consulting International, 2016), causing problems like traffic congestion, parking problems (Arnott and Inci, 2006; Giuffrè et al., 2012), as well as air and noise pollution (Barth and Boriboonsomsin, 2008; Murphy and Delucchi, 1998; Willing et al., 2017a; 2017b). Given the estimation that the percentage of the worldwide population living in cities will rise up from 50% in 2015 to 66% by 2050 (United Nations Department of Economic and Social Affairs, 2015), solutions are needed now more than ever.

New possibilities are provided by the proliferation of information technology (IT) like smartphones, and ongoing technical progress (sensors, etc.). Several mobility services such as car-sharing (Firnborn and Müller, 2011; Hildebrandt et al., 2015), bike-sharing (Shaheen et al., 2010), or ride-sharing (Teubner and Flath, 2015) have become much simpler and more convenient to use, contributing to their increased popularity and thus to less dependency on private car use. More recently, in a manifestation of Arthur (2009, p. 194) observation that “technology creates the structure of the economy”, an entirely new market actor has emerged. So-called door-to-door (D2D) mobility integrators aimed to offer smart D2D mobility, which is characterized by individual, context-aware, and dynamic packaging of mobility services provided by different mobility providers like bus, car-sharing, or train companies (Schulz et al., 2018). D2D mobility services save customers time and energy by eliminating the need to search through myriad mobility service offerings as well as challenging on-trip adaptations, for example, due to short-term cancellations or delays. For these reasons, D2D mobility integrators are well-positioned to better fulfil city dwellers’ mobility needs (Alt, 2016; Winter et al., 2012) and to provide a viable alternative to private car use. As a result, it is expected that D2D mobility services will command the largest share of the mobility market (Consulting4Drive and BSL Transportation Consultants, 2015).

However, whereas there is little doubt about the value of the services D2D mobility integrators can offer, technical implementation of these D2D mobility services is still its infancy. A recent study by Willing et al. (2017b) finds that all government-backed projects have either been abandoned or are not yet in full operation. A handful of private-sector solutions (e.g., Moovel, Qixxit) are on the market, but the D2D mobility services provided lack important features of smart mobility, such as a booking/payment functionality and access to a larger number of mobility providers and their services to offer alternative D2D trips (Willing et al., 2017a; 2017b). Albrecht and Ehmke (2016), for instance, find that D2D mobility integrators are often unable to integrate the mobility services of public transport (56%), or station-based car-sharing companies (78%) into their technical solutions.

To date, D2D mobility integrators and their difficulties have been largely ignored by research (Willing et al., 2017b). In this exploratory paper, we partly fill this gap by exploring how mobility providers like bus, car-sharing, or train companies can be convinced to cooperate with D2D mobility integrators. Some studies (e.g., Beirão et al., 2017; Frow et al., 2016; Vargo and Lusch, 2017; Vargo et al., 2008) have examined service provision by multiple actors using service-dominant (S-D) logic and its underlying concepts of service ecosystem and value co-creation as an investigatory lens. However, these studies are often on a meta-theoretical level (Vargo and Lusch, 2017), are without empirical evidence (see Giesbrecht et al., 2017), and seldom incorporate IT as an enabler (Breidbach and Maglio, 2016). To further develop S-D logic towards a midrange theory, framework, and model, Vargo and Lusch (2017) proposed using non-marketing theories.

In management literature, different theories like transaction cost theory (Barney and Hesterly, 2006; Ireland et al., 2002), the resource-based view (Eisenhardt and Schoonhoven, 1996), social network theory (Ahuja, 2000; Kenis and Knoke, 2002), organizational learning theory (Kale et al., 2000), and institutional theory (Dacin et al., 2007; Oliver, 1990) have been used to examine rationales for dyadic strategic alliance formation. Given the expected high importance of institutions, which are “humanly devised rules, norms, and beliefs that enable and constrain action” (Scott, 2008; Vargo and Lusch, 2017, p. 49), and their higher-level institutional arrangements in establishing a service ecosystem (Koskela-Huotari et al., 2016a; Vargo and Lusch, 2016; 2017; Vargo et al., 2015), we draw on institutional theory

and its concept of legitimacy. We argue that a mobility provider and its activities must conform to institutional arrangements, and, if the resulting pressure is strong enough, enter into a service ecosystem of a D2D mobility integrator for legitimacy purposes (Dacin et al., 2007). Taking into account the low cooperation rate of mobility providers, our research questions is: *How do existing institutional arrangements impede the need of mobility providers to gain legitimacy and thus act as barriers to their cooperation with D2D mobility integrators?*

To approach this research question, we conducted explorative interviews with experts from thirteen German mobility providers. Analysing mobility providers as a potential part of the IT-enabled service ecosystem of D2D mobility integrators, we present their lack of legitimacy needs as a result of existing institutional arrangements. After introducing the theoretical background, we explain our methodology, and present and discuss our results.

## 2 Theoretical Background

### 2.1 Service Ecosystem of D2D Mobility Integrators: A Service-Dominant Logic Perspective

Traditional scientific literature is grounded on a goods-dominant (G-D) logic, which is characterized by a company and output-centric perspective. Their central characteristics are the assumption that customers exchange for goods, i.e., primarily manufactured things such as cars, and that their value is determined by the producers (value-in-exchange). Hence, customers are solely passive recipients of goods, which they receive on the market (Vargo and Lusch, 2004).

In 2004, Vargo and Lusch (2004; 2016; 2017) introduced a new service-dominant (S-D) logic into marketing. More recently, a high number of authors from different research fields (e.g., Hearn et al., 2007; Jarvis et al., 2014; Storbacka et al., 2016), including service science (Maglio et al., 2009; Spohrer and Maglio, 2010, etc.), and information systems (IS) (e.g., Giesbrecht et al., 2017; Lusch and Nambisan, 2015; Schmidt-Rauch and Schwabe, 2014), also adopted this perspective. According to S-D logic, service, which is defined as “the application of resources for the benefit of others” (Vargo and Lusch, 2017, p. 48), is the basis of exchange (Vargo et al., 2008). Thereby, the former differentiation between customers and producers is becoming obsolete, assuming that all actors engage in service-for-service exchange, i.e., resource integration activities (Vargo and Lusch, 2016; 2017). For instance, customers have to provide their GPS data to D2D mobility integrators in order to get context-aware, dynamic packaging of mobility services. It also becomes clear that the particular context of an actor (e.g., the current trip home) plays an important role for its resource integration (Chandler and Vargo, 2011). Hence, the previous principle of value-in-exchange (G-D logic) is replaced by the principle of value-in-use (Vargo and Lusch, 2004), or, more precisely, by value-in-context (Chandler and Vargo, 2011; Vargo and Lusch, 2017; Vargo et al., 2008).

The service-for-service exchange connects actors in a service ecosystem, which represents “a relatively self-contained, self-adjusting system of mostly loosely coupled social and economic (resource-integrating) actors connected by shared institutional logics and mutual value creation [i.e., value co-creation] through service exchange” (Lusch and Nambisan, 2015, p. 161. For varying definitions, see Nischak et al. (2017). See Spohrer et al. (2008) for a related definition of a service system). Given this definition, the size of service ecosystems varies from small (individual households, companies, etc.) to large, such as nations and global markets (Koskela-Huotari et al., 2016a). A specific service ecosystem is thus not autonomous because its actors are embedded in multiple service ecosystems simultaneously (Akaka et al., 2013). The analysis of a service ecosystem like those of a D2D mobility integrator (see Figure 1) therefore requires zooming in and out, which Chandler and Vargo (2011) describe as oscillating foci. For example, taking a narrow focus, the D2D mobility integrator service ecosystem consists at least of customers and different mobility providers like car-sharing, bus or train companies (1a-d). Expanding the focus makes additional actors visible, such as a national government (1a) legislating for the promotion of car-sharing parking lots in public spaces to enhance physical connection with bus and train sta-

tions (Bundesministerium für Verkehr und digitale Infrastruktur, 2017), local transport and tariff associations (1c) harmonizing tariffs between different public transport companies (Reinhardt, 2012), or industry associations (1d). These possible additional actors are indicated with black dots. The different sizes of the dots illustrate the varying number of actors' service-for-service exchange relations.

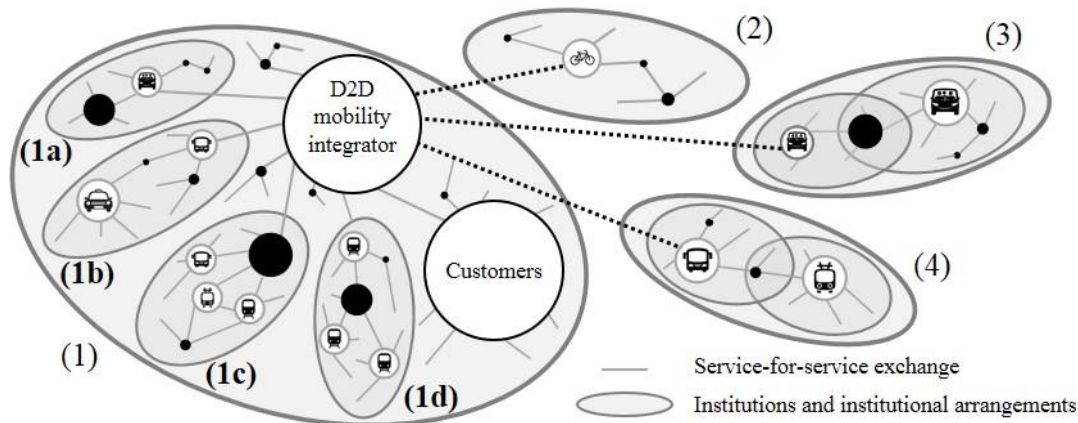


Figure 1. Exemplary service ecosystem of a D2D mobility integrator.

According to Vargo and Lusch (2017), the coordination mechanism for the actors involved in a service ecosystem and their service-for-service exchange activities are institutions and institutional arrangements (a synonym for “shared institutional logics” (e.g., Lusch and Nambisan, 2015, p. 163)). Institutions are “humanly devised rules, norms, and beliefs that enable and constrain action” (Scott, 2008; Vargo and Lusch, 2017, p. 49), what North (1990, p. 3) also calls “the rules of the game”. Institutional arrangements are the higher-order collection of these interrelated institutions (Vargo and Lusch, 2017). Due to the embeddedness of actors in multiple service ecosystems, institutions and institutional arrangements also exist between service ecosystems (Akaka et al., 2013; Koskela-Huotari et al., 2016a; Lawrence and Suddaby, 2006). For instance, a car-sharing company (1a) faces institutions on a company level (corporate culture, etc.), mobility-sector level (e.g., cooperation with a D2D mobility integrator), as well as on a nation level, such as the law for the promotion of car-sharing parking lots.

However, institutions and institutional arrangements not only enable service-for-service exchange. If they are incompatible, they cause conflicts, which constrain service-for-service exchange (Akaka et al., 2013; Koskela-Huotari et al., 2016a; Vargo et al., 2015). In an extreme case, this could lead to a situation in which mobility providers being completely incapable to conduct service-for-service exchange with D2D mobility integrators. This means that the service ecosystems concerned are not nested. As depicted in Figure 1, mobility providers like car-sharing companies (3) already often cooperate through digital platforms (Remane et al., 2016). It is therefore conceivable that decision-makers do not see the necessity for cooperating with emerging D2D mobility integrators. In addition, at least in larger cities, mobility services like bus, subway, and tram transport (4) are frequently provided by subsidiaries of the same company. As a result, IT solutions are often already available which allow these mobility services to be combined (Masuch et al., 2013; Willing et al., 2017b).

By focusing on a clearly defined service ecosystem, like that of a D2D mobility integrator (1), scientific literature (Koskela-Huotari et al., 2016a, p. 2964; Lawrence and Suddaby, 2006) have recommended “breaking, making, and maintaining [of its] institutionalized rules”, in order to solve its inherent conflicting institutions and institutional arrangements and thus to increase service-for-service exchange. Necessary adjustments can be initiated by the inclusion of one or more new actors (Koskela-Huotari et al., 2016a). However, S-D logic research has not yet examined how institutions and institutional arrangements that an external actor in its current service ecosystem face, such as in the case of the mobility providers (2) to (4), can prevent such a step. In order to shed more light on this issue, we expand S-D logic by introducing the concept of legitimacy (Dacin et al., 2007).

## 2.2 Adding the Concept of Legitimacy to Service-Dominant Logic

Whereas S-D logic-informed research – whether in an IS (e.g., Koskela-Huotari et al., 2016b; Lusch and Nambisan, 2015) or other context (Akaka et al., 2013; Vargo and Lusch, 2017, etc.) – has only more recently begun taking an institutional perspective, related institutional theory is well established in a number of scientific areas like sociology (e.g., DiMaggio and Powell, 1983; Meyer and Rowan, 1977), management (e.g., Baum and Oliver, 1991; Dacin et al., 2007; Oliver, 1990; Provan et al., 2015) and IS. Focusing on the application of institutional theory in IS research specifically, based on the literature review of Mignerat and Rivard (2009), three broad research streams can be identified.

A first stream examines the influence of institutional pressure exerted by different actors (government, suppliers, competitors, etc.) on the diffusion of IT innovations, such as electronic-trading systems (Khalifa and Davison, 2006), physician order entry systems (Kaganer et al., 2010), or electronic data interchanges (Teo et al., 2003). A second stream focuses on how actors respond to such pressure and shape institutional arrangements. Exemplary studies focus on institutionalization processes with regard to sharing platforms (Schultze and Bhappu, 2017), security standards (Backhouse et al., 2006), enterprise resource planning (ERP) systems (Lyytinen et al., 2009), and healthcare systems (Miscione, 2007; Nielsen et al., 2014). Institutional theory has also been applied with regard to the institutionalization of nascent markets like cloud computing (Lai et al., 2014; Su, 2011), couchsurfing (Marton et al., 2017) and electronic exchanges (Cousins and Robey, 2005), a category which includes the D2D mobility market. Finally, a third stream analyses the interaction between IT and existing institutions (Avgerou, 2000; Mangan and Kelly, 2009; Sia and Soh, 2007). For instance, Cho and Mathiassen (2007) find misalignment between telehealth innovation and healthcare industry infrastructure leads to a barrier for adoption.

We base our introduction of the concept of legitimacy into S-D logic to better explain how existing institutions and institutional arrangements can be barriers to mobility providers conducting service-for-service exchange with D2D mobility integrators mainly on conclusions reached in the first research stream. According to Suchman (1995, p. 574) “*legitimacy is a generalized perception or assumption that the actions of an entity [a mobility provider] are desirable, proper, or appropriate within some socially constructed system of norms, values, beliefs, and definitions [i.e., institutional arrangements of its established service ecosystem (Vargo and Lusch, 2017)]*”. As the analogies to the present research in brackets indicate, this definition supplements the widely accepted definition of a service ecosystem: “a relatively self-contained, self-adjusting system of mostly loosely coupled social and economic (resource-integrating) actors connected by shared institutional logics [i.e. institutions and institutional arrangements] and mutual value creation through service exchange” (Lusch and Nambisan, 2015, p. 161). To date, institutional theory and its concept of legitimacy have rather taken a G-D logic perspective, as indicated by the lack of focus on value co-creation (e.g., Cousins and Robey, 2005; Dacin et al., 2007; Marton et al., 2017; Provan et al., 2015). By introducing the concept of legitimacy into S-D logic, it becomes clear that a specific actor, such as a mobility provider, needs to obtain legitimacy for its actions from the actors of its existing service ecosystem.

Based on these arguments, we assume that actors (government, industry associations, other mobility providers, etc.) constituting the service ecosystem of mobility providers can “impose significant pressures on [them] to justify their strategic actions” (Dacin et al., 2007, p. 171). This also influences their decision whether or not to conduct service-for-service exchange with D2D mobility integrators. Thus, the need of each mobility provider to legitimize its actions varies depending on the service ecosystems in which it is embedded. For example, the car-sharing company Car2go can draw on the existing legitimacy of its well established parent company Daimler AG, and hence does not face the same challenges as more recent start-ups such as Uber (Marton et al., 2017). Similarly, Dacin et al. (2007) argue that the need to legitimize actions depends on company-specific as well as environmental characteristics and can be a rationale for forming strategic alliances. In turn, given the frequent lack of service-for-service exchange between mobility providers and D2D mobility integrators (Albrecht and Ehmke, 2016), we expect that the other actors in their service ecosystem are not exerting sufficient legitimacy pressure on mobility providers to persuade them to cooperate with a D2D mobility integrator.

## 2.3 Possible Legitimacy Needs of Mobility Providers

In order to better understand the possible kinds of such pressure leading to legitimacy needs of mobility providers and, as a result, to service-for-service exchange with D2D mobility integrators, we draw on the institutional theory based framework of Dacin et al. (2007). This is also in line with the recommendation of Vargo and Lusch (2017) to further develop S-D logic with frameworks from outside marketing. Subsequently, we transfer the five types of legitimacy needs (market, relational, social, investment and alliance legitimacy), which, together or alone, motivate companies to enter a strategic alliance (Dacin et al., 2007), to the broader service ecosystem setting.

A mobility provider may conduct service-for-service exchange with a D2D mobility integrator in order to achieve *market legitimacy*, i.e., to establish or maintain the rights or qualifications necessary to continue doing business in its existing market or to enter into a new market, as in the case of D2D mobility. The need to gain market legitimacy is particularly high when a mobility provider lacks experience, a good reputation, or government approval in the eyes of its service ecosystem actors (customers, municipality, etc.). For example, after Uber was criticised for violating the German Passenger Transportation Act, it was banned in Germany (Seibt, 2016). In the positive sense, cooperation with a D2D mobility integrator perceived as an important actor to address the mobility-related challenges of cities could facilitate authorisation.

A mobility provider may also cooperate with a D2D mobility integrator in order to be perceived as an attractive potential member for a further service ecosystem (*relational legitimacy*). The mobility market is changing and its future is unclear (Münchener Kreis e.V., 2017; Schrieck et al., 2018). Numerous mobility providers with varied and sometimes innovative business models have entered the car- and ride-sharing market (Remane et al., 2016; Teubner and Flath, 2015), leading to high fragmentation. Simultaneously, market consolidation has already taken place in certain areas, such as German long-distance bus service (Breitinger, 2016). In addition, technical advances in autonomous driving are expected to further change the structure of the mobility market (Doll and Vetter, 2017). Against this background, it seems obvious that mobility providers are more likely cooperate with D2D mobility integrators when they expect to need to expand beyond their current service ecosystem and face high competition for attractive partners.

Another possible reason for cooperating is to gain *social legitimacy*. Our S-D logic perspective highlights that the service ecosystem of mobility providers includes not only possible additional mobility providers, but also a large number of other actors, such as national governments, municipalities, and, of course, citizens. Each of these actors evaluates the social acceptability of mobility providers' behaviour. Given the high number of problems caused by dominant private car usage, such as traffic congestion, a lack of parking (Arnott and Inci, 2006; Giuffrè et al., 2012) and air and noise pollution (Barth and Boriboonsomsin, 2008; Murphy and Delucchi, 1998), resulting in part from the inability of mobility providers to offer attractive mobility services, the need to enhance social legitimacy should be high. We argue that cooperation with a D2D mobility integrator can increase the attractiveness (Willing et al., 2017b) and social legitimacy of individual mobility services.

As already described in the introduction, the possibilities for providing mobility services have changed considerably in recent years due to the proliferation of smartphones and the emergence of new IT solutions, for example, for the provision of mobile tickets and real-time timetable data (Willing et al., 2017b). This development exerts enormous pressure on mobility providers to invest in order to meet the new requirements for vehicles, traffic infrastructure, and IT equipment (data platforms, sensors, etc.). While most service ecosystem actors acknowledge the necessity of investment in the long term, some financial actors, such as municipalities and parent companies, question the economic necessity for investment in the short term. For example, almost two thirds of the German experts surveyed in the study of Lasch et al. (2005) shared the expectation that electronic tickets will not provide economic benefits for mobility providers. In other words, there appears to be a lack of *investment legitimacy*. We argue that in order to legitimize their expenditures, mobility providers can enter a service-for-service exchange with a D2D mobility integrator. As Willing et al. (2017a) argue, a D2D mobility integrator, deploying

advanced IT, can provide services leading to economic advantages for a mobility provider, such as recommendations for business area optimization or multi-mobility provider analyses.

Lastly, the aim to gain *alliance legitimacy*, which is “to establish endorsement for the alliance form itself” (Dacin et al., 2007, p. 178), can encourage companies to enter strategic alliances. For example, in the past, competing automobile manufacturers initially had to validate the appropriateness of a strategic alliance as a form of transaction in this sector. However, in the case of our study, there seems to be no necessity for such a traditional alliance legitimacy. As explained, most mobility providers already operate in service ecosystems and cooperate with other mobility providers directly or indirectly, for instance, through digital platforms. Today it is widely recognized that mobility services are sometimes in a competitive but more often in a complementary relationship (Willing et al., 2017a). We argue that mobility providers seek to establish a *smart service integrator legitimacy* when conducting service-for-service exchange with D2D mobility integrators. Similar as the alliance was new for automobile manufacturers in the past, a cooperation with D2D mobility integrators aiming to provide individual, context-aware, and dynamic packaging of mobility services (Schulz et al., 2018) is new for mobility providers. Due to the high share of private car use in total mobility (TCI Röhling Transport Consulting International, 2016), the validation and legitimation of an intermediary role of D2D mobility integrators can contribute to ensuring the future business success of mobility providers.

In sum, based on the adapted framework, we assume that mobility providers may face five different kinds of pressure to legitimize themselves, and that cooperation with a D2D mobility integrator can provide the required legitimacy. In this study, we interview experts from German mobility providers to understand their lack of legitimacy needs and determine how that lack is shaped by the institutional arrangements of their current service ecosystem.

## 3 Methodology

### 3.1 Research Context

D2D mobility integrators as well as the scientific research on this topic are essentially limited to Europe, especially Germany (Willing et al., 2017b). The reasons for this could be pre-existing infrastructure, high public pressure, and legal conditions (Marx et al., 2015; Willing et al., 2017b). According to overviews of D2D mobility integrators operating in German-speaking Europe by Albrecht and Ehmke (2016) and Willing et al. (2017a; 2017b), all D2D mobility integrators are still in the start-up phase, illustrated by the limited functionality of their IT solution, for example, their lack of consideration of dynamic customer location data (Albrecht and Ehmke, 2016), and their failure to offer a booking or payment function (Willing et al., 2017a). The two most well-known examples are Moovel (Daimler AG) and Qixxit (Deutsche Bahn AG), which are both subsidiaries of established mobility companies. Simultaneously, publicly funded research projects like the Intermodal Mobility Assistance for Megacities (Masuch et al., 2013), Mobility Broker (Beutel et al., 2014a; 2014b), or WISETRIP (Aditjandra et al., 2009) envision D2D mobility. However, these projects have not yet been implemented or have been discontinued (Willing et al., 2017b).

We chose the German mobility market as the focus of this research because of its large size and unique structure. In 2015, German public transport, which is a collective of bus, subway, train, and tram transport, carried more than 10 billion passengers (Verband Deutscher Verkehrsunternehmen, 2016). In comparison, there were only a little over 4.5 billion passengers in Spain (Instituto Nacional de Estadística, 2016) and just over 2 billion passengers in Switzerland (in 2014) (Verband öffentlicher Verkehr, 2017). In addition, most German public transport companies belong to transport and tariff associations (TTAs), which are traditional service ecosystems. German TTAs used to consist solely of public transport companies, but now regional authorities, such as federal states, districts, or cities are frequently also shareholders (Reinhardt, 2012). This organizational specificity leads to a particularly high number of institutional arrangements, which may impede the legitimacy needs of mobility providers.

### 3.2 Data Collection and Analysis

Our data collection reflects the grouping of German public transport services into TTAs, which reflects the idea of mobility providers acting together in a service ecosystem. We used a theoretical sampling method (Flick, 2009; Glaser and Strauss, 1967) to choose twelve out of approximately 124 TTAs (Reinhardt, 2012; Wikipedia, 2016) typical in terms of the number of public transport companies involved and passengers per year. We excluded TTAs and their public transport companies that currently conduct service-for-service exchanges with an external D2D mobility integrator. We then chose between 2 and 12 of the public transport companies belonging to each TTA, depending on the size of the TTA, resulting in a selection of 57 public transport companies. In addition, we identified twelve further mobility providers, such as car-sharing and taxi companies, located in the geographical area of the selected TTAs. Because some of the car-sharing companies operate nationwide, and therefore in the geographical area of several TTAs, and because there are only a few bike-sharing companies, we randomly chose seven additional companies from the list of members of the association of German car-sharing providers (bsc Bundesverband CarSharing e.V., 2016) and from an updated bike-sharing market overview (Monheim et al., 2012; Wikipedia, 2017) to enhance our selection. In total, our selection comprises 76 mobility providers.

Since the managing director (MD) of the mobility providers is responsible for strategic decisions like whether to enter into a service ecosystem of D2D mobility integrators, we chose him/her as our contact person. Using a snowball sampling method (e.g., Su, 2013), we encouraged them to name further or more appropriate employees, such as department heads (HD). This approach using “highly knowledgeable informants” (Eisenhardt and Graebner, 2007, p. 28) helps us to reduce bias by image-conscious interviewees. We received thirteen interview confirmations, whereby in the case of MD8 and HD1 a joint interview appointment was agreed. Table 1 shows interviewees’ demographic data and basic facts about their company.

ID	Role / Function	Gender	Years in position	Type of company	Number of employees	Passengers / bookings (in millions)	Revenue (EUR millions)
MD1	Managing director	Male	4	Car-sharing	17	0.02	2
MD2	Managing director	Male	2	Car-sharing	12	n.a.	n.a.
MD3	Managing director	Female	5	Car-sharing	180	1	14
MD4	Managing director	Male	12	Bus, tram	2,000	176	214
MD5	Managing director	Male	2	Train	300	11	80
MD6	Managing director	Male	7	Bike-sharing	3	0.03	0.3
MD7	Managing director	Male	18	Bus	19	1	n.a.
MD8	Managing director	Female	2	Bus, tram	500	52	n.a.
HD1	Head of department	Female	1				
HD2	Head of department	Male	2	Bus, tram	700	43	27
HD3	Head of department	Male	2	Bus, tram	2,000	174	154
HD4	Head of department	Male	4	Car-sharing	n.a.	n.a.	n.a.
MM1	Marketing manager	Male	1	Car-sharing	n.a.	n.a.	3
OM1	Operations manager	Male	17	Bus	80	2.5	4

Table 1. Overview of interviewees and their companies.

Before the interviews were carried out, a semi-structured guideline (Yin, 2014), including questions about possible legitimacy needs of mobility providers, was developed. The questions comprised technical aspects like the currently used IT, and business-related topics, such as the involvement in current service ecosystems. The interviews took place between November 2016 and June 2017, and lasted on



average 31 minutes. All interviews were recorded and transcribed (Flick, 2009). In addition, we followed a data triangulation approach (Flick, 2009; Miles et al., 2014) in order to enrich the interview data and to validate the statements of the interviewees. The secondary data (company reports, press releases, etc.) was collected through the websites and via publicly available data sources.

For data analysis, the software NVivo 10 was used. Following an iterative coding approach (Strauss and Corbin, 1998), one of the researchers scanned, categorized and coded the data. The initial coding schema was derived from the five types of legitimacy needs (market, relational, social, investment and smart service integrator legitimacy). In a second cycle of analysis, the codes of each entity were cross-related (Miles et al., 2014). During the entire coding process, the researchers constantly discussed the emerging coding with the aim to reduce the coding bias and to strengthen the internal validity. In addition, alternative explanations were checked to ensure the explanatory power of the results.

## 4 Analysis Results

We structure our results along the five legitimacy needs of mobility providers that may positively influence their decision to cooperate with D2D mobility integrators. We find that particularly car-sharing company representatives (MD1, MD2, MD3, MM1) believe that a D2D mobility integrator can help them to establish or maintain the rights or qualifications necessary to continue doing business in their existing car-sharing market or to enter into the D2D mobility market. This demonstrates a need for **market legitimacy**. For example, MD2 stated that the company is “*still relatively new to the market and still relatively small (...). [And] it is, of course, a huge advantage if you can make a registration through a platform [of a D2D mobility integrator] once and try it [its car-sharing service] out without any additional hurdles*”.

By contrast, other interviewees voiced little need to gain market legitimacy through D2D mobility integrators. The car-sharing company of HD4 belongs to a regional municipal utility whose subsidiaries also provide bus and tram transport and operate a bike-sharing service. This company appears to already have the rights and qualifications (e.g., bus transport concessions, market experience, and reputation in the market) necessary to succeed in its car-sharing business and to enter into a regional limited D2D mobility market:

*“We will never be represented there [on D2D mobility integrator platforms] because our market is not supraregional. Hence, we will deliberately distinguish ourselves by saying that we can offer something here in the city area identical to what Qixxit and Moovel can provide for a larger area.”*  
(HD4)

Similarly, MD6 highlighted the regional character of its business activity as well as its focus on non-digital distribution channels as reasons why the emerging D2D mobility market is not particularly attractive for its bike-sharing company. Thus, no new rights or qualifications are needed:

*“If we are requested for a destination that seems to make sense for us, we will of course place bikes there. (...). For this I don’t need other platforms [e.g., from D2D mobility integrators] also not to win [end] customers online. You win them in cities like [names of the cities] better directly on site because it is always about the specific sector of tourism.”* (MD6)

In contrast to this, HD2 attributes high relevance to the D2D mobility market at least in the future (“we already see this as a market, but not in the current situation. Rather, in the long term, maybe in ten years”). This appears to indicate that the need of some of the mobility providers to achieve market legitimacy is likely to increase in the future. In addition, there are interviewees for whom such a need is only partly existent, which means there are arguments for and against its existence. For instance, MD8 expects the D2D mobility market to divide into two parts:

*“On my smartphone I have a separate section, called ‘public transport apps’. There are eleven [apps] right now and this is okay for me. Because when I am in Berlin or in Cologne, I don’t need an app that also shows me all transport connections from Munich. (...). But when I really make a longer trip, then I am quite interested in seeing the last mile of this travel chain as well. Hence, I have different needs, which probably have to be reflected in different apps.”* (MD8)

Because MD8 estimated a much higher customer demand for D2D mobility services in a specific city, the necessity for service-for-service exchange with nationally operating D2D mobility integrators is limited. In summary, the proportion of mobility providers with an existent, partly existent, and non-existent need for market legitimacy is almost equal.

Secondly, mobility providers can enter into a service ecosystem of D2D mobility integrators in order to gain *relational legitimacy*, i.e., because they wish to be perceived as an attractive potential member for further service ecosystems. This presupposes that the D2D mobility integrator and the actors of its service ecosystem are considered sufficiently attractive to increase their own attractiveness. However, almost all interviewees question this. For example, HD3 argued that, in the current state of flux, an evaluation of the attractiveness and subsequent selection of appropriate D2D mobility integrators is impossible:

*“But it [a D2D mobility integrator] could also be a competitor. This is still an unclear situation that depends on how these third parties, as well as we ourselves, will develop over the next few weeks, months, and years. I don’t think it is possible to final answer the question of competition or partnership today.” (HD3)*

HD4 added that the strong dependency on the respective parent company represents a difficulty to identify the D2D mobility integrator which will succeed on the market:

*“Moovel (...) will not integrate certain competitors [e.g., from Car2go, the car-sharing company of Daimler AG] because of their owners. Thus, two or three apps will remain on the market and then you can evaluate their quality; how well do the D2D trips work?” (HD4)*

In addition, the interviewees (MD2, MD5, MD8, OM1) expected negative economic consequences for their current business. Resulting from the fact that the parent company is often a traditional automobile manufacturer or a direct competitor, as in the case of the Deutsche Bahn AG, they assumed an over-reaching and non-neutral creation of D2D mobility services. For instance, MD2 illustrated:

*“Everyone is asking the big question: What is Daimler AG’s intention? Why does the Daimler AG want to do this? There must be something wrong. They are probably trying to push or pull us in one direction. Because it is an automobile company and not a public provider there is a bit of skepticism.” (MD2)*

The legal affiliation of a D2D mobility integrator to an automobile manufacturer also reduces its attractiveness in the eyes of the car-sharing companies controlled by competing automobile manufacturers. In the case of MM1, whose car-sharing company belongs to one of the largest European automobile manufacturers, competitive thinking closely ties its company to the superordinate service ecosystem of the parent company:

*“All mobility platforms are somehow in the hands of automobile companies or in the process of being purchased by automobile or mobility companies. For example, Free2Move – Groupe PSA, Moovel – Daimler AG, (...), Urbi is about to be purchased. (...). Everyone is buying in the general store of mobility start-ups what s/he still needs for its portfolio” and “Everyone hopes that his or her acquisitions are suitable to capture the market.” (MM1)*

The observation that an embeddedness in an existing service ecosystem contributes to making D2D mobility integrators unattractive is also emphasized by MD8. Its TTA can already now offer an integrated ticket for its local bus and tram companies, which, for example, Qixxit cannot do. Moreover, MM1 implies that further mobility platforms – the two additionally mentioned do not provide D2D mobility, but only allow access to car-sharing services offered by different companies – are regarded as equally attractive as those of D2D mobility integrators.

Another reason for mobility providers to engage in service-for-service exchange with D2D mobility integrators is to meet *social legitimacy* needs. Different actors from its service ecosystem, such as the national government, municipalities, or citizens, evaluate whether its current behaviour is acceptable. In the case of the car-sharing companies, the interviewees (MD1, MD2, MD3, MM1) did not perceived such legitimacy pressure, which could be due to the fact that these companies use environmentally

friendly cars (e.g., with electric drive). In contrast, as exemplified by the following quotations, there are more differentiated results concerning the other mobility providers. As HD3 stated:

*“The question at the moment is: Can it [a D2D mobility integrator] ensure that access to in our view meaningful mobility, with regard to urban development, [and] ecological development, can be further facilitated?”*, whereby s/he more precisely specified ‘in our view’ as *“in the interest of cities, associations, politics, etc..”* (HD3)

It becomes clear that HD3 currently perceived high pressure to legitimize its behaviour in light of problems caused by the large share of private car use, such as traffic congestion and air and noise pollution. An obvious explanation for this result is that three cities are shareholders of this mobility provider. However, as in the cases of MD7 (*“there is no specification at the moment”*) and OM1 (*“we [the members of its TTA] are rather in the phase where we are making observations now and will decide at a later point in time”*) there are also regional authorities, acting as shareholders of a TTA, which are not exerting sufficient legitimacy pressure on public transport companies to persuade them to cooperate with D2D mobility integrators.

None of the mobility providers expressed the need to gain *investment legitimacy*. This is partly because, although the mobility market has changed rapidly due to technical advances, the mobility providers obtained approval for cost-intensive investments in new equipment as, for instance, necessary for the provision of real-time timetable data and mobile tickets. This is reflected by MD4:

*“The need for this development and for digitalization (...) is seen in any case and it is also understood that this costs money. I observe that we are already dealing with understanding owners familiar with the issue. On the contrary, I am aware of cases of other municipal transport companies which, if they do not address this development, get reprimanded.”* (MD4)

Similarly, OM1 is stating that its owners are relatively generous and *“also willing to spend money, where a corresponding revenue does not immediately result and everything cannot be realized in a cost-covering way”*. Nevertheless, it is somewhat surprising that this applies equally to private and public mobility providers. In some cases (MD2, MD6, MD8, HD4), we could even observe that the desire to act in the interests of owners leads to a rejection of D2D mobility integrators. As MD2 stated:

*“At the end, the customer looks at the Moovel-App (...), i.e., to what extent does my brand erode? (...). But if I want to continue to operate this [its mobility service] as an independent brand, the platform [of a D2D mobility integrator] is already a threat. (...). It is also a question of money. In group thinking, we put a few hundred million euros into a brand like [name of the brand], which thus has a brand value. The brand value is also shown on the balance sheet. Now, if I say that I will forego the brand, first of all, I will lose a large share of goodwill on the balance sheet. Why should I give it away?”* (MD2)

Such concerns especially existed in cases in which the respective mobility provider is embedded in a larger service ecosystem of an automobile manufacturer or a local municipal utility.

Lastly, our analysis showed that most of the mobility providers have no need to build up a *smart service integrator legitimacy* with the help of D2D mobility integrators currently operating in the market. This is caused by actors that are present in their service ecosystem, such as a subsidiary of the federal state (HD2), a sector association (MD5), a TTA (MD4, MD8, HD3), a parent company (HD4), or another mobility provider (MM1), which integrate the respective mobility provider into their own D2D mobility project. In this way, these mobility providers contribute – at least in the long term – to the legitimation of the new type of cooperation and thus to the intermediary role of D2D mobility integrators. However, as can be seen from the quotation of HD2, the involvement is not always welcome:

*“We are participating in a development carried out by the [name of the subsidiary of the federal state]. An app has been developed (...) and we are more or less inevitably involved due to the fact that we operate mobile ticketing. The mobile ticketing becomes part of these mobility chains.”* (HD2)

One reason for this reluctance could be the low success rates of public funded D2D mobility projects, as described above. Besides this political directive, the close ties to the parent company and its service

ecosystem can positively influence the choice of a D2D mobility project. As MD5 reported, there is a financial obligation of its parent company to the sector association, called ‘Verband Deutscher Verkehrsunternehmen’ (VDV), leading to a participation (“we contribute to the financing of this VDV platform [a D2D mobility project] via the parent company”). This D2D mobility project will satisfy its need to establish a legitimacy for smart service integrators, making service-for-service exchange with available D2D mobility integrators unnecessary:

“Our goal is to present a comprehensive [D2D] mobility platform through the ‘Mobility-Inside’ solution from the VDV. We will participate in this one, but not in more than one because I don’t see the point and purpose of it.” (MD5)

Figure 2 summarizes the existing legitimacy needs of the mobility providers interviewed. Each of them perceived at least one of the five types of needs to gain legitimacy. However, in contrast to the argumentation for strategic alliances (Dacin et al., 2007), a single legitimacy need is not sufficient to motivate them to enter into the service ecosystem of a D2D mobility integrator. A closer look at the results shows that while the car-sharing companies are particularly interested in gaining market legitimacy, the other mobility providers aim to achieve social and smart service integrator legitimacy.

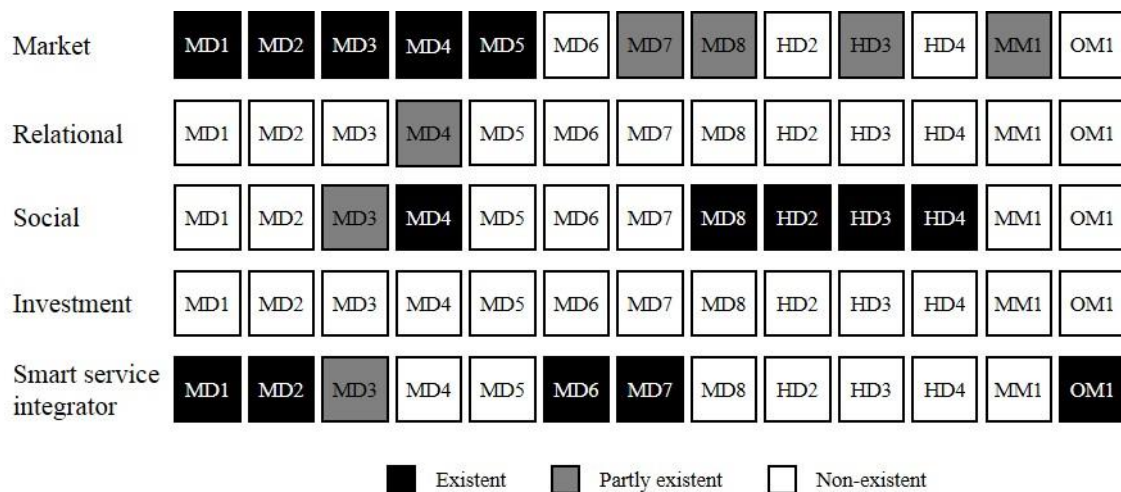


Figure 2. Legitimacy needs of German mobility providers.

## 5 Discussion and Conclusion

Prior to outlining avenues for future research, we discuss the major findings and implications of our study. The primary aim of this study was to enhance our understanding on D2D mobility integrators and their difficulties to convince mobility providers to cooperate. Currently, the need for scientific research on emerging D2D mobility integrators in general (Albrecht and Ehmke, 2016; Willing et al., 2017a; 2017b), and this specific research topic in particular (Schulz et al., 2018), is great. We contribute to closing this gap by conducting an exploratory study in the German mobility market.

For the theoretical foundation of our study, we linked the concept of service ecosystem, which follows from S-D logic (Vargo and Lusch, 2004; 2016; 2017), with that of legitimacy stemming from the institutional theory (Dacin et al., 2007; Mignerat and Rivard, 2009; Suchman, 1995). Thus, we follow the call of Vargo and Lusch (2017) to further develop S-D logic using frameworks and models outside marketing. We initially illustrated that in the case of D2D mobility integrators, which aim to offer smart D2D mobility, the assumptions of S-D logic are fulfilled. In particular, we showed that all actors, including the customers, were engaged in service-for-service exchange (Vargo and Lusch, 2016; 2017). For example, customers have to provide their GPS data to D2D mobility integrators.

Secondly, we provide evidence that the introduction of the concept of legitimacy into S-D logic can help us to better understand the low level of cooperation between mobility providers and D2D mobility integrators. According to S-D logic (Akaka et al., 2013; Koskela-Huotari et al., 2016a; Vargo and Lusch,

2017; Vargo et al., 2015), institutions and institutional arrangements are the coordination mechanism within and between service ecosystems, which can also constrain service-for-service exchange if they are incompatible. While Koskela-Huotari et al. (2016a) put forward that necessary adjustments in a specific service ecosystem, such as that of a D2D mobility integrator, can be initiated by the inclusion of one or more new actors, the literature does not provide an explanation how institutional arrangements of another service ecosystem, as in the case of a mobility provider, can prevent such a step. We shed light on this issue by drawing on an adapted framework of Dacin et al. (2007), which proposed five types of legitimacy needs leading a company to enter a strategic alliance.

Hence, thirdly, we contribute to institutional theory (Dacin et al., 2007; Scott, 2008) by adapting the five types of legitimacy needs (market, relational, social, investment, and alliance legitimacy) to the broader service ecosystem context, more specifically, D2D mobility integrators. In particular, we completely revised alliance legitimacy, changing its name to *smart service integrator legitimacy*, to cover the emerging kind of cooperation enabled by D2D mobility integrators. As result of this, and with the choice of D2D mobility integrators as object of investigation in general, we also address the criticism of S-D logic to rarely consider IT, as put forward by Breidbach and Maglio (2016).

In addition, based on our exploratory study in the German mobility market, which complements the currently predominant S-D logic publications without empirical evidence (see Giesbrecht et al., 2017), we can provide numerous practical implications. For example, our results show that in order to achieve cooperation, D2D mobility integrators need to position itself more strongly as a source for legitimation. The corresponding strategies, however, differ depending on the type of mobility providers. Whereas car-sharing companies need to gain market legitimacy, most of the analysed bus, train, and tram companies, due to existing institutional arrangements which form a kind of regional monopoly (in particular, their relation to their parent company, as in the case of municipal utilities, and the TTA), see no need for cooperating to continue their business successfully. Nonetheless, D2D mobility integrators might contribute to increasing demand even in such a closed market. As Willing et al. (2017a) illustrated, D2D mobility integrators have extensive possibilities to use business analytics that exceed those of an individual or a small group of mobility providers. Based on this, they can, for example, coordinate car-sharing and bus services (positioning of stations, etc.) and thus increase their common attractiveness compared to private car use. In the case of higher market demand, it is also to expect that the management is increasingly giving up its concerns with regard to the erosion of the brand in order to reap the additional revenues for the owners.

Another practical implication results from our observation that mobility providers do not find the existing D2D mobility integrators attractive enough because their competitors occupy a central position in the service ecosystem. This is a bit paradoxical, as obviously more suitable public funded D2D mobility projects have also been discontinued or have yet to be implemented (Willing et al., 2017b). Hence, we call for pursuing these projects with more effort to contribute quickly to solving the mobility-related challenges of cities. In particular, we opt for a higher-order project that links the numerous emerging locally operating D2D mobility integrators.

Future research can build on this recommendation and investigate the failure of public funded D2D mobility projects. In addition, even though conducting an exploratory study is a good starting point for understudied research topics like D2D mobility integrators it has some limitations that must be addressed by future work. Further qualitative and quantitative studies are necessary to ensure validity of the results. Furthermore, although the selection of the German mobility market seems suitable (Marx et al., 2015; Willing et al., 2017b), mobility providers from additional countries also should be analysed to check the transferability of the results.

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