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Value co-creation and co-destruction in service ecosystems: The case of the Reach Now app

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ABSTRACT

In recent years, a change in business logic from goods-dominant (G-D) to service-dominant (S-D) logic can be observed widely. For instance, in the case of the mobility sector, companies such as Daimler AG and the BMW Group are shifting from solely producing cars to also providing mobility services. One fruit of their efforts is the Reach Now app, which supports users by combining multiple mobility services. Although such an app can contribute significantly to achieving smart mobility and thereby making the use of the private car less predominant, only a relatively small number of people use it. In this article, we adopt the S-D logic perspective to analyze the link between value formation (i.e., value co-creation and co-destruction) in customer-to-business relationships and business-to-business relationships in the service ecosystem of the Reach Now app based on an analysis of customer reviews of the Reach Now app in the Android Google Play Store between 2016 and 2019. We complement this analysis with interviews with representatives from six German public transport organizations and the Moovel Group GmbH, the app provider. Based on our analysis, we develop an interactional phase-based perspective on value formations in the tripartite relationship between app users, the Moovel Group GmbH, and public transport organizations. Our work complements previous S-D logic studies that (1) do not focus on information technology-enabled value formation, (2) neglect the concept of value co-destruction, (3) analyze only single dyadic actor-to-actor relationships, and/or (4) examine an established service ecosystem.

1. Introduction

Technological progress such as big data collection and analysis and the rise of the platform economy have affected almost all industries, changed production and service processes, and disrupted successful business models (Malthouse et al., 2019; van Riel et al., 2019). The automotive industry is particularly affected by these developments (Wells et al., 2020). Ever since Carl Benz patented the vehicle in 1886 (Stiller et al., 2011), the business model of automotive companies has, until recently, entailed selling vehicles to private and business customers. As the sharing economy driven by platforms emerged (Nadeem et al., 2020), automotive companies started adapting their business

model by rolling out car-sharing services, primarily in large cities. For example, car2go, a subsidiary of Daimler AG, launched the world's first free-floating car-sharing system in Ulm, Germany, in 2009 (Firnborn and Müller, 2011). Nevertheless, the main business of automotive companies worldwide remains vehicle sales – a business model which is increasingly outdated and obsolete.

Cities around the world face many problems associated with the use of private cars, including traffic jams, a lack of parking spaces, as well as noise and air pollution caused by combustion engines, which threatens the health and wellbeing of their citizens (Schreieck et al., 2018; Willing et al., 2017a; 2017b). Simultaneously, studies indicate that use of mobility services such as car-sharing (Firnborn and Müller, 2011;

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Hildebrandt et al., 2015), bike-sharing (Yin et al., 2019), and ride-sharing (Rayle et al., 2014; Teubner and Flath, 2015), has increased in many urban areas. The spread of information technology (IT), in particular of the smartphone, has contributed to this development by making it easier and more convenient to use mobility services.

In the future, smartphone apps (i.e., platforms) bundling access to mobility services from a number of providers, can further drive this development. Scientific literature (e.g., Hein et al., 2018; Ye et al., 2020) refers to this concept also as ‘mobility as a service’ (MaaS). Some such apps not only enable users to compare and purchase different mobility services, but also provide them with individualized, context-aware, and dynamic recommendations of mobility service bundles to facilitate comfortable mobility from an origin to a destination (Schulz et al., 2018). According to Gretzel et al. (2015, p. 179) such a service that reflects “technological, economic, and social developments Direct quote fuelled by technologies that rely on sensors, big data, open data, new ways of connectivity and exchange of information (e.g., Internet of Things, RFID, and NFC) as well as abilities to infer and reason” can be considered ‘smart’.

To date, these apps and scientific research into them are still in their infancy. In the recent past, several smart mobility app providers, including the Moovel Group GmbH (Daimler AG), have entered the German-speaking mobility market and are competing for customers and mobility providers. Comparisons of the apps conducted by Albrecht and Ehmke (2016) and Willing et al. (2017a; 2017b) show that most apps only include a rather low number of mobility services offered by few mobility providers. For example, only 44% of the analyzed apps provide information about the public transport service of at least one company (Albrecht and Ehmke, 2016). This is one reason why (potential) users currently tend to find these apps rather unattractive and an inadequate substitute for private car-based mobility. In order to make the Moovel (later renamed Reach Now) app more attractive and thus become more successful mobility service providers, Daimler AG and the BMW Group entered into a joint venture in 2019 (Moovel, 2019).

A large number of scientific studies (for an overview see Brust et al., 2017) have taken the service-dominant (S-D) logic perspective to analyze resource integration and service exchange (i.e., value co-creation) among the actors of a service ecosystem. This S-D logic perspective, originally introduced into marketing by Vargo and Lusch (2004), contrasts with the goods-dominant (G-D) logic perspective, which focuses on value creation in the case of a company that manufactures things like cars. As with the current study, some previous studies focus on value co-creation among different actors located in a mobility context (e.g., Alexander and Jaakkola, 2011; Gebauer et al., 2010) and in some cases the value co-creation is IT-enabled (e.g., Gilsing et al., 2018; Hein et al., 2018; Turetken et al., 2019).

Of particular relevance to our research are studies investigating value co-creation in single dyadic actor-to-actor relationships embedded in service ecosystems comparable to that surrounding the Moovel Group GmbH (hereafter referred to as the Moovel Group). Several studies have examined why German mobility providers, especially public transport organizations, have not established business-to-business relationships with smart mobility app providers (e.g., Schulz and Ikonomou, 2020; Schulz and Überle, 2018), and how such a relationship can be initiated (Schulz et al., 2020c). Schulz et al. (2020a) examine value co-creation among different public transport organizations and two smart mobility app providers (private and public) and Schulz et al. (2020b) focus on customer-to-business relationships and determined the preference structures of potential users to predict their choice decision in the case of competing smart mobility app providers.

Currently, however, it is unclear why so few people use apps like the Reach Now app or stop using it. In order to understand the factors driving smart mobility app use and discontinuation, it is necessary to analyze the value formation in the customer-to-business relationships that takes into account both value co-creation and co-destruction (Echeverri and Skålén, 2011) reflected by a loss of resources

(financial, physical, etc.) and negative feelings (e.g., anger, dissatisfaction, and frustration) (Sthapit and Björk, 2019). However, since such value formation takes place in a service ecosystem, value co-creation and co-destruction between the smart mobility app provider and mobility providers (i.e., in business-to-business relationships) must also be considered. This article addresses these gaps, asking the following research question:

RQ: How are value co-creation and co-destruction, the components of value formation, linked across dyadic actor-to-actor relationships in the service ecosystem of the Moovel Group?

Taking a case study approach (Benbasat et al., 1987; Yin, 2018), we analyze customer reviews of the Reach Now app and interviews with experts from the Moovel Group and German public transport organizations. Based on our analysis, we provide an interactional phase-based understanding of value formation in the tripartite relationship between customers, the Moovel Group, and the public transport organizations.

This study has practical implications for the service ecosystem of the Moovel Group and for comparable service ecosystems and can thus support non-private car-based mobility. In terms of theory, we complement the general S-D logic perspective research by (1) focusing on IT-enabled value formation (e.g., Breidbach and Ranjan, 2017; Haki et al., 2019; Kim et al., 2018), (2) considering the concept of value co-destruction (e.g., Laud et al., 2019; Plé and Cáceres, 2010; Prior and Marcos-Cuevas, 2016), (3) analyzing the interplay among multiple dyadic actor-to-actor relationships (e.g., Blaschke et al., 2019; Breidbach and Maglio, 2016; Sigala, 2018), and (4) examining a nascent service ecosystem (Hodapp et al., 2019).

The remainder of the article is structured as follows: In the theoretical background section the foundations of the S-D logic perspective are explained. Next, the case study methodology and the analysis of customer reviews and expert interviews are described. We then present and discuss our results and their implications and identify the limitations of our work and avenues for future research.

2. Service-dominant logic perspective

2.1. Service ecosystem and service platform

The service-dominant (S-D) logic perspective is well established in many research fields, including service science (e.g., Čaić et al., 2018; Maglio et al., 2009; Spohrer and Maglio, 2010; van Riel et al., 2019). An overview of information systems (IS) studies applying the S-D logic perspective is provided by the literature review by Brust et al. (2017). Several recent (IS) studies apply the S-D logic perspective in a mobility context (e.g., Schulz et al., 2020a; 2020b; 2020c; Yin et al., 2019), and some simultaneously take a business model perspective (Gilsing et al., 2018; Hein et al., 2018; Turetken et al., 2019).

The emergence and widespread dissemination of the S-D logic perspective is based on a fundamental shift in business logic “in which service provision rather than goods is fundamental to economic exchange” (Vargo and Lusch, 2004, p. 1). S-D logic has taken hold in many industries, including the mobility industry. For example, automotive companies, such as Daimler AG, are moving beyond the traditional model of car manufacturing by also providing services such as apps like Reach Now (Moovel, 2019), which provides access to multiple mobility services such as public transport, car-sharing and bike-sharing, or by operating a car-sharing service such as car2go (Firnborn and Müller, 2011). The change from goods-dominant (G-D) logic to S-D logic also takes place on the demand side. The young adult generation is less inclined to buy a car than older generations (Circella et al., 2017; Umweltbundesamt, 2019) and more inclined to use app-based mobility services such as ride-sharing (Rayle et al., 2014).

Research considering the S-D logic perspective is traditionally

centered on three concepts: (1) the service ecosystem, (2) the service platform, and (3) value co-creation (Hein et al., 2018; Lusch and Nambisan, 2015). A service ecosystem represents an actor-to-actor network and can be defined as “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 through service exchange” (Lusch and Nambisan, 2015, p. 161). Service ecosystems vary in size, ranging from small (e.g., a household, a company) to large (e.g., a nation, the global market) (Koskela-Huotari et al., 2016). The service ecosystem concept has strong parallels with network and cluster theory (e.g., Sedoglavich and Dabić, 2017), which highlights the need for collaboration among actors to ensure mutual benefit and even survival.

An exemplary service ecosystem of a smart mobility app provider that can be adapted for the case of the Reach Now app is described by Schulz and Überle (2018). The key actors are the Moovel Group, with Daimler AG and the BMW Group as its parent companies, which provides the Reach Now app, various mobility providers, including public transport, car-sharing companies such as car2go and DriveNow, bike-sharing companies, and customers. Other actors indirectly embedded in the service ecosystem include the federal government of Germany, which promotes the provision of car-sharing parking spaces near public transport stations to support and facilitate the use of these mobility services (Bundesministerium für Verkehr und digitale Infrastruktur, 2017). Each actor can be embedded in multiple service ecosystems simultaneously. For example, Daimler AG is embedded in the service ecosystem of the Moovel Group and of car2go because it is a parent company of both.

As can be seen from these two examples, digitalization contributes to the emergence and spread of service ecosystems. In the non S-D logic literature, several authors (e.g., Brendel et al., 2020; Hildebrandt et al., 2018; 2015; Meng et al., 2020) describe how IT, such as technologies for instant access and vehicle monitoring, but in particular the use of smartphones, supports and influences resource integration and service exchange among actors in the case of car-sharing.

Whereas in the past employees were responsible for tasks such as refueling and relocation of vehicles, these are now often performed by customers (Brendel et al., 2020; Meng et al., 2020). In the case of peer-to-peer car-sharing, members even make their private car available to other members via the Internet (Ballús-Armet et al., 2014). By using IT, car-sharing companies can thus save costs (Brendel et al., 2020), make their service attractive to potential customers (Hildebrandt et al., 2015; Meng et al., 2020) and contribute to the long-term viability of their service ecosystem by mitigating careless and wasteful use of resources through customers (e.g., reckless and wasteful driving) (Hildebrandt et al., 2018).

The coordination mechanisms for actors and their service-for-service exchange within and between service ecosystems are institutions and institutional arrangements (a synonym for institutional logics) (Lusch and Nambisan, 2015; Vargo and Lusch, 2017). Institutions reflect rules, norms, practices, and beliefs that enable or constrain action, while institutional arrangements reflect assemblages of institutions (Vargo and Lusch, 2016; 2017). For example, a single, specific, isolated industrial norm represents an institution, while various industrial norms and company and national cultures reflect institutional arrangements (Koskela-Huotari et al., 2016).

When the actors of a service ecosystem share an institution and institutional arrangements, their resource integration and their service exchange is often facilitated. However, shared institutional arrangements can also constrain the resource integration and service exchange among actors by leading to ineffective dogmas, ideologies, and dominant institutional logics (e.g., when actors follow the G-D logic) (Koskela-Huotari et al., 2016; Schulz et al., 2020a; Vargo and Lusch, 2016).

A service platform can be defined as “a modular structure that consists of tangible [e.g., metal, IT hardware] and intangible components [e.g., digital artifacts] (resources) and facilitates the interaction of

[service ecosystem] actors and resources (or resource bundles)” (Lusch and Nambisan, 2015, p. 162). In other words, “service platforms are any kind of artifacts that act as the mediator, enabler, facilitator, or distribution mechanism for service provisioning. For instance, jet turbines are service platforms facilitating the service of airtime” (Haki et al., 2019, p. 495). In this study, we focus on the Reach Now app that represents a service platform for its surrounding actor-to-actor network.

Schulz et al. (2019) identify operand (e.g., interfaces and information system architecture) and operant (e.g., security and privacy capability) resources that a smart mobility app provider integrates. Without explicitly adopting the S-D logic perspective, Albrecht and Ehmke (2016) as well as Willing et al. (2017a; 2017b) show that currently available smart mobility apps have several shortcomings (e.g., no mobile tickets are offered) that indicate a lack of resource integration and service exchange between app providers, mobility providers, and customers (Schulz et al., 2020c). Based on these results, Schulz et al. (2020b) perform a conjoint analysis, finding, for example, that car drivers are the only potential user group for whom the app price is not particularly important in the choice decision.

2.2. Value co-creation

Value co-creation involves the resource integration and the service exchange among actors of a service ecosystem, including customers (Vargo and Lusch, 2017). Whereas G-D logic postulates that customers are buyers of products (e.g., cars) manufactured by companies, S-D logic assumes an interaction process between companies and their customers (Vargo and Lusch, 2004). Based on this understanding, Payne et al. (2008) identify three types of processes that underlie value co-creation among these two actors: customer value-creating processes, supplier value-creating processes, and encounter processes. Such processes encompass, among others, the procedures, tasks and activities performed by the actors.

However, value co-creation is not the result of the resource integration and service exchange in a single dyadic actor-to-actor relationship between a customer and supplier, but rather multiple actors embedded in a service ecosystem are involved in value co-creation (Lusch and Nambisan, 2015; Rahman et al., 2019). For instance, Dey et al. (2019) illustrate how value co-creation among multiple actors, such as multinational companies, not-for-profit organizations, and the government, leads to technology upgrades (diffusion of smartphones and apps) in the case of mobile telephone industry in Bangladesh.

By focusing on the outcome of value co-creation for an individual customer, Nambisan and Nambisan (2008) argue that the customer can experience different types of value, namely pragmatic, hedonic, usability, and sociability experience. As applied to the case of the Reach Now app, users may experience sociability, for example, by perceiving themselves as members of the group of environmentally conscious people. This illustrates how actors beyond the dyadic customer-to-business relationship, such as other users or members of a perceived group (e.g., Mikalef et al., 2017; Rahman et al., 2019), are engaged in value co-creation.

In S-D logic, “value is fundamentally derived and determined in use – the integration and application of resources in a specific context – rather than in exchange – embedded in firm output and captured by price [G-D logic]” (Vargo et al., 2008, p. 145). In this vein, Gilsing et al. (2018) observe that people increasingly look at the value, such as flexibility and ease-of-use, which is offered by car-sharing apps, in contrast to appreciating the intrinsic value of a car they might buy. In line with this example, Payne et al. (2008) note that technical breakthroughs, such as the development and diffusion of the smartphone, and changes in industrial logic, such as Daimler AG’s and BMW Group’s provision of the Reach Now app, often offer opportunities for value co-creation.

IT can serve both as an operand and as an operant resource in value co-creation among actors embedded in a service ecosystem (Lusch and Nambisan, 2015). As an operand resource, IT represents an enabler or

facilitator of value co-creation, providing actors the means to carry out resource integration and service exchange effectively and efficiently (Haki et al., 2019; Hein et al., 2018; Lusch and Nambisan, 2015). For example, users of the Reach Now app (which represents a service platform) can use smartphone technology to passively or actively provide information about how crowded their bus or train is (Nunes et al., 2014). An increasing number of German public transport companies also now use sensors in vehicles to track and monitor their position and predict delays (Schulz et al., 2020c).

In its role as operant resource, IT acts as an initiator or trigger for value co-creation among the actors. For instance, the “digital components of a service platform may seek out and pursue unique resource integration opportunities on their own, and in the process, engage with (or act upon) other actors” (Lusch and Nambisan, 2015, p. 167). In the present context, among others, the algorithm for calculating an app user’s optimal route (the choice of mobility services, respectively) could dynamically adjust the recommendation based on information about changes in contextual factors (e.g., weather conditions, delays of vehicles, and capacity utilizations), user preferences, and current user behavior.

Despite the dual roles of IT as operand and operant resource and its great importance for value co-creation among service ecosystem actors, scientific research on these roles remains limited. In line with other scholars (Blaschke et al., 2019; Breidbach and Ranjan, 2017; Haki et al., 2019; Mikalef et al., 2017; Schürirtz et al., 2019, etc.), Breidbach and Maglio (2016, p. 73 and p. 83) conclude that “we know very little about how economic actors engage in the process of value co-creation in traditional, co-located contexts [...], let alone in technology-enabled ones” and that “future work may consider how individuals in complex multi-actor value networks perceive value through use or experience after exchanging and integrating resources by means of ICT”.

Much of the scientific literature has focused on value co-creation (1) in established service ecosystems (Hodapp et al., 2019), (2) in dyadic actor-to-actor relationships (e.g., Blaschke et al., 2019; Breidbach and Maglio, 2016), and/or (3) in a non-IT-enabled environment (e.g., Blaschke et al., 2019; Breidbach and Maglio, 2016; Breidbach and Ranjan, 2017; Haki et al., 2019; Kim et al., 2018). Overall, there is a lack of studies that examine IT-enabled value co-creation in a nascent service ecosystem at the network analysis level, which thus move beyond dyadic analysis of value co-creation such as Alexander and Jaakkola’s (2011) examination in the context of railway stations in Scotland and Gebauer et al.’s (2010) examination of public transport service provision in Switzerland. With regard to IT, Haki et al. (2019) highlighted that the IS community can contribute to the shift from the G-D logic to the S-D logic through the analysis and design of digital service platforms following a value co-creation perspective.

The scientific literature provides valuable insights into value co-creation among actors using a service platform. Pappas et al. (2017) and Mikalef et al. (2017) take a customer perspective in examining the value co-creation in social commerce. Social commerce is a subset of electronic commerce, in which (potential) customers use social media to participate in the design, marketing, and/or sale of a product/service. Both studies find a strong correlation between the degree of value co-creation among potential customers and their purchase intention. As applied to the Reach Now app, customers may submit an online review to inform other (potential) customers about their user experience or provide information about a specific mobility provider and its service, such as delays or capacity utilization.

Other studies focus on how IT, especially a service platform, enables value co-creation among actors. Breidbach and Ranjan (2017) analyze how peer-to-peer lending platforms facilitate value co-creation among borrowers and lenders by adopting one or more of four practices. For instance, the interaction practice assists and guides borrowers and lenders. Kim et al. (2018) identify value co-creation in the case of a digital content platform through convergence, re-purposing, and co-production among actors such as broadcasting companies,

entertainment agencies, and fans.

Schürirtz et al. (2019) illustrate that value co-creation between a data-driven service provider and a customer depends on the size of their so-called ‘joint sphere’. The joint sphere can be enlarged through increased interaction (e.g., data exchange, automated actions), improved access to the processes and/or behaviors of the customer, and greater decision-making power, which is defined as the degree to which one actor can decide things for another actor. Hodapp et al. (2019) identify the challenges for value co-creation among actors enabled by nascent ‘Internet of Things’ platforms, including defining the roles and responsibilities of each actor, establishing data protection requirements and data ownership regulations, and acquiring and protecting crucial information property.

2.3. Value co-destruction

Resource integration and service exchange among actors in a service ecosystem is not necessarily accompanied by value co-creation. Plé and Cáceres (2010, p. 431) define value co-destruction as “an interactional process between service systems that results in a decline in at least one of the systems’ well-being (which, given the nature of a service system, can be individual or organizational)”. The term ‘service system’ is synonymous with ‘service ecosystem’ (see Nischak et al. (2017) and Spohrer et al. (2008) for a more detailed discussion of these terms) and ‘interactional process’ highlights the assumption of the S-D logic perspective that value is created (and thus also destroyed) through resource integration and service exchange by multiple actors, including customers, and is not embedded in firm output (G-D logic).

While the concept of value co-destruction is not part of the original S-D logic perspective (Lusch and Nambisan, 2015; van Riel et al., 2019; Vargo and Lusch, 2004), we propose that it is a valuable complement to its three main concepts: service ecosystem, service platform, and value co-creation. While some research (e.g., Rahman et al., 2019; Sigala, 2018; van Riel et al., 2019; Yin et al., 2019) considers value co-destruction, most studies adopting the S-D logic perspective focus solely on the concept of value co-creation. To illustrate this bias, a search in the electronic library of the Association for Information Systems (AISel) on 10 January 2020 yielded 629 hits for ‘value co-creation’, but only 15 hits for ‘value co-destruction’, a number of which (e.g., Kokko et al., 2018; Lintula et al., 2018) focus on value co-destruction in online and mobile games. Plé (2016, p. 154) calls this positive bias in the S-D logic literature value “co-creation myopia” and there are several calls for further research on value co-destruction (e.g., Laud et al., 2019; Plé, 2017; Plé and Cáceres, 2010; Prior and Marcos-Cuevas, 2016).

Leroi-Werelds (2019, p. 667) identifies the importance of this concept, asking “When and how can value be destroyed instead of created in a service ecosystem?” and “When and how can technologies destroy instead of create customer value?”. The Uber app illustrates IT-enabled value co-destruction, in that while service ecosystems may create value for certain actors, such as app users, they often destroy value for other actors, such as cab drivers. This leads to unsustainable service ecosystems (Sthapit and Björk, 2019; van Riel et al., 2019).

There have been various attempts to conceptualize the relationship between the concepts of value co-destruction and value co-creation. Rahman et al. (2019, p. 538) view value co-creation as “the outcome of a dialectical process that involves [value] co-destruction. Furthermore, the process is not just based on dyadic interrelationship between buyers and sellers, as often suggested in academic literature. Multiple stakeholders engage and interact at multiple levels that constitute co-innovation and co-production of ideas, processes and outcomes”. In other words, value co-destruction and co-innovation/co-production constitute the two integral parts of value co-creation.

This conceptualization is problematic because depicting value co-creation as the “net outcome” (Rahman et al., 2019, p. 540) of the dialectical process implicitly assumes that co-innovation and co-production exceed value co-destruction. The authors’ argument,

Table I

Overview of the literature on value formation in dyadic actor-to-actor relationships located in a mobility context.

Focus	Environment	Customer-to-business relationships	Business-to-business relationships
Value co-destruction	Face-to-face	Echeverri and Skålén (2011); Gohary et al. (2016)	–
	Digital	Dolan et al. (2019); Frau et al. (2018); Sthapit and Björk (2019); Yin et al. (2019)	Schulz and Überle (2018) ¹ ; Schulz et al. (2020c) ¹ ; Schulz and Ikonomou (2020) ¹ ; Zimmermann et al. (2020)
Value co-creation	Face-to-face	Alexander and Jaakkola (2011); Echeverri and Skålén (2011); Gebauer et al. (2010); Gohary et al. (2016)	Alexander and Jaakkola (2011)
	Digital	Dolan et al. (2019); Gilsing et al. (2018) ² ; Hein et al. (2018) ² ; Nunes et al. (2014); Schulz et al. (2020b); Turetken et al. (2019) ² ; Yin et al. (2019)	Gilsing et al. (2018) ² ; Hein et al. (2018) ² ; Schulz et al. (2019); Schulz et al. (2020a; 2020c); Turetken et al. (2019) ²

¹ The authors used the term value co-creation. However, they investigate an entire lack of resource integration and service exchange by mobility providers, and thus, according to the conceptualization used in this study, value co-destruction (antonym of value co-creation).

² The authors adopt a business model perspective.

which is based in part on Schumpeter (2012), may be justified for a study focused on value co-creation and co-destruction among actors in the smartphone industry in Bangladesh and the Indian province of West Bengal. However, in a single dyadic actor-to-actor relationship or among actors of a specific service ecosystem, the ‘net outcome’ of the dialectical process need not be positive, in other words, the co-innovation and co-production need not exceed value co-destruction. In the research at hand, for example, this conceptualization, assuming that value co-creation takes place at the higher level, does not sufficiently explain why users stop using the Reach Now app.

For this reason, we adopt an alternative conceptualization and consider value co-creation and co-destruction as two sides of the same coin, positing value co-destruction as an antonym of value co-creation (Laud et al., 2019; Plé and Cáceres, 2010). In this context, the ‘same coin’ represents the resource integration and service exchange of actors, which, according to the traditional S-D logic literature (Vargo and Lusch, 2004; 2017), underlie value co-creation. In line with Echeverri and Skålén (2011), we use the term ‘value formation’ as an umbrella term for value co-creation and co-destruction. This conceptualization takes into account that the ‘net outcome’, which results from the resource integration and service exchange of an actor, can be positive or negative.

Value formation is difficult to observe empirically, which may explain the conceptual nature of many studies drawing on the S-D logic perspective (Vargo and Lusch, 2017). In conceptualizing value co-creation, Storbacka et al. (2016) recommend using ‘actor engagement’ as the microfoundation, which focuses on both the disposition of an actor to engage in resource integration, and its performed resource integration in a service ecosystem. Other scholars (e.g., Laud et al., 2019; Smith, 2013) assume that value co-destruction causes a negative shift in ‘well-being’ among actors in a service ecosystem and can thus point to value co-destruction. Similarly, Chen et al. (2020) argued that value co-creation leads to a positive change in well-being.

Manifestations of negative well-being include negative feelings (e.g., anger, dissatisfaction, and frustration) and loss of resources (financial, physical, etc.) for an actor (Sthapit and Björk, 2019). Value co-destruction already exists if there is a “lack of resources to integrate[, i.e.] the unavailability of resources or the belief of such by at least one interacting actor” or an “unwillingness to integrate resources[, i.e.] the deliberate withholding or withdrawing of resources by at least one interacting actor” (Laud et al., 2019, p. 869). In the study at hand, for example, Moovel Group not enabling users to purchase mobile tickets for the public transport services recommended by the Reach Now app within the app constitutes value co-destruction for users, manifested in perceived negative well-being (e.g., inconvenience, frustration, wasted time).

In the following, we review studies focusing on value co-destruction in actor-to-actor relationships in a mobility context. An overview is provided in Table I. We distinguish whether the studies analyze value co-destruction in customer-to-business relationships (dyad 1) or in

business-to-business relationships (dyad 2). In addition, we differentiate whether the studies investigate value co-destruction in a face-to-face or digital environment. Echeverri and Skålén (2011) and Gohary et al. (2016) examine value co-destruction between customers and a public transport company in a face-to-face environment. Among other results, they show that the discontinuation of tickets sales by the tram driver leads to value co-destruction if customers are not familiar with or do not understand the new ticketing practices (Echeverri and Skålén, 2011).

Other authors analyze value co-destruction in digital customer-to-business relationships, primarily relying on negative reviews and complaints posted online and available to potential customers and the companies being reviewed. The studies focused on two airlines – Qantas Airways Limited and its subsidiary Jetstar Airways Pty Limited (Dolan et al., 2019; Frau et al., 2018) – a bike-sharing company (Yin et al., 2019), and Uber Technologies Inc. (Sthapit and Björk, 2019).

Negative customer reviews are evidence of customer dissatisfaction with the mobility and related services (e.g., app installation, registration, crashes, inaccuracy), as well as negative feelings, such as anger and frustration (Yin et al., 2019). By dissuading potential customers from initiating a customer-to-business relationship (i.e., joining the service ecosystem), negative customer reviews can lead to value co-destruction for the Moovel Group in the form of lost revenue, but negative customer reviews can also inspire it to improve the Reach Now app, which can in turn lead to value co-creation. Finally, Frau et al. (2018) investigate additional actor-to-actor relationships, such as between the airline and an anti-brand organization or a hacker.

Four studies (Schulz et al., 2020c; Schulz and Ikonomou, 2020; Schulz and Überle, 2018; Zimmermann et al., 2020) examine the lack of actor-to-actor relationships between a company offering a smart mobility app and mobility providers such as public transport and car-sharing companies. These studies complement the S-D logic perspective with additional theories, such as activity theory (Schulz et al., 2020c) and power theory (Schulz and Ikonomou, 2020). Their results revealed that the mobility providers often do not possess the necessary resources, such as real-time timetable information and mobile tickets, or are not willing to provide the resources for strategic reasons.

In addition, the studies focusing on value co-creation between mobility service ecosystem actors (see the explanations in the previous section) are classified in Table I. In summary, to date, almost only single dyadic actor-to-actor relationships have been investigated with regard to value co-creation or value co-destruction. This finding is consistent with the research gap that we previously described for the S-D logic literature in general with respect to IT-enabled value formation in service ecosystems (e.g., Blaschke et al., 2019; Breidbach and Maglio, 2016; Laud et al., 2019; Rahman et al., 2019; Sigala, 2018).

In other words, currently there is a lack of understanding of the link between value formations in dyadic actor-to-actor relationships in a service ecosystem, especially in the case of a nascent service ecosystem (Hodapp et al., 2019). As a step toward filling this research gap, the present study analyzes the dyadic relationships between the Moovel

Group and the users of its Reach Now app, as well as the dyadic relationships between the Moovel Group and the public transport organizations.

3. Methodology, data collection, and analysis

3.1. Case study research

According to the definition of Benbasat et al. (1987, p. 370) “a case study examines a phenomenon in its natural setting, employing multiple methods of data collection to gather information from one or a few entities (people, groups, or organizations). The boundaries of the phenomenon are not clearly evident at the outset of the research and no experimental control or manipulation is used”. Data can be collected by conducting interviews, in quantitative surveys, through observation, and from archives (Eisenhardt, 1989).

The use of a case study research design is appropriate when the research question is a ‘how’ or ‘why’ question, as in our case (Benbasat et al., 1987; Yin, 2018). Benbasat et al. (1987) posit four criteria in determining whether a case study research design is appropriate, including when the analysis focuses on a contemporary event (here: the emergence of app-based service ecosystems for smart mobility) and when there is no strong theoretical basis in terms of the phenomenon of interest (here: the link between value formations in different dyadic actor-to-actor relationships of a service ecosystem). In conducting our case study, we followed the six phases suggested and described by Yin (2018).

We adhered to Stake (1994) criteria for selecting a case, including considering previous cases that may contribute to understanding its singularity, as well as evaluating its nature, its historical background, its physical setting and its context (e.g., economic, political, legal), and access to informants. Based on these criteria, we chose the Moovel Group’s Reach Now app due to several unique characteristics (an overview of competitor apps available in German-speaking Europe is provided by Albrecht and Ehmke (2016) and Willing et al. (2017a; 2017b)):

- (1) The Reach Now app has a higher number of downloads in the Android Google Play Store (Android Google Play Store, 2020) than competitor apps (e.g., fromAtoB, Qixxit, and RouteRANK);
- (2) The Reach Now app is operated as a joint venture by Daimler AG and the BMW Group (Moovel, 2019) and thus represents the efforts of two of the world’s largest automotive companies to make the step from solely manufacturing cars to also providing mobility services;
- (3) Many of the available smart mobility apps, including the Reach Now app, focus on the European market, and in particular on Germany (Albrecht and Ehmke, 2016; Willing et al., 2017a; 2017b). The reasons for this include the legal conditions, high public pressure, and pre-existing infrastructure in Germany, which support the shift from private car use towards more sustainable mobility (Marx et al., 2015; Willing et al., 2017b). Shifts in mobility behavior can be observed in particular in the young adult generation, which may contribute to the demand for these apps. The recent study by the Umweltbundesamt (2019) shows, for instance, that the share of 18- to 29-year-old German residents who have a driver’s license and own a car declined between 2002 and 2017; and
- (4) The website of the Moovel Group provides information about existing business-to-business relationships with public transport companies and transport and tariff associations (local representatives of public transport companies) (Moovel, 2020). This information makes it possible to identify potential interviewees with insights into the value formation that emerges in the business-to-business relationships.

3.2. Customer reviews

Following the lead of previous studies (e.g., Dolan et al., 2019; Sthapit and Björk, 2019) examining value co-creation and/or value co-destruction between a company and its customers in a digital environment, we analyzed customer reviews. Customer reviews represent archival data and have the advantage that they are usually written immediately after the trip and therefore the ratings are not distorted by observations. In addition, customer reviews offer valuable insights into the well-being of customers by revealing feelings such as anger, dissatisfaction, and happiness, as well as loss of resources (financial, physical, time, etc.) (Sthapit and Björk, 2019).

First, we extracted the 506 customer reviews provided for the Reach Now app in the Android Google Play Store between 2016 and 2019 and imported them to NVivo 12 for analysis. The customer reviews provided in this period of time represent a relatively high share of the 2391 total customer reviews available for the Reach Now app at the time of our case study. This analysis period was defined to take into account that value formation in customer-to-business relationships changes over time due as the service develops.

Comparisons of the Reach Now app with competitor apps revealed that they have similar strengths and weaknesses (Albrecht and Ehmke, 2016; Willing et al., 2017a; 2017b), which should make the results for the value formation transferable. For example, Albrecht and Ehmke (2016) show that only 44% of the apps offering smart mobility solutions for German-speaking Europe provide information (e.g., ticket prices, real-time timetable information) about at least one public transport service.

On an aggregate level, the star ratings (one to five) of the customers provide general evidence as to whether customers perceive value co-creation or value co-destruction. A one-star rating reflects an extremely negative perception of the Reach Now app, a five-star rating indicates an extremely positive perception of the Reach Now app, and a three-star rating represents a middle-of-the-road perception of the app. There are two different explanations for awarding a three-star rating. First, it can reflect “a truly moderate review” (Mudambi and Schuff, 2010, p. 188), akin to indifference. Second, it can indicate a “series of positive and negative comments that cancel each other out (Mudambi and Schuff, 2010, p. 188), akin to ambivalence. The Moovel Group has frequently responded to negative customer reviews by initiating a problem-solving process. Such complaint management can lead to value co-creation for customers and for the business, but is not the focus of this work.

There are different approaches for the analysis of customer reviews, such as topic models (e.g., Büschken and Allenby, 2016; Titov and McDonald, 2008), sentiment analysis (Bagheri et al., 2013; Gonçalves et al., 2013; Laksono et al., 2019), and visual opinion analysis (Oelke et al., 2009). As highlighted by Büschken and Allenby (2016, p. 1), the challenge in analyzing customer reviews “is in understanding what the words mean. The use of the word ‘hot’ has a different meaning if it is paired with the word ‘kettle’ as opposed to the word ‘car’”.

As a result, analysis approaches that use predefined keywords (e.g., crash, error, and good) (Gonçalves et al., 2013), or keywords determined on the basis of word counts and frequencies (Büschken and Allenby, 2016), to identify satisfied and unsatisfied customer experiences can only reflect the actual meaning of customer reviews to a certain extent. In addition, Titov and McDonald (2008) show for topic models using the example of customer reviews for restaurants that a relatively short length of customer comments (on average 4.2 sentences) makes it more difficult to identify ratable aspects. This is a significant limitation because Reach Now app customers’ comments tend to be short.

For these reasons, we decided to analyze the customer reviews provided for the Reach Now app taking a non-automated approach. We used the software NVivo 12 to store the customer reviews, which we coded in a three-stage iterative procedure (Strauss and Corbin, 1998), which is comparable to the approach followed by Sthapit and Björk

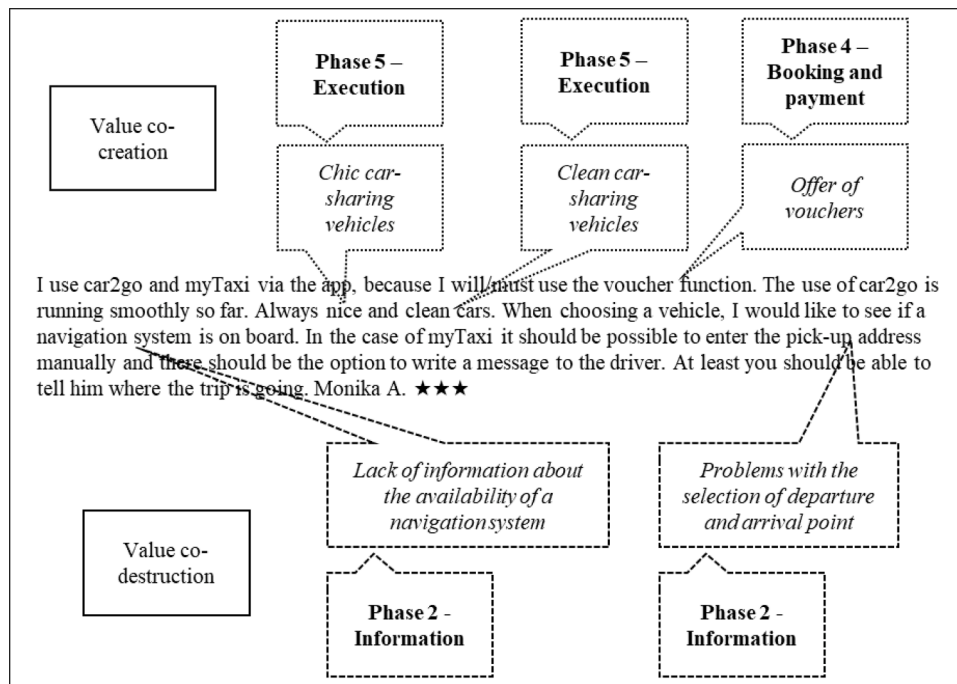


Fig. 1. Coding of an exemplary customer review.

(2019) to identify the sources of value co-destruction in the case of Uber Technologies Inc.:

- (1) We performed open coding in order to gain a better understanding of resource integration and service exchange between the Moovel Group and customers of its Reach Now app, and the resulting value formation. Our coding approach is based on the conceptualization that value formation is the umbrella term for value co-creation and co-destruction (Echeverri and Skälén, 2011), which represent the positive and negative outcome of resource integration and service exchange among actors. Open coding is appropriate because our knowledge about value formation, in particular value co-destruction, in actor-to-actor relationships located in a digital and mobility context is still very limited.
- (1) In the analysis, the coding of the value co-creation and co-destruction that become obvious in the customer comments is performed independently of each other. To determine whether there has been an increase or decline in the well-being of the customers (i.e., whether there is value co-creation or value co-destruction), we focused on the feelings expressed and indications of the gain/loss of resources. An illustrative example for such an open coded section of a customer comment that provides empirical evidence for value co-destruction (in the form of a loss of money) is: *The amount was charged to my credit card, but I have not received the ticket. Rip-off. Nina D ★*
- (2) During axial coding, we formed sub-categories, such as 'clean car-sharing vehicles' and 'problems with the selection of departure and arrival point' based on the open codes. The latter mentioned sub-category contains, for instance, the codes *in the case of myTaxi it should be possible to enter the pick-up address manually* (Monika A. ★★ ★) and *'Kiel central station' is already too difficult for the app. You need the exact addresses* (reqq ★). Fig. 1 shows the coding approach using an exemplary customer review. The axial codes are marked in italics.
- (3) Finally, during selective coding, we used the sub-categories to create main categories that cover the different interactional phases from app installation to app support during the use of

mobility services. For example, among others, the sub-categories 'chic car-sharing vehicles' and 'clean car-sharing vehicles' are assigned to the main category 'Phase 5 - Execution'. The selective codes are highlighted in bold in Fig. 1.

3.3. Expert interviews

In order to investigate value formation in the business-to-business relationships between the Moovel Group and the mobility providers, we conducted expert interviews. Qualitative interviews are suitable due to the exploratory nature of this research (Venkatesh et al., 2013). According to Mauksch et al. (2020, p. 2) an expert is "someone who is skilful and well-informed in some special field". Expert interviews provide, among other things, the advantage of efficient data collection, as experts represent "crystallization points" for practical insider knowledge" (Bogner et al., 2009, p. 2), and they offer access to a field that is otherwise not possible to access (Bogner et al., 2009; Myers and Newman, 2007).

Following a purposive sampling approach (Flick, 2009) aimed at identifying mobility providers with whom the Moovel Group has established an actor-to-actor relationship, we identified eleven actors on the website of the Moovel Group (Moovel, 2020) responsible for the marketing and provision of public transport services (bus, subway, tram, and/or regional train) in Germany.

These actors are four public transport companies and seven transport and tariff associations. The latter are associations of regional authorities, such as federal states, districts, or cities, which are responsible for the public transport in a geographically delimited local area, and frequently also encompass public transport companies (Reinhardt, 2012). In 2017, more than 10 billion rides were taken on German public transport (Verband Deutscher Verkehrsunternehmen, 2018), making the establishment of value co-creation between the Moovel Group and these actors an important prerequisite to ensure the satisfaction of the mobility needs of the users of the Reach Now app and of the long-term viability of the service ecosystem.

We were able to arrange semi-structured interviews with representatives from six out of the eleven public transport organizations. Semi-structured interview guidelines provide a high degree of flexibility

Table II
Overview of the interviews.

ID	Role / Function	Gender	Duration
PTO1	Project manager	Male	20 min.
PTO2	Project manager	Male	30 min.
PTO3	Project lead	Male	35 min.
PTO4	Head of department	Male	47 min.
PTO5	Head of department	Male	19 min.
PTO6	Project manager	Male	21 min.
Moovel Group	Managing director	Male	43 min.

and offer the opportunity to address issues that arise during the interviews (Flick, 2009; Myers and Newman, 2007). The managing director was chosen as contact person since s/he has knowledge about the business relationship to the Moovel Group and can help to identify possibly even better experts on this topic, such as project managers and department heads, within its organization. The interviews were conducted from October 2018 to January 2019 and lasted on average 31 min and all were recorded. Table II gives an overview of the interviews.

Slightly different interview guidelines were used for the public transport companies and the transport and tariff associations. The questions were related to the interviewee's profession, to his/her organization, as well as to the resource integration and service exchange between the organization and the Moovel Group. In line with Laud et al. (2019), our questions also focused on cases of value co-destruction where a public transport organization owns the resource required by the Moovel Group but is not willing to provide it. The selection of resources was made on the basis of scientific literature (e.g., Schulz et al., 2018; 2020c) and the preliminary results of the analysis of the customer reviews. Examples of questions include: 'Does your organization generate real-time timetable information?', 'Does your organization operate a mobile ticketing system?' and 'Do you permit Moovel Group to sell mobile tickets?'

A semi-structured interview was also conducted with the managing director of the Moovel Group, who is positioned as an intermediary between the users of its Reach Now app and the public transport organizations and thus represents the node between the dyadic customer-to-business relationships and business-to-business relationships. Since we could not guarantee anonymization of the results, we only used this interview data to verify the statements of the other interviewees and the customer reviews. Such data triangulation improves the quality of the results (Flick, 2009; Miles et al., 2014).

The interviews were transcribed and then analyzed using the software NVivo 12. The coding was done by a member of the research team with expert knowledge in the study area and with several years of coding experience. The other researchers cross-checked the coding (e.g., Weeger and Ott-Schwenk, 2017). In addition, the emerging coding results were discussed in the research team at regular meetings in order to increase their reliability (Miles et al., 2014). In case of different interpretations of the coded data, the data was discussed as long as necessary until a common understanding was reached.

The three-stage iterative coding procedure (Strauss and Corbin, 1998) is similar to that used to analyze the customer reviews. (1) Open coding was performed on the basis of the interview transcripts to get detailed knowledge about the resource integration and service exchange between the Moovel Group and the public transport organizations, and the associated increase (decline) in well-being of public transport organizations (as evidence of value co-creation or value co-destruction). (2) On the basis of the open codes, sub-categories (e.g., 'brand damage' and 'addressing new customer groups') were created by axial coding. (3) During the selective coding stage, value formation (i.e., value co-creation or value co-destruction) in the business-to-business relationships is related to value formation in the customer-to-business relationships.

4. Results

4.1. Value co-creation and co-destruction in customer-to-business relationships (Reach Now app user-to-Moovel Group relationships)

On an aggregate level, the star ratings (one to five) assigned by the users to the Reach Now app (originally named Moovel app) provide information about whether the users perceived value co-creation or value co-destruction based on resource integration and service exchange. Of the 506 customer reviews, 294 have a one- or two-star rating. Hence, the majority of the customer reviews provide evidence of value co-destruction often indicated by the additional expression of negative feelings, such as anger and dissatisfaction. A detailed analysis of the customer comments shows how the (inadequate) integration of different single resources – subsequently highlighted in bold letters – and the subsequent service exchange leads to value co-creation (value co-destruction) from the customer perspective.

The customer reviews of the Reach Now app and of the recommended mobility services *are very individual*. As can be seen from the following exemplary customer reviews, the provision of discounts for public transport on days with high particle pollution level warnings (**special ticket**) often caused value co-creation as a monetary benefit is achieved. However, in some cases, also value co-destruction because the users are annoyed and frustrated that they did not win a ticket:

Thank you, Mr. Daimler! A few years ago, I wouldn't have thought that such a great offer, of course especially the 50/50 chance of winning the ticket on days with particle pollution level warnings (...) is possible. Of the seven trips I took in the Verkehrs- und Tarifverbund Stuttgart [transport and tariff association], four were paid for, two of them were 7 zone tickets. A Google-user ★★★★★

Cheating at the particle pollution lottery? I have so far bought 8 single tickets during the particle pollution level warnings in Stuttgart and won one of them – according to my calculations a 12.5% ratio. Moovel Group advertises a 50:50 chance. It is extremely unlikely that my chances are so unequal. Have other users had similar experiences? A Google-user ★

In accordance with the theoretical foundations of the S-D logic perspective, the detailed analysis of the customer reviews shows that the different resources lead to value co-destruction or value co-creation on the part of the Reach Now app users in the different interactional phases of the customer-to-business relationships (e.g., installation, registration and log-in, information). An overview of the value formation in each phase and the resources responsible, is provided in the Appendix (Table IV to XV). In the following, we each present the three most important resources that caused value co-creation, respectively, value co-destruction.

Two out of the three cases concerning *value co-destruction* can be assigned to the booking and payment phase. 49 users of the Reach Now app complained about booking and payment errors (**app**; phase 4), indicating insufficient resource integration and service exchange by the Moovel Group. As can be seen from the following exemplary customer review, there is not only value co-destruction that is reflected by negative feelings (e.g., anger, dissatisfaction, and frustration), but also a loss of money:

I had double bookings because the app reported that the booking could not be completed. So I did the booking again and suddenly had two identical bookings with two tickets each. Stefan G. ★★★★★

The fact that no ticket sale for public transport (**mobile tickets**; phase 4) is currently offered directly in the Reach Now app resulted in value co-destruction for 39 users. As a result, users had to, for example, spend additional time downloading a second app and completing the registration to obtain tickets:

Now I was redirected to the next app (SSB Best Price) when buying a ticket, where a new registration, etc. was necessary. This means that the core benefit for me of being able to use everything with one app is completely lost (that was the only benefit so far). A pity. Andreas Matera ★★

Formerly, a great app! In Hamburg you suddenly can't buy Hamburger Verkehrsverbund [the transport and tariff association] tickets for public transport anymore. Before the update, this was a great app. But now it is useless for me. Michael Krieg ★

The two customer reviews reveal that there was a change over time in terms of resource integration and service exchange by the Moovel Group. Similar changes were also observed with regard to the type and number of payment methods implemented.

Our analysis shows that there was value co-destruction for 40 users, such as loss of time and financial disadvantage, caused by Reach Now app crashes (**app**; phase independent). For example:

It just doesn't work. I spent an hour going from error to error and crash to crash until I was finally ready to buy a ticket. After I pressed the buy button, you might have guessed it, it came to an error. I tried two more times – nothing! I give up and will buy via the Verkehrs- und Tarifverbund Stuttgart [the transport and tariff association] at double price © Heiko Schneider ★

The crashes of the Reach Now app occurred during all interactional phases. While the value co-destruction resulting from the lack of ticket sales indicates an underlying lack of resource integration and service exchange by the public transport organizations, the booking and payment errors as well as the crashes of the app are the responsibility of the Moovel Group.

The customer reviews also provide insights into the resource integration and service exchange that lead to value co-creation for the users of the Reach Now app. In the case of 24 users, the discounts offered for the public transport services on days with particle pollution level warnings in the geographical area of the transport and tariff association Stuttgart (**special ticket**; phase 4) result in value co-creation.

In addition, the high stability (23 users) and the good functional design (20 users) of the Reach Now app (**app**; phase independent) lead to value co-creation for users. For example, in the form of a time-efficient use of the Reach Now app.

Wonderful, just great. I've been using Moovel for a few months now. It is super. Everything works just fine. A Google-user ★★★★★

I like this app. It is chic, has an efficient user workflow and does what it is supposed to do. Udo Bussmann ★★★★★

As the results show, value co-creation currently often takes place in cases when the Reach Now app fulfills the basic requirements placed on it. Value co-creation related to the provision of high quality recommendations or simple booking and payment across several mobility services as possible differentiating features of apps such as the Reach Now app are of relatively minor importance.

4.2. Value co-creation and co-destruction in customer-to-business-to-business relationships (Reach Now app user-to-Moovel Group-to-public transport organization relationships)

By conducting expert interviews, we analyzed the value formation in the business-to-business relationships between the Moovel Group and the public transport organizations. We focused on identifying the causes for the resource integration and service exchange (as well as the related value formation) that we observed for the customer-to-business relationships between the users of the Reach Now app and the Moovel Group described in the previous section. Our analysis shows that empirical evidence can be provided for all four possible links of value

formations between the two dyadic actor-to-actor relationships.

4.2.1. Value co-creation - Value co-creation

The provision of different information, such as travel times and prices, about multiple mobility services (**information**; phase 2) by the Reach Now app creates value for users (e.g., shorter travel times, lower costs, and fewer transfers). The satisfaction about the provision of information can be seen from the following exemplary customer review:

SUPER! Uniquely good! There's a lot more information provided than I thought. I am really excited – Thanks for this app! Peter Pommerenck ★★★★★

The wide dissemination of information through the Reach Now app, especially of travel times, also leads to value co-creation for the public transport organizations. It is not surprising that the interviewees see the potential to gain new customers, such as private car drivers, for their public transport service – “For us, that is marketing” (PTO4). In addition, the transfer of (high-quality) information to third parties, such as the Moovel Group, ensures that the same information is provided to (potential) customers across all information channels:

“We want to strengthen the public transport. Therefore, we use as many media channels as possible. (...) This is also an added value when the customer can use different portals and always receives the same information, which always originates from our system.” (PTO6)

Furthermore, the Reach Now app can help the public transport organizations to provide information about their mobility services in a more attractive and user-friendly way to customers:

“Of course, we also offer apps and online shops. But I could imagine that there are solutions that are perhaps even smarter and more customer-friendly. (...) I could imagine that if there is, for example, a large [service] platform, it would be able to adapt the offers much better to the customer. Using artificial intelligence to make recommendations to the customer, which make more sense for her/him than this standard offer that, for instance, we would offer.” (PTO1)

Especially in cases where public transport connections are poor, customers can use the Reach Now app to access information on how to reach their destination without a private car (PTO5). Thus, by providing information about their services that can be bundled with other mobility services, public transport organizations can make their service offer more attractive, which leads to more customers and earnings.

The offer of discounts (**special ticket**; phase 4) also initiates value co-creation in both dyadic actor-to-actor relationships. As quoted above, one user of the Reach Now app wrote:

Thank you, Mr. Daimler! A few years ago, I wouldn't have thought that such a great offer, of course especially the 50/50 chance of winning the ticket on days with particle pollution level warnings (...) is possible. Of the seven trips I took in the Verkehrs- und Tarifverbund Stuttgart [transport and tariff association], four were paid for, two of them were 7 zone tickets. A Google-user ★★★★★

In addition, offering discounts is associated with a value co-creation for the public transport organizations, as their public transport services become more attractive for non- and infrequent users. This can contribute to solving the problems caused by the predominant use of private cars, which is, in particular, a concern of the regional authorities involved in the public transport organizations:

“The topic high particle pollution [discount] is aimed primarily at occasional customers who should switch to bus and train. The subscription customers who have the regular discount are already users. (...) But in the case of particle pollution level warnings, individual trips should be avoided. It is a matter of making an offer to the user of the individual motorized transport, where s/he has a significant monetary advantage

and, as a result, takes the bus and train and leaves the car parked.” (PTO2)

4.2.2. Value co-creation - Value co-destruction

In addition, we have identified cases where resource integration and service exchange caused value co-creation in the relationship between the users of the Reach Now app and the Moovel Group, but value co-destruction in the relationship between the Moovel Group and the public transport organizations. Users appreciate, for example, that the Reach Now app can be used as single access point for the purchase of a number of mobility services (**app**; phase 4), as illustrated by the following customer review:

Everything in one app, with only a few clicks to book. This is really practical. Robert Wolf ★★★★★

In other words, users can save time and effort when booking different mobility services by using the Reach Now app. On the other hand, the simplified access to various mobility services leads to value co-destruction for the public transport organizations (e.g., higher distribution costs) as they lose direct access to the customers:

(...) simply for the reason to keep access to customers and not to fall into dependence on these intermediaries. In the hotel sector or in the case of travel platforms, one can already see that [companies, such as] the HRS Group, can sometimes charge commissions that nobody can defend themselves against.” (PTO3; see also PTO1)

For the public transport organizations, however, value co-destruction occurs not only due to potential overcharging, but also the value of their brand may decrease due to the loss of direct customer contact:

“With the [name of the app], for example, we have a coverage range of over 90 percent that is one of the highest ranges of coverage of all mobility providers here in the region and much more than other apps for public transport combined. This is because the [name of the transport and tariff association] has built up a brand over decades and the customer has always understood the [name of the transport and tariff association] as the first point of contact. Everything that newly introduced to the market is entering a saturated market and must fight for its market position and poach customers accordingly.” (PTO2)

4.2.3. Value co-destruction - Value co-creation

As can be seen from the following exemplary customer review, value co-destruction takes place because there is currently no ticket sale for public transport (**tickets**; phase 4) directly via the Reach Now app. As a result, users have to purchase tickets, for example, from the bus driver or by using a ticketing machine, which leads to a loss of time. Alternatively, they can install and use a second app, but this causes complexity and a high cognitive effort.

To buy a ticket, you now have to install another app – that is awful! It is called ‘all-in-one mobility app’! But the strangest thing is: Many people complain here that you can’t buy tickets anymore and that you need another app since the update. Moovel Group replies succinctly that since the update ticket purchases are not longer possible, but there is another ‘great app’ for ticket purchase. Yes, that is exactly the point being criticized! I have no idea what that’s good for. A pity. Uninstalled. Saša Vrabac ★

However, also the fact that not all ticket types (**tickets**; phase 4) were sold before the update caused value co-destruction for users as the cheapest tickets in their specific case were not available:

The only problem is that you cannot book daily tickets (but due to the absurd single ticket prices they are the better option here in Stuttgart). If these tickets were available, you’d get 5 stars! TheHennes36 ★★★★★

While the lack of (direct) sales of tickets leads to value co-destruction for the users of the Reach Now app, the public transport organizations can realize value co-creation. After the update, users are still able to indirectly purchase (as least some of) the tickets, while the public transport organizations ensure that their own distribution remains attractive, which makes overcharging more difficult and ensures the availability of tickets for the entire geographical area, as expected by the regional authorities:

“(...) of course, there is also the danger that platforms sell our tickets, but charge a 30 percent commission. In this case, it helps us relatively little if we, for example, can attract 10 percent more customers but have to pay a 30 percent commission.” (PTO1)

“(...) that is a problem, you see it quite often, for example, in Berlin. There are mainly start-ups that try to sell tickets for the Berliner Verkehrsbetriebe or the Verkehrsverbund Berlin-Brandenburg, (...), and they mostly limit the ticket distribution to the inner railway ring of Berlin, but that is not our claim. Our claim is to sell tickets for the entire geographical area of the [name of the transport and tariff association]. That is not quite as simple as it is for only one city, because there are special features in the tariff.” (PTO1)

Further value co-creation for public transport organizations arises as other ticket media can continue to be used for specific tickets, which among other things reduces the costs caused by misuse:

“(...) the [name of the smartcard] is the access medium for subscription customers. Because the smartcard offers a certain degree of security and has a long shelf life, the more expensive tariff products (time tickets) are provided on it. For occasional customers (...) it is better to offer a mobile ticket so that they do not have to get a smartcard first. In comparison, in the case of misuse, the loss is of course not as high as in the case of the smartcard.” (PTO2)

4.2.4. Value co-destruction - Value co-destruction

The lack of provision of real-time information (**information**; phase 2) in the Reach Now app is associated with value co-destruction in both dyadic actor-to-actor relationships. As illustrated by the following customer review, one user is angry about the provision of incorrect timetable information:

WRONG timetables like those here are worse than no timetables! A Google-user ★

The lack of real-time timetable information not only leads to user dissatisfaction with the Reach Now app, but the mobility services offered by the public transport organizations also become less attractive. As a result, more people will use their private car, which leads to negative effects for the society (e.g., air and noise pollution, which is especially noticeable in cities). On the other hand, due to the lack of real-time data (PTO6), the public transport organizations also cannot improve their capacity management, for example during rush hour, by marketing their services via the Reach Now app:

“(...) as long as there are no reliable availability forecasts, it is uncertain whether I should advise people to get off the train at a certain stop because they might not find a car-sharing car.” (PTO4)

Furthermore, value co-destruction takes place in both actor-to-actor relationships with regard to customer data (**data**; phase independent). The following customer review shows that users of the Reach Now app currently do not understand why the collection and analysis of data, such as of the departure and arrival points, as well as the preferences in the choice of mobility service bundles, is important:

But the app is definitely using too much data without any clear benefit. This looks too much like a data leech to me. Markus Sortis ★★

Table III
Examples of value formations in customer-to-business-to-business relationships.

Case	Customer-to-business relationships	Business-to-business relationships	Exemplary resources	Description
1	Value co-creation	Value co-creation	Information, special ticket	Provision of information about mobility services (e.g., travel times and prices), provision of discounts on days with particle pollution level warnings
2	Value co-creation	Value co-destruction	App	Provision of a single access point for a number of different mobility services
3	Value co-destruction	Value co-creation	Tickets	No ticket sale, no sale of all ticket types
4	Value co-destruction	Value co-destruction	Information, data	No provision of real-time information, no provision of customer data (e.g., route requests)

The value co-destruction as perceived on part of the users is caused by the high fragmentation of customer data between the Moovel Group and the public transport organizations, and their desire to have control over this resource, which makes the use of a big data approach more difficult:

“(...) the Moovel Group is the boss that has data sovereignty. In other words, they have encapsulated the data in terms of customer and mobility data. What we receive are sales invoices (that customers have booked). But we don’t get any data about which routes were taken, for example with a car-sharing car, or what the requests and bookings look like. We don’t have this information.” (PTO3)

The lack of dissemination of information obtained at a higher level prevents public transport organizations from gaining a better understanding about the mobility behavior of the current users of the Reach Now app. As a result, possible obstacles for using public transport, such as a high number of transfers and long waiting times cannot be taken into account when drawing up timetables, which in turn make the service less attractive for customers and also for current non-users. Table III summarizes the results of our analysis focusing on the link between the value formations in the dyadic customer-to-business relationships and the business-to-business relationships that are embedded in the service ecosystem of the Moovel Group.

5. Discussion

5.1. Theoretical implications

This article contributes theoretically by *mitigating the value “co-creation myopia”* (Plé, 2016, p. 154), which currently prevails in research

adopting the S-D logic perspective as a theoretical lens. Most previous studies (e.g., Lusch and Nambisan, 2015; Vargo and Lusch, 2004), including those with a mobility context (e.g., Hein et al., 2018; Schulz et al., 2020a; Turetken et al., 2019), consider the concept of value co-creation but fail to consider the concept of value co-destruction (e.g., Laud et al., 2019; Leroi-Werelds, 2019; Plé, 2017; Plé and Cáceres, 2010; Prior and Marcos-Cuevas, 2016). This applies in particular to the IS field, as evidenced by the results of a search in the electronic library AISel showing 629 articles considering value co-creation, but only 15 articles considering value co-destruction.

In other words, the S-D logic literature is slanted toward or presumes positive outcomes (value co-creation) of the resource integration and service exchange among actors of a service ecosystem and underplays or disregards negative outcomes (value co-destruction). Based on this limitation, earlier works only provide fragmented insights into the emergence and long-term viability of a service ecosystem such as that of the Moovel Group.

In contrast, this study considers both value co-creation and co-destruction among different actors of the service ecosystem of the Moovel Group. In line with Echeverri and Skålén (2011), we use the term ‘value formation’ as an umbrella for the value co-creation and co-destruction that take place during resource integration and service exchange. Following the approach of several scholars (e.g., Dolan et al., 2019; Frau et al., 2018; Yin et al., 2019), we analyzed customer reviews provided for the Reach Now app to gain insights into the value formation in the customer-to-business relationships between the app users and the Moovel Group.

Our results point to extensive value co-destruction evidenced by app users’ negative feelings, such as anger and frustration, and a loss of resources (e.g., time and money) that can lead to the termination of the

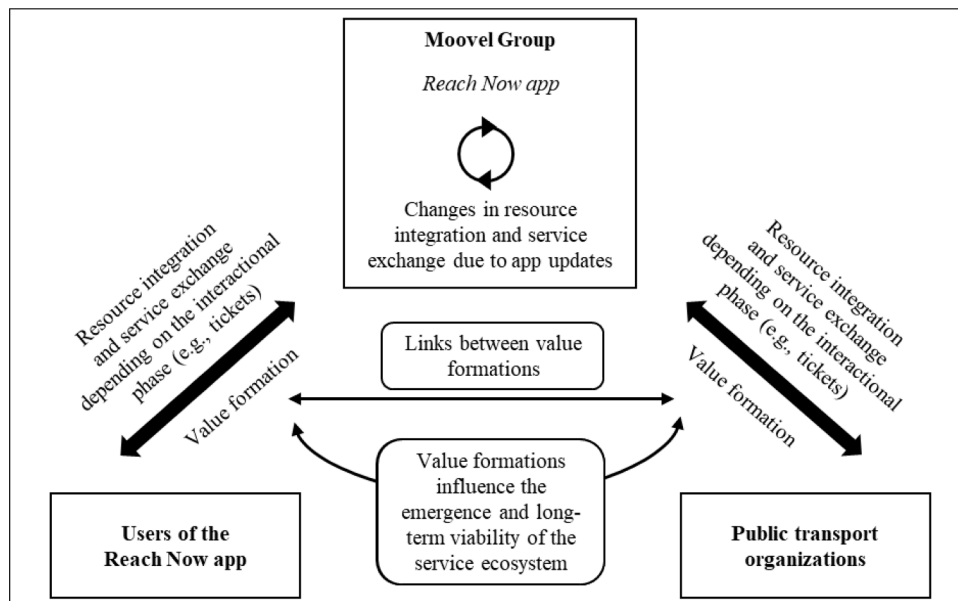


Fig. II. Interactional phase-based perspective on the IT-enabled value formations in a tripartite relationship of a service ecosystem.

Table IV
Value co-destruction in phase 1 – Installation, registration and log-in.

	Value co-destruction	Resource	Number of customers	Exemplary customer review
Phase 1 – Installation, registration and log-in	Problems with log-in	App	35	The app wouldn't open this morning in the subway... I was sent back to the log-in page over and over. When I was asked to show my ticket, I was told I had to pay a 60 Euro penalty. In the end, I had to pay a 7 Euro handling fee, after I had a lot of trouble getting my ticket to come up... I am really angry about this app!
	Problems with registration	App	12	What a bunch of crap! I have been waiting for over 30 min for the confirmation mail to complete my registration! No THANK YOU – if it's that much trouble right at the beginning, better steer clear of it! App deleted! Put it in the trash, where it belongs!
	Problems with editing user profile	App	4	Bad, if you change your email address you lose all of your customer data. Great if the train is just arriving (this connection comes every 20 min) and you notice that no payment option has been saved!!! Thanks, really great ☺
	Problems with validating driver's license	App	3	Unfortunately, the driver's license scan failed again and again, despite a lot of patience. So car-sharing does not work with the Moovel-app [now called Reach Now], which makes the app useless for me.
	Problems with installation	App	2	Cannot be installed. Unfortunately, the new version cannot be installed, error 504. Too bad, I was a customer from the very beginning :-)
	Unsolicited installation	App	1	How audacious, the app wants to install itself without being asked.
	Complex general terms and conditions	General terms and conditions	1	Finally, I would like to mention that for my taste the general terms and conditions are so opaque and long that I will not study them. Since I have to agree to them to use the app, it will be deleted. It is actually a pity, because I found the approach quite ok.
	No crediting of bonus points	Bonus points	1	Unfortunately, the TVSmiles were not credited accordingly!!
	Unsolicited advertising	App	1	Dubious, adware-like advertising. Opens the Playstore page directly from the browser without clicking. Such apps should be banned from the Playstore! Simply audacious, such 'advertisements' that border very strongly on adware. Shame.
	No provision of a fingerprint ID	App	1	The integration of the fingerprint ID from Android would be great.

Table V
Value co-destruction in phase 2 – Information.

	Value co-destruction	Resource	Number of customers	Exemplary customer review
Phase 2 – Information	Problems with the selection of departure and arrival point	App	32	But now it is useless. Search queries with names are unclear or wrong in 80% of the cases. 'Kiel central station' is already too difficult for the app. You need the exact addresses and even these are difficult for the app to find.
	Lack of information on mobility services	Information	22	Very little car-sharing. Nextbike would be fine, but then I'll simply use their app.
	Inadequate information on travel times	Information	8	WRONG timetables like those here are worse than no timetables!
	Incorrect price information	Information	5	Car2go price information without taking into account the airport fee and the drop off fee, thus the double price was charged after use. Very questionable practice.
	Lack of information on the location of car-sharing vehicles	Information	3	BUT: Why aren't all the car2go vehicles displayed that car2go displays in its own app? It happens again and again and again that Reach Now does not display all vehicles. In addition, free spaces at the charging stations are not reliably displayed. In the car2go-app they are always correct, I have seen this for several weeks at the charging station in front of my door.
	Lack of price information	Information	2	Why am I not given an overview of the costs of each means of transport?
	Problems with selection of departure and arrival time	App	1	The departure and arrival time can also not be changed properly. How can you mess it up like that?
	Lack of information about availability of a navigation system	Information	1	When choosing a vehicle, I would like to see if a navigation system is on board.

relationship. One user, for instance, was annoyed because he had to pay a high penalty for fare evasion due to log-in problems. He ultimately had to pay the handling fee. In addition, our analysis illustrates that value co-destruction (similar to value co-creation) occurs at all interactional phases of the customer-to-business relationships (e.g., installation, registration and log-in phase, information phase). In summary, this study is a (further) call to researchers to focus on the full spectrum of value formation in order to provide a more nuanced understanding of the emergence and long-term viability of a service ecosystem.

Secondly, we contribute to the S-D logic literature that focuses on *IT-enabled value formation in dyadic actor-to-actor relationships* embedded in a service ecosystem, especially in service ecosystems, in a *mobility context*. Although the S-D logic perspective is a well-established theoretical lens that has been applied in various research fields (for an

overview, see [Vargo and Lusch, 2017](#)), many scholars (e.g., [Blaschke et al., 2019](#); [Breibach and Maglio, 2016](#); [Breibach and Ranjan, 2017](#); [Haki et al., 2019](#); [Kim et al., 2018](#)) point out that the knowledge about IT-enabled value co-creation is very limited. In addition, since the concept of value co-destruction is rarely considered in scientific research (e.g., [Laud et al., 2019](#); [Leroi-Werelds, 2019](#); [Plé, 2017](#)) there also is a lack of understanding about IT-enabled value co-destruction.

This general picture is confirmed by our review of the S-D logic literature that focuses on the value formation among actors in a mobility context (see [Table I](#)). First, our overview shows that there are very few studies in this research area. Some previous studies analyzed value co-creation and/or value co-destruction in *dyadic customer-to-business relationships* (e.g., [Echeverri and Skålén, 2011](#); [Gohary et al., 2016](#); [Sthapit and Björk, 2019](#)). The underlying resource integration and service

Table VI
Value co-destruction in phase 3 – Optimization and recommendation.

	Value co-destruction	Resource	Number of customers	Exemplary customer review
Phase 3 – Optimization and recommendation	Lack of connections between departure and arrival point	App	35	MyTaxi app. The developer of this app is obviously sponsored by myTaxi. Not one public transport connection is shown. Not even if the start and arrival point are right next to stops.
	Poor quality recommendation	App	18	Apparently not mature. I wanted to organize a trip from a Duisburger district to Duisburg central station. In a radius of 500 m around my location, there are three different bus lines and one tram connection to get to the destination. The travel time using the tram is 9 min, with the bus 30 min for 2,60 Euro in each case. The recommended trip is a taxi for (approximately) 16 Euro. Conclusion: Uninstall.
	Lack of individualization	App	10	Unfortunately, only the shortest connection is displayed. Sometimes I want to make a little detour to meet friends. This is not possible with the app. It is also not possible to specify via settings that only train travel should be searched for. Please improve it. For these reasons, I currently cannot use the app.
	Poor display of recommendations	App	9	Time comparisons between car2go, public transport, and taxi are no longer available. What a pity. This was once a very well-thought-out app.
	No link to the diary	App	1	It is not possible to export the travel times to my calendar.

Table VII
Value co-destruction in phase 4 – Booking and payment.

	Value co-destruction	Resource	Number of customers	Exemplary customer review
Phase 4 – Booking and payment	Errors in booking and payment	App	49	I had double bookings because the app reported that the booking could not be completed. So I did the booking again and suddenly had two identical bookings with two tickets each.
	No sale of tickets	Tickets	39	To buy a ticket, you now have to install another app – that is awful! It is called 'all-in-one mobility app'! But the strangest thing is: Many people complain here that you can't buy tickets anymore and that you need another app since the update. Moovel Group replies succinctly that since the update ticket purchases are not longer possible, but there is another 'great app' for ticket purchase. Yes, that is exactly the point being criticized! I have no idea what that's good for. A pity. Uninstalled.
	Lack of a payment method	App	23	After the cancellation of the SEPA direct debit procedure as a payment option, I canceled my account! Credit card is the only possible option. I have never experienced customers being treated so harshly and inconsiderately.
	No sale of entire range of tickets	Tickets	14	The only problem is that you cannot book daily tickets (but due to the absurd single ticket prices they are the better option here in Stuttgart). If these tickets were available, you'd get 5 stars!
	No provision of discounts	Special ticket	9	Cheating at the particle pollution lottery? I have so far bought 8 single tickets during the particle pollution level warnings in Stuttgart – and won one of them – according to my calculations a 12.5% ratio. Moovel Group advertises a 50:50 chance. It is extremely unlikely that my chances are so unequal. Have other users had similar experiences?
	No consideration of subscriptions and other certificates	Special ticket	7	However, you should also be able to enter: I am a BahnCard owner, I am a pensioner, and also if you have a disability certificate.
	Lack of information at booking and payment	Information	5	Taxi reservation. I booked a taxi last night for an airport ride on Sunday. Now under 'future trips' 'reservation started' is shown and that's it. More information or cancellation, I don't know how. Is my requested taxi coming or not? :(

exchange take place either in a face-to-face (e.g., [Echeverri and Skålén, 2011](#); [Gohary et al., 2016](#)) or digital environment ([Sthapit and Björk, 2019](#); [Yin et al., 2019](#), etc.). However, there are currently no studies on the value formation in dyadic customer-to-business relationships embedded in a service ecosystem such as that of the Moovel Group, where a variety of mobility services are accessible through an app.

Furthermore, only a few S-D logic studies have examined value formation in dyadic *business-to-business relationships* in a mobility context. Previous studies that focused on the IT-enabled value co-destruction are limited because only cases with an entire lack of resource integration and service exchange among actors were analyzed (e.g., [Schulz and Überle, 2018](#); [Zimmermann et al., 2020](#)). In addition, the scientific research that used both the value co-creation and the business model concept does not provide detailed insight into the integration of specific resources (e.g., an app) and the subsequent service exchange ([Gilsing et al., 2018](#); [Hein et al., 2018](#); [Turetken et al., 2019](#)). In summary, our review on the value formation in dyadic actor-to-actor relationships that are located in a mobility context provides a synthesized knowledge base on which future research can be built. In particular, it reveals a major

research gap with regard to the IT-enabled value formation among actors.

We contribute to closing the identified research gap by analyzing the customer reviews provided for the Reach Now app in the Android Google Play Store between 2016 and 2019. Based on our analysis, we provide a holistic perspective on resource integration, service exchange and value formation in the different interactional phases of the customer-to-business relationships that are embedded in the service ecosystem of the Moovel Group (see [Tables IV to XV](#) in the Appendix). Our results offer quantitative insight into which resources are most important for value co-creation and co-destruction from the perspective of the app users, and thus on which future research should focus in order to ensure its practical relevance. For example, the provision of discounts for public transport on days with particle pollution level warnings is one of the main sources of value co-creation in the case of the Reach Now app. With these results, we complement previous work ([Albrecht and Ehmke, 2016](#); [Willing et al., 2017a](#); 2017b) that provides a comparison of apps and browser solutions similar to the Reach Now app, but without analyzing the value formation on the part of users (i.e., not taking the

Table VIII
Value co-destruction in phase 5 – Execution.

	Value co-destruction	Resource	Number of customers	Exemplary customer review
Phase 5 – Execution	Poor navigation	App	4	Has not be improved. It is okay! Almost every train and bus stop has two directions. In the display, however, you can't figure out which direction you should go. The final stop is of no use at all. Especially, if you are unfamiliar with the area. This is important.
	No taxi cancelation	App	2	After 20 min waiting time and often changing departure time forecasts, myTaxi in Berlin did not arrive after all. Unfortunately, there is no cancelation button. I'm getting a private ride now.
	Error in opening the car-sharing vehicle	App	2	The Flinkster vehicles cannot be opened. I have tried several times to book and open vehicles via the app today. The reservation worked perfectly, but when I stood in front of the vehicle nothing happened...After long phone calls with the Flinkster hotline I was able to get help after 20 min. Please get on this quickly and see what is going on.
	Failure of the mobility service	Taxi vehicle	1	After 20 min waiting time and often changing departure time forecasts, myTaxi in Berlin did not arrive after all.
	Lack of information about bike-sharing	Information	1	For example, you can rent a Nextbike. But it is not written anywhere that the code is for the bike lock and not for the computer. And there is no explanation how to return the bike.
	Lack of information about public transport	Information	1	Platform information would be very helpful, especially at large stops or stations.
	Charging card defective (car-sharing)	Charging card	1	Car2go used. Charging card defective, Moovel Group not reachable. Car2go-hotline cannot help. I had to pay twice as much as necessary because of waiting time. Never again.
	No reward for charging the car-sharing vehicle	Reward	1	Rewards for charging car2go-vehicles are not credited.

Table IX
Value co-destruction – Phase independent.

	Value co-destruction	Resource	Number of customers	Exemplary customer review
Phase independent	App crashes	App	40	It just doesn't work. I spent an hour going from error to error and crash to crash until I was finally ready to buy a ticket. After I pressed the buy button, you might have guessed it, it came to an error. I tried two more times – nothing! I give up and will buy via the Verkehrs- und Tarifverbund Stuttgart [the transport and tariff association] at double price ☹
	Poor functional design	App	16	Cumbersome and confusing to use.
	Poor performance	App	15	In addition, searching for connections for simple 15-min routes takes over 30 s (even with WLAN).
	Poor customer service	Staff	13	Service is almost non-existent. The contact via Twitter was very friendly and helpful, but couldn't help either, because the people responsible were already at the end of the working day.
	Low level of data protection	Data	12	But the app is definitely using too much data without any clear benefit. This looks too much like a data leech to me.
	Server connection problems	App	8	Connection?? If the connection exists, it works quite well but unfortunately the server seems to go down very often. The app is thus hardly usable.
	High data volume consumption	App	7	For four bookings 317 MB data transfer, there is something wrong!!!
	High battery consumption	App	4	Unfortunately, it is currently draining the battery, although I did not use it and even forced a stop. So it is uninstalled.
	No added value	App	3	Where is the added value compared to Google Now? I was curious because of all the advertising and I am disappointed. I don't see any added value compared to Google Now (except the information about the expected fare) – I already have the car2go-app – why should I use this app? I don't understand the concept.
	Poor visual design	App	3	Otherwise only the pale background color disturbs me.
	No offline use	App	1	A great app, but unfortunately you always have to be connected to the Internet. It would be great if the app could also be used offline.
	Not for disabled persons	App	1	I am unfortunately hearing-impaired, I cannot use everything.

S-D logic perspective).

In addition, our analysis of the customer reviews provided for the Reach Now app highlights the importance of app updates for the understanding of changes in value formation in the customer-to-business relationships over time. Usually, software updates are performed to improve the functionality and operational reliability, and to close security gaps, which lead to higher value formation for users. However, our results depict that the Moovel Group has also used updates to reduce the functionality of its Reach Now app. Several user experienced value co-destruction after updates if, for instance, public transport tickets can no longer be purchased directly in the app or the range of payment methods (e.g., SEPA direct debit, Paypal) is narrowed. In other words, the Moovel Group has used updates to change resource integration and service exchange among actors, and thus the value formation in the customer-to-business relationships. Accordingly, S-D logic research should focus on updates to study changes in value formation over time

and related topics such as the termination of relationships.

Lastly, we contribute to the S-D logic literature by providing an understanding *how the IT-enabled value formations in different dyadic actor-to-actor relationships of a service ecosystem are linked*. Almost all previous studies (e.g., Blaschke et al., 2019; Breidbach and Maglio, 2016; Laud et al., 2019; Rahman et al., 2019; Sigala, 2018) – in line with the research gap that we identified for studies with a mobility context – only examine the IT-enabled value formation in single dyadic actor-to-actor relationships in a service ecosystem. This results in limited insights into the emergence and long-term viability of service ecosystems. In order to complement our results for value formation in the customer-to-business relationships, we conducted interviews with experts from the Moovel Group and German public transport organizations to gain knowledge about value formation in the business-to-business relationships.

Our analysis of the link between the value formations in both dyadic

Table X
Value co-creation in phase 1 – Installation, registration and log-in.

	Value co-creation	Resource	Number of customers	Exemplary customer review
Phase 1 – Installation, registration and log-in	App is free of charge	App	1	It costs nothing!!!
	Driver's license validation	App	1	The validation of the driving license is great. Everything can be done easily online.
	Free driver's license validation	App	1	The validation of the driving license is great. Everything can be done easily online and even free of charge. In contrast, in the case of car2go, you have to pay 9 Euro.

actor-to-actor relationships shows, for instance, that the lack of integration of all ticket types by the public transport organizations leads to value co-destruction between the Moovel Group and the users of its Reach Now app, because the users have to buy certain tickets from the bus driver or install and use a second app (e.g., loss of time, high cognitive effort and complexity). On the other hand, the public transport organizations sell certain tickets via the Reach Now app generating monetary value, and by preventing the sale of other tickets, also ensure that their own distribution remains attractive, which leads to lower costs of distribution and makes overcharging by the Moovel Group more difficult (i.e., value co-creation). The integration of a specific resource (here: certain ticket types) by the public transport organizations thus leads to different value formations in both analyzed dyadic actor-to-actor relationships. Overall, our results provide empirical evidence that all four links between value co-creation and co-destruction occur in practice (see Table III).

In summary, our study helps to better understand IT-enabled value formations (that take into account both value co-creation and co-destruction) among different actors of a service ecosystem, and thus of its emergence and long-term viability by shedding light on the resource integration and service exchange in the tripartite relationship between the Moovel Group, users of its Reach Now app, and German public transport organizations. Fig. II exhibits our interactional phase-based perspective on IT-enabled value formations in a tripartite relationship of a service ecosystem such as that of the Moovel Group.

5.2. Practical implications

This study makes several practical contributions. First, smart

mobility app providers can apply the findings of our work to improve their apps and thus to enable a simpler and more convenient use of several mobility services during a trip. The results are particularly valuable for start-ups which, unlike the Moovel Group, are not subsidiaries of well-established companies (Albrecht and Ehmke, 2016) and are often subject to financial and personnel constraints. Our findings go well beyond current rather superficial comparisons of the different apps and browser solutions available to practitioners (Albrecht and Ehmke, 2016; Willing et al., 2017a; 2017b) by taking the customer perspective into account. Our analysis of customer reviews that were provided for the Reach Now app offers deeper insights into user needs at all interactional phases of the customer-to-business relationships, ranging from the app installation and registration to the app-supported execution of the trip. For example, many users complained that it is not possible to buy a (specific) public transport ticket and about the limited payment options available.

In addition, our study points out to the need to improve and stabilize the Reach Now app technically to prevent crashes, solve log-in problems, as well as prevent booking and payment errors. Better understanding user needs and eliminating technical shortcomings can make using apps such as the Reach Now app more attractive for current and potential users. This, in turn, can contribute to a shift in the mobility behavior of individuals from private car use to the use of different mobility services, such as public transport, and car- and bike-sharing. A decrease in private car use helps to address problems such as time wasted waiting in traffic or looking for parking, as well as air and noise pollution, which are commonplace in cities around the world (Schrieck et al., 2018; Willing et al., 2017a; 2017b).

Secondly, we contribute to the emergence and long-term viability of

Table XI
Value co-creation in phase 2 – Information.

	Value co-creation	Resource	Number of customers	Exemplary customer review
Phase 2 – Information	Information on mobility services	Information	6	Top app, with a good range of mobility providers.
	Information on travel times	Information	3	But it is very nice that you can always see when the train is going to arrive. Kudos to you. THANK YOU. Best regards, Lilli Lilli.
	Information (general)	Information	3	SUPER! Uniquely good! There's a lot more information provided than I thought. I am really excited – Thanks for this app!
	Provision of price information	Information	1	Only once did Moovel Group and the Verkehrs- und Tarifverbund Stuttgart [the transport and tariff association] quote different prices for the same route. Moovel Group offers a price that is one zone cheaper, the Verkehrs- und Tarifverbund Stuttgart the more expensive price. I wrote to the Verkehrs- und Tarifverbund Stuttgart and asked for clarification. The Verkehrs- und Tarifverbund Stuttgart said that both prices are correct. How about that. The Verkehrs- und Tarifverbund Stuttgart just provides the more expensive price information.

Table XII
Value co-creation in phase 3 – Optimization and recommendation.

	Value co-creation	Resource	Number of customers	Exemplary customer review
Phase 3 – Optimization and recommendation	High-quality recommendation	App	9	I use the app primarily in Stuttgart and there it is much better, especially regarding the connections, than the Verkehrs- und Tarifverbund Stuttgart [the transport and tariff association] app.
	Good display of recommendations	App	6	A very good app. It always shows the fastest and easiest connection, also considering car2go.

Table XIII

Value co-creation in phase 4 – Booking and payment.

	Value co-creation	Resource	Number of customers	Exemplary customer review
Phase 4 – Booking and payment	Offer of discounts	Special ticket	24	Thank you, Mr. Daimler! A few years ago, I wouldn't have thought that such a great offer, of course especially the 50/50 chance of winning the ticket on days with particle pollution level warnings (...) is possible. Of the seven trips I took in the Verkehrs- und Tarifverbund Stuttgart [the transport and tariff association], four were paid for, two of them were 7 zone tickets.
	Simple booking and payment	App	19	Everything in one app, with only a few clicks to book. This is really practical.
	Offer of vouchers	Special ticket	1	I use car2go and myTaxi via the app, because I will/must use the voucher function.
	Offering a mobility budget	Special ticket	1	The mobility budget is really practical.

service ecosystems like this of the Moovel Group (Albrecht and Ehmke, 2016; Willing et al., 2017a; 2017b) by providing insights into how value co-destruction among actors can be better anticipated, mitigated, and prevented. Our results indicate that, in addition to an increase in value co-creation by improving the quality of the Reach Now app and/or of the provided mobility services (e.g., the provision of clean car-sharing vehicles), improved communication and expectation management can mitigate and prevent value co-destruction, and thus also lead to increased value formation. Many Reach Now app users were angry and frustrated when they had to install an additional app in order to purchase public transport tickets and were not informed about this change sufficiently in advance. Furthermore, users were displeased to discover that they could no longer pay via SEPA direct debit or Paypal and that the reasons for this change were not communicated transparently. In order to avoid such value co-destruction, our study guides practitioners to communicate realistic value propositions to (potential) users and to provide timely information on the reasons for any adjustments.

Finally, our results support automotive companies, such as Daimler AG and the BMW Group, in moving from solely making and selling cars towards providing mobility services, and thus in *successfully adapting their business models* in response to a changing reality. Solutions like the Reach Now app have only recently become available on the market through the ongoing technological progress (e.g., sensors, big data) and the incipient shift in demand, in particular among young adults, away from private car ownership towards the use of alternative mobility services (Circella et al., 2017; Rayle et al., 2014; Umweltbundesamt,

2019) – partly fueled by the problems caused by the predominant usage of private cars. With our study, we show how smart mobility apps like the Reach Now app and the mobility services they distribute (e.g., car2go) can be positioned more attractively on the market by better meeting needs of (potential) users. By supporting the shift of revenue from the sale of cars to mobility services, the long-term existence of the automotive companies can be secured and jobs preserved.

5.3. Limitations and further research

Our work has some limitations that should be addressed by future research. First of all, our data collection and analysis is limited to one case study – the Moovel Group, which offers the Reach Now app. The choice of this case seems appropriate, since the intended shift of automotive companies from the production of cars to providers of mobility services clearly reflects the shift from the G-D logic to the S-D logic, as postulated in the scientific literature (e.g., Gilsing et al., 2018; Vargo and Lusch, 2004). Furthermore, the Reach Now app is the joint offer of Daimler AG and the BMW Group, two of the largest automotive companies worldwide. However, like most smart mobility apps and browser solutions, the Reach Now app focuses on German-speaking Europe (Albrecht and Ehmke, 2016; Willing et al., 2017a; 2017b). Other countries, for example, have a less extensive public transport infrastructure, which may result in different user needs with regard to an app that supports the use of multiple mobility services. To ensure the transferability of the results, further case studies should be conducted in

Table XIV

Value co-creation in phase 5 – Execution.

	Value co-creation	Resource	Number of customers	Exemplary customer review
Phase 5 – Execution	Good navigation	App	2	The app helps me several times a week to find my way around Stuttgart and also in other cities.
	Chic car-sharing vehicles	Car-sharing vehicle	2	Car2go: Chic cars and a large number of cars.
	Clean car-sharing vehicles	Car-sharing vehicle	1	The use of car2go is running smoothly so far. Always nice and clean cars.

Table XV

Value co-creation – Phase independent.

	Value co-creation	Resource	Number of customers	Exemplary customer review
Phase independent	High stability	App	23	Wonderful, just great. I've been using Moovel [now called Reach Now] for a few months now. It is super. Everything works just fine.
	Good functional design	App	20	I like this app. It is chic, has an efficient user workflow and does what it is supposed to do.
	Good customer service	Staff	9	Good. The customer service is first class. I mean this seriously.
	Good visual design	App	8	A very nice design and a high performance.
	Added value	App	7	Ingenious for Stuttgart. Perfect app for the Stuttgart area that combines all possible means of transport. You don't need other apps anymore.
	High performance	App	2	Initially, thumbs up: Short loading times.

future research.

A second limitation also relates to the transferability of the results. In this study, we analyzed the value formation in the business-to-business relationships on the basis of interviews conducted with experts from German public transport organizations. Public transport, which includes bus, subway, tram, and/or regional train services, guarantees the mobility of the German population. The importance of public transport is much higher than, for instance, of car-sharing, as evidenced by more than 10 billion public transport rides in 2017 (Verband Deutscher Verkehrsunternehmen, 2018). However, the other mobility services (e.g., car-, bike- and ride-sharing) to which the Reach Now app provides access are usually offered by private companies who may have different goals and interests than public transport organizations (Schulz and Überle, 2018). For this reason, it is necessary to also examine the value formation in such business-to-business relationships.

Lastly, there are some limitations with regard to the methodology chosen for the analysis of value formation in the customer-to-business relationships. Following the approach taken in other studies (e.g., Dolan et al., 2019; Sthapit and Björk, 2019), we have collected and analyzed customer reviews provided for the Reach Now app. But this approach does not cover users who do not write a customer review, for whatever reason. In addition, due to their format (star rating and customer comment), customer reviews can provide a broad overview on value formation of a large number of users, but only limited deep insights with regard to value formation of individual users.

To address this weakness, future research could use in-depth interviews and customer diaries for data collection. In this way, the value formation could also be examined over a longer period of time, potentially casting light on the factors that influence whether the initiation of a problem-solving process turns initial value co-destruction into value co-creation. Both data collection methods also account for the fact that (potential) users are not a homogeneous group (e.g., economic, cultural, mobility-related, and demographic differences) (Schulz et al., 2020b), since “value is always uniquely and phenomenologically determined by the beneficiary” (Vargo et al., 2008, p. 148).

6. Conclusion

In this study, we examine value formation among different actors embedded in the Moovel Group service ecosystem to improve its establishment and long-term viability. The Moovel Group offers the Reach Now app that makes the use of multiple mobility services during a trip more convenient, and thus contributes to the realization of smart mobility not based on the predominant use of the private car. Currently, however, both the number of users and the number of public transport organizations distributing their mobility services via the Reach Now app is very low. Drawing on the analysis of customer reviews and expert interviews, we develop an interactional phase-based perspective on the value formations in the tripartite relationship between app users, the Moovel Group, and German public transport organizations.

Our results show, in particular, that all four possible links of value co-creation and co-destruction in the underlying dyadic customer-to-business relationships and business-to-business relationships occur in practice. For example, not providing access to the entire range of public transport tickets leads to value co-destruction for app users, while value co-creation takes place for public transport organizations because they can continue to use smartcards for their subscriptions that provide a higher protection against misuse, and because they can remain in direct contact with their customers.

Our research is unique in several ways. This is the first case study of the Moovel Group and their Reach Now app, a joint venture between Daimler AG and the BMW Group that supports their transformation towards mobility service providers. Furthermore, our work complements previous studies that have adopted the S-D logic perspective which mainly (1) focus on non-IT-enabled value formation, (2) neglect the concept of value co-destruction, (3) limit their analysis to single

dyadic actor-to-actor relationships, and/or (4) examine an established service ecosystem.

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Declarations of interest

None.

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Supplementary materials

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Appendix

Table IV, Table V, Table VI, Table VII, Table VIII, Table IX, Table X, Table XI, Table XII, Table XIII, Table XIV, Table XV

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