A service-dominant logic perspective on the roles of technology in service innovation: uncovering four archetypes in the sharing economy

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Abstract
The role and influence of information technology in firms' business and value creation remains controversial. The question of how technology can drive service innovations is especially crucial in highly competitive and rapidly developing areas such as digital platforms but not well understood. This study investigates the role of information technology in service innovation in sharing economy organizations. These organizations are digital platforms that combine physical and digital service elements. Adopting a service-dominant logic perspective, we conduct an interpretive multiple-case study to gain a deeper understanding of the types of service innovation in this area and the different roles that IT can play in these initiatives. Our findings reveal different manifestations of service innovation and thereby help to identify previously unexplored interdependencies between the service ecosystem and value co-creation. We furthermore find that organizations' choices regarding the role of IT are dependent on the level of heterogeneity and standardization of the mediated transactions. We derive four archetypes for the role of IT in service innovation that explain how and why sharing economy organizations exploit IT. We then translate our findings into practical guidelines for managers of digital platforms.

Keywords Service innovation · Role of technology · Sharing economy · Service-dominant logic · Digital platform · Value creation

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1 Introduction

Technology is a critical component of value creation in service systems (Maglio and Spohrer 2008; Nambisan et al. 2017). However, the role and influence of technology in firms' business and value creation remains controversial. Some researchers consider information technology (IT) to be a commodity good and, therefore, posit that it does not lead to a sustained competitive advantage (e.g., Carr 2003; Shin 2001). Others acknowledge the ability to leverage technical resources as competitive resources (e.g., Bhatt and Grover 2005; Mata et al. 1995; Santhanam and Hartono 2003). Instead of viewing IT as an initiator of change, those studies have mostly regarded IT as a tool or facilitator to achieve certain goals. Moreover, prior studies focused mainly on manufacturing firms, whereas studies on the role of IT in service firms remain limited. In light of the ongoing trend toward services (Bertschek et al. 2016) and the significant role of services in the global economy (O'Cass and Wetzels 2018), this shortage is surprising. Therefore, this study attempts to increase the limited understanding of the different technology exploitation strategies of service firms (Akaka and Vargo 2014).

Digital platforms represent one of the fastest growing category of such service firms (Tiwana et al. 2010). Their services facilitate the exchange between different types of consumers that otherwise could not transact with each other (Gawer 2014). In contrast to traditional businesses, platforms create value by connecting two (or more) formerly unconnected consumer groups and generating economies of scope in supply and demand (Gawer 2014). For platforms, value is generated in the use of service innovations in a complex, collaborative, networked ecosystem (Häikiö and Koivumäki 2016; Vargo and Lusch 2007). With the help of technology, the formerly dyadic relationship between consumer and service provider is extended to a more dynamic, many-to-many landscape (Grenha Teixeira et al. 2017). Therefore, technology and service innovation are interconnected (Lusch and Nambisan 2015). Barrett et al. (2015) highlight the importance and timeliness of service innovation in the context of transformational developments in information and communication technologies and call for future research. We respond to this call and apply a service-centered view (Akaka and Vargo 2014) to examine service innovation in the transformational and technology-driven context of the sharing economy—one of the fastest growing areas of digital platforms.

Sharing economy organizations as digital platforms facilitate the shared use of resources supported through IT (e.g., Casprini et al. 2019; Cohen and Kietzmann 2014; Geissinger et al. 2018; Tussyadiah 2016). Service innovation on such sharing economy platforms is even more multifaceted as the scope of these platforms extends beyond the digital sphere by offering sharing services often based on physical assets provided by individuals (Trenz et al. 2018). Since these platforms are simultaneously exposed to the dynamics of both the digital and physical worlds (Constantiou et al. 2016), they are, on the one hand, characterized by the presence of network effects in the digital world and the resulting dynamic and competitive environment (Eisenmann et al. 2006; Hagiu 2009). On the other hand, these platforms have to deal with issues of the physical world (e.g., the

transfer of the shared resource). This leads to close physical interactions between the different parties participating in value creation and provides new ways for creating value, such as social experiences (Frey et al. 2019; Kamal and Chen 2016), thereby emphasizing the need for unique service innovations.

Trenz et al. (2018) identified the value creation as one of the critical topics in sharing economy research. However, it remains unclear how IT can drive service innovation for such firms and why some firms decide to exploit technology differently than others to create value. In other words, an in-depth understanding of the different ways in which technology contributes to service innovation is lacking (e.g., Akaka and Vargo 2014). To address this issue, we combine the dual role of IT (Nambisan 2013) with the conceptualization of service innovation (Lusch and Nambisan 2015) and explore the following research question:

How does information technology contribute to service innovation in sharing economy organizations?

We use this novel perspective to analyze the benefits of IT through its operant (initiator of change) and operand (enabling or facilitating) role in all three perspectives of service innovation within one study and, thereby, view IT not solely as a tool or product but also as a resource to trigger or to initiate change (Nambisan 2013). Our investigation of service innovation beyond a traditional output-based view therefore contributes to a more systemic understanding of value creation (Helkkula et al. 2018). Using data from 17 cases of sharing economy organizations and their strategic decisions allows us to uncover four archetypes to explain how and why these types of organizations exploit IT.

In the following, we provide the theoretical basis for service innovation and its interconnection with the role of IT in organizations, followed by a description of the research methodology applied in our study. We then reveal different manifestations of service innovation and derive four archetypes for the role of IT in service innovation. Based on the archetypes, we explain how and why different sharing economy organizations exploit IT and show that the role of IT is dependent on the level of heterogeneity and standardization of the mediated transactions. We further identify previously unexplored interdependencies between the service ecosystem and value co-creation. This manuscript concludes by summarizing the main findings and providing directions for future research.

2 Theoretical foundation

In this section, we combine service innovation concepts with the role of IT as exploited by organizations. First, we review different perspectives on service innovation. Second, we provide a conceptualization of service innovation. Third, we review the operand and operant roles of IT in organizations. Fourth, we provide theoretical foundations on the sharing economy.

2.1 Perspectives on service innovation

In the past decade, academic research on service innovation has increased substantially (e.g., Lusch and Nambisan 2015; Snyder et al. 2016; Witell et al. 2016). The growing number of publications from diverse fields such as marketing (e.g., Dotzel et al. 2013; Ordanini and Parasuraman 2011), economics (e.g., Cainelli et al. 2006; Dominguez-Péry et al. 2013), strategy (e.g., Dörner et al. 2011), and information systems (e.g., Bardhan et al. 2010; Barrett et al. 2015) underscore the interest in service innovation.

Research on service innovation has undergone major changes due to a shift in focus from internal innovation resources and capabilities into a network- or ecosystem-centric view (Häikiö and Koivumäki 2016). Coombs and Miles (2000) separate service innovation into three perspectives: assimilation, demarcation, and synthesis.

The assimilation perspective conceptualizes service innovation similarly to manufacturing innovation and is driven by the development of new technology that contributes to the development of significantly different service offerings (Coombs and Miles 2000). This perspective aligns well with Schumpeter (1934) and his view of innovation (Witell et al. 2016).

The demarcation perspective argues that service innovation is highly distinct from innovation in manufacturing firms (Coombs and Miles 2000) and that service innovation arises in a business relationship between two actors (Witell et al. 2016). According to this perspective, service innovation begins to shift away from a Schumpeterian view of innovation by focusing on inventions that are new to the firm but remains focused on outcomes (Witell et al. 2016). An invention new to the firm and not necessarily substantially new to the market can be considered a service innovation (Hertog et al. 2011). Witell et al. (2016) argue that according to the demarcation perspective, innovation often means "small process adaption" for a firm. Therefore, this perspective implies that in practice, all service firms develop service innovations (Witell et al. 2016).

According to the synthesis perspective, both products and processes can be part of the value proposition offered to customers as service innovation (Skålén et al. 2015). Service innovation can be described as being "created with a particular value proposition in mind, which enables the user of the service to create value for themselves or their community" (Cullen 2008, p. 255). In that sense, service innovation can be a new process or an outcome that is new to the firm and creates value for the actors involved in the service transaction (Witell et al. 2016).

In summary, recent research tends to develop from assimilation and demarcation approaches towards a synthesis approach (e.g., Ordanini and Parasuraman 2011). In line with this development, we employ a synthesis perspective on service innovation in this study to consider both outcomes and processes that are new to specific sharing economy organizations (not necessarily new to the world) and create value for the users and their community. This stance enables us to investigate service innovation beyond a traditional output-based view and contributes to a more experiential and systemic understanding of value creation (Helkkula et al. 2018). Table 1 summarizes the characteristics of the three perspectives on service innovation.

Table 1 Perspectives on service innovation. Adapted from Witell et al. (2016)

	Assimilation	Demarcation	Synthesis (this study)
Description	Service innovation is similar to manufacturing innovation and is driven by the development of new technology	Service innovation is highly distinct from innovation in manufacturing firms and appears in a business relationship between two actors	Service innovation is a value proposition that enables the users of the service to create value for themselves or their community
Key characteristic	Radical technical innovation	New or considerably changed	Value for users or community
Focus	Outcome	Outcome	Process and outcome
New to whom	World	Firm	Firm

2.2 Conceptualization of service innovation

Even recent studies adopting a more integrated or synthesis approach generally consider innovation in the traditional context of producers and consumers without taking the characteristics of service innovation into account (Lusch and Nambisan 2015). Therefore, a newly devised framework for service innovation is necessary to overcome that issue. Lusch and Nambisan (2015) build upon studies that explicitly or implicitly deal with service innovation and broaden the definition of service innovation as "the rebundling of diverse resources that create novel resources that are beneficial (i.e. value experiencing) to some actors in a given context; this involves a network of actors, including the beneficiary (e.g., the customer)" (Lusch and Nambisan 2015, p. 161). According to Lusch and Nambisan (2015), service innovation can be conceptualized through three elements grounded in service-dominant (S-D) logic (Vargo and Lusch 2004, 2007): (1) service ecosystem, (2) service platforms, and (3) value co-creation.

A service ecosystem is 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). According to Lusch et al. (2010), "self-adjusting" often occurs by actors spontaneously sensing and responding to their continued market relevance and viability, which help to overcome the cognitive distance among the actors. The more content is digitized, the easier it is for actors to share information quickly and to share a similar institutional logic with common perspectives (adopting a shared worldview) to ensure the ecosystem's survival (Lusch and Nambisan 2015). "Loosely coupled" indicates that actors are relatively free to enter and exit the environment and form collaborations or exchanges with other actors (Lusch and Nambisan 2015). For a sharing economy organization, this can simply be registering for the service. The broader role of the service ecosystem is to facilitate a common environment for value co-creation by a diverse set of actors, illustrated by a shared institutional logic (Lusch and Nambisan 2015). In other words, the service ecosystem is a network of actors intended to provide an organizing structure for actors and network participation. For a P2P carpooling

organization, for instance, the service ecosystem is the network consisting of drivers, riders, the organization itself, and additional actors (e.g., an insurance company) that maintain a common worldview.

Lusch and Nambisan (2015, p. 166) define a service platform "as a modular structure that comprises tangible and intangible components (resources) and facilitates the interaction of actors and resources (or resource bundles)". The service platform serves as a venue for service exchange and leverages resource liquefaction and enhances resource density (Lusch and Nambisan 2015). The service platform provides an organizing structure for resources. In the P2P carpooling case mentioned above, this is the digital platform that the organization provides to offer and share rides.

The third element to conceptualize service innovation is the co-creation of value. S-D logic states that all social and economic actors integrate resources to collectively create value. Therefore, actors that benefit are always part of value creation (Lusch and Nambisan 2015). Service ecosystems and service platforms enable actors (e.g., customers and suppliers) to co-create value. This includes "processes and activities that underlie resource integration and incorporate different actor roles in the ecosystem" (Lusch and Nambisan 2015, p. 162). As an example, in a P2P carpooling organization, this could be the actual execution of the ride, where value is created for the driver and the rider.

The conceptualization of service innovation (Lusch and Nambisan 2015) and the above-mentioned examples in a P2P carpooling context are summarized in Table 2.

2.3 Different roles of information technology

We conducted a literature review on the role that IT can play for different organizations. In our study, we define IT as the hardware and software a firm needs to use to achieve its business objectives (Laudon and Laudon 2014). This includes not only computers and storage devices but also software, the internet, mobile devices, and other digital and communication technologies. We used a continuously iterated concept matrix to analyze and synthesize the identified literature (see Webster and Watson 2002 for further details on our literature review methodology). Based on the studies, we aggregated different views on IT in organizations following the framework of Nambisan (2013), which separates the roles of IT as an operand and

Table 2 Conceptualization of service innovation. Adapted from Lusch and Nambisan (2015)

	Service ecosystem	Service platform	Value co-creation
Description	Network of actors to provide an organizing structure for actors and network participation	Organizing structure for resources	Processes and activities that underlie resource integration and incorporate different actor roles in the ecosystem
Example (P2P carpooling)	Drivers, passengers, the carpooling organization, or additional actors (e.g., insurances companies)	The digital platform that the organization provides to offer and to share rides	Execution of a ride, where value is created for the driver and the passenger

an operant resource. The role of IT as an operand resource describes technology as a resource that an actor acts on to obtain support for executing a task. Therefore, IT acts as an enabler or facilitator for achieving a certain goal. By contrast, operant resources are resources that act on other resources to produce effects (Nambisan 2013). They act or operate on other things rather than being operated on (Vargo and Lusch 2004) and are an initiator of or a trigger for change (Nambisan 2013).

Table 3 summarizes the dual role of IT and provides typical general examples for the specific role, whereas Table 4 provides a detailed overview of the dual role of IT that emerged from our literature review.

The operand role of IT is the most prominently investigated in prior studies. Those studies focus primarily on IT as an enabler and tool to achieve operational goals (e.g., Chan 2000; Eardley et al. 2008; Nan and Tanriverdi 2017; Vannoy and Salam 2010). This includes IT to support operational efficiency and productivity (e.g., Gregor et al. 2006; Tallon 2010), enhance quality (e.g., Bhatt and Grover 2005; Oh and Pinsonneault 2007; Tallon et al. 2000), reduce operating costs (e.g., Dewan and Ren 2011; Rivard et al. 2006; Tallon et al. 2000), achieve agility and flexibility (e.g., Benitez et al. 2018b; Chakravarty et al. 2013; Overby et al. 2006; Roberts and Grover 2012), enable growth (e.g., Dewan and Ren 2011; Mitra 2005; Oh and Pinsonneault 2007), support core competencies (e.g., Ravichandran and Lertwongsatien 2005; Wang et al. 2012), enable integration activities (e.g., Häikiö and Koivumäki 2016), or support business strategy (e.g., Chan et al. 1997; Joshi et al. 2018) and service innovation (Plattfaut et al. 2015).

Although it is frequently described as disruptive, a minority of the studies we examined consider IT as an operant resource. Gregor et al. (2006) and Eardley et al. (2008) describe IT as a driver of organizational change, whereas Tallon et al. (2000), Tallon (2010), and Vannoy and Salam (2010) discuss how IT can be a driver of changing industry and market practices and competitive actions. Akaka and Vargo (2014) and Häikiö and Koivumäki (2016) add another perspective by discussing IT as a trigger for new value propositions. Ghazawneh and Henfridsson (2013), Cui et al. (2018) and Nan and Tanriverdi (2017) regard digital technology as a trigger for innovation, whereas Chen et al. (2009) see IT capabilities as a driver of the provision of innovative services.

Table 3 Overview of the dual role of IT

Role of information technology	Objective	Typical examples
Operand (IT as a tool)	Enabling and facilitating	Improvements of quality (e.g., by automatic error detection) or reduction of operating costs (e.g., by reducing response times)
Operant (IT as an initiator)	Trigger or driver for change	Creation of new value propositions such as new services or user experiences (e.g., virtual reality to create new customer experiences)

Table 4 Studies investigating the role of IT

Source	Role of information technology	
	Operand	Operant
Akaka and Vargo (2014)		IT to create new value
Bhatt and Grover (2005)	Quality of IT as competitive necessity	
Benitez et al. (2018b)	IT as facilitator of flexibility and M&A	
Chakravarty et al. (2013)	IT as facilitator of organizational agility	
Chan (2000)	IT to accomplish something and facilitate the workload	
Chan et al. (1997)	IT as supporter of business strategy	
Chen et al. (2009)		IT for innovative services
Cui et al. (2018)		IT to trigger innovation
Dewan and Ren (2011)	IT as cost-reduction tool	
Eardley et al. (2008)	IT as enabler of BPR	IT as driver of BPR
Ghazawneh and Henfridsson (2013)		IT to trigger innovation
Gregor et al. (2006)	IT for transactional efficiency	IT as a driver of change
Häikiö and Koivumäki (2016)	IT as facilitator of integration activities	IT to create new value
Joshi et al. (2018)	IT as instrument to signal actions to external stakeholders	
Mitra (2005)	IT as enabler of growth in firms	
Nan and Tanriverdi (2017)	IT to increase scope, scale, and speed	IT to trigger innovation
Oh and Pinsonneault (2007)	IT for cost reduction, quality improvement, revenue growth	
Overby et al. (2006)	IT as enabler of enterprise agility	
Plattfaut et al. (2015)	IT as support for service innovation	
Ravichandran and Lertwongsatien (2005)	IT as support for core competencies	
Rivard et al. (2006)	IT for cost reduction	
Roberts and Grover (2012)	IT as facilitator of customer agility	
Tallon (2010)	IT for enhancing efficiency and productivity	IT to redefine banking practices
Tallon et al. (2000)	IT for cost reduction, quality improvement, and effectiveness	IT for changing industry practices
Vannoy and Salam (2010)	IT as tool to achieve goals	IT as trigger for competitive actions
Wang et al. (2012)	IT as support for core competencies	
This study	IT as facilitator of service innovation	IT as trigger for service innovation

Most existing studies have focused on traditional firms (e.g., manufacturing). The fact that few studies have investigated the role of IT in a service context indicates that research on the exploration and scope of technology in service ecosystems is at an early stage. In the context of digital services, Chakravarty et al. (2013) and Plattfaut et al. (2015) focus on the facilitating and enabling role of IT, whereas Akaka

and Vargo (2014), Chen et al. (2009), and Ghazawneh and Henfridsson (2013) investigate the operant role of IT. Häikiö and Koivumäki (2016) study both the operand and operant roles of IT in value creation without considering the service ecosystem or the service platform.

2.4 Sharing economy

Today the sharing economy is well known by a lot of people as a rapidly growing technological phenomenon (e.g., Heo 2016; Möhlmann 2015; PWC 2017) that postulates access over ownership (e.g., Bardhi and Eckhardt 2012). However, it is discussed controversially. Whereas, mass media and firm communication (e.g., Botsman and Rogers 2010; Gansky 2010; Walsh 2011) promoted the sharing economy as an innovative phenomenon and a radical game changer for consumer behavior (Ertz et al. 2016), others paint a rather negative picture of the sharing economy (e.g., Rifkin 2014; Sundararajan 2016) as it yields crowd-based capitalism.

Due to the many facets of internet-based sharing (Belk 2014; Boons and Bocken 2018), this ambiguity is also reflected in the unclear scope and the blurring boundaries of the sharing economy leading to semantic confusions of what the sharing economy is and what it should be (Acquier et al. 2017; Baumber et al. 2019).

As a detailed discussion of definitorial debates on the sharing economy is beyond the scope of this article, we refer to the interdisciplinary literature review by Trenz et al. (2018) and their conceptualization of sharing practices (see Fig. 1). According to Trenz et al. (2018), there is a variety of partially incompatible definitions and perspectives on the sharing economy. Some studies, such as Ert et al. (2016) or Zervas et al. (2017), restrict the sharing economy to private individuals and exclude professional services (e.g., B2C car sharing), whereas others (e.g., Dreyer et al.

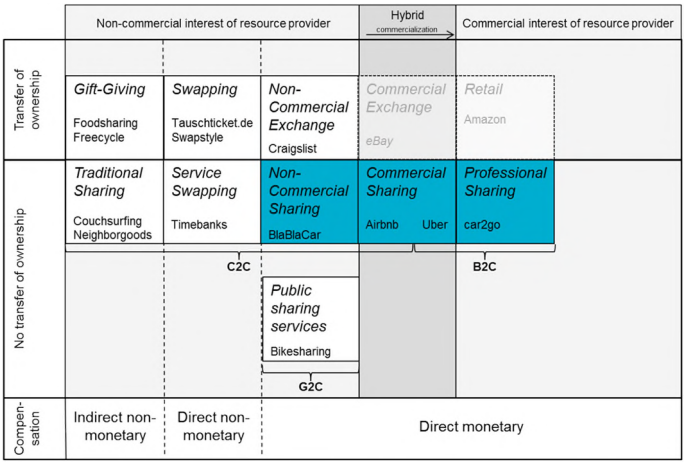

Fig. 1 Focus of the study according to the conceptualization of sharing practices. Adapted from Trenz et al. (2018)

2017; Malhotra and Van Alstyne 2014; Pedersen and Netter 2015; Sordi et al. 2018) include these services in the sharing economy. Some authors see this phenomenon as an umbrella concept encompassing different related phenomena (e.g., Barnes and Mattsson 2016; Hamari et al. 2015; Henten and Windekilde 2016; Plewnia and Guenther 2018). The basic idea of the sharing economy is to capture and redistribute idle capacity to others, leading to a reduced need for ownership (e.g., Lutz and Newlands 2018; Parente et al. 2018). For the sake of this study and to cover the phenomenon as broadly as possible, we define the sharing economy as an economic system in which assets and services are shared between individuals or between individuals and organizations with financial compensation using IT.

Adapting this definition to the conceptualization of sharing practices (see Trenz et al. 2018 for more details), this study reflects the practices of non-commercial sharing (provider of the service is monetarily compensated; the motivation to offer this service is not driven by profit orientation but rather by cost savings), commercial sharing (provided service is directly monetarily compensated, but the purpose shifts from a non-commercial interest to profit orientation), and professional sharing (companies offer access to a resource without transferring ownership with direct monetary compensation). Figure 1 visualizes the focus of the study.

3 Research design

3.1 Methodology

To uncover the roles of IT in service innovation in sharing economy organizations, we draw on multiple case studies. Case study research is particularly suitable in this context for three reasons. First, it provides a way to analyze service innovations in an organization in a natural setting, which allows us to understand the object of investigation in depth (Yin 2009). Second, a case study approach is suitable to answer "how" and "why" questions of contemporary events (Yin 2009). Third, our analysis includes interview data and other available documents (e.g., websites) from different organizations and therefore allows an analysis based on multiple sources of evidence (Eisenhardt 1989).

We follow a multiple-case study design and employ an interpretive stance to understand the phenomena by exploring participants' subjective and intersubjective meanings when they interact with their environment (Walsham 1995). We are aware that investigations are shaped by the predefined beliefs, interests, and values of the researcher (Darke et al. 1998). With our multiple-case study approach and interpretative stance, we are able to deeply understand the role of IT in sharing economy organizations in their context without manipulation or explicit control of variables (Darke et al. 1998). The collection of data in multiple cases supports our efforts to study the phenomenon in different settings and enables cross-case analysis (Sarker et al. 2013).

We choose service innovation (Lusch and Nambisan 2015) in sharing economy organizations as a unit of analysis, as the aim of this study is to explore how IT contributes to service innovation for these kinds of organizations.

3.2 Data collection and analysis

We collected data from sharing economy organizations offering transportation services in the mobility sector. We focus on transportation services in the sharing economy for four reasons: First, the mobility sector is one of the fastest-growing segments of the sharing economy in terms of revenue (Freese et al. 2014). Second, Uber and DiDi—the two most valuable digital start-ups of the world (Statista 2017)—offer mobility services in the sharing economy highlighting the importance of this sector. Third, the mobility sector in terms of usage frequency is one of the most used sectors of the sharing economy (PWC 2017). Fourth, there is no other area of the sharing economy in which so many established players enter the market with the result that the mobility sector serves as a testing ground for tomorrow's technological solutions (Grosse-Ophoff et al. 2017). This dynamic and competitive environment emphasizes the need for investigating service innovation in the sharing economy in general and the mobility sector in particular.

By focusing on one sector, the organizations are comparable in their environmental setting. All of them enable access to resources without transfer of ownership and charge a monetary fee for each transaction. However, the firms differ in their business models, allowing us to uncover the roles of IT in service innovation in different settings. We carefully selected these cases for two reasons: First, they represent business models with differences in the motivations for running the business, development stages and regional scopes. Second, car sharing, carpooling, ride-for-hire, and bike/scooter sharing solutions with B2C and P2P models are prime examples for the mobility sector of the sharing economy (PWC 2017). Therefore, our sample includes seven B2C car sharing services, two P2P car sharing services, one B2C scooter sharing service, one P2P ride-for-hire service, one P2P carpooling service, one B2C ride-sharing service, and four noncommercial car sharing associations. To cover a broad spectrum of sharing economy organizations, our sample ranges from start-ups and noncommercial car sharing associations, through more mature companies, to global players with 100–4500 employees. Table 5 illustrates the variety of cases in our sample.

In a first step, in August 2015, we developed a semi-structured interview guideline (Eisenhardt 1989; Orlikowski 1993) based on the literature on service innovation (e.g., Barrett et al. 2015; Lusch and Nambisan 2015), business models (e.g., Giessmann and Legner 2016; Veit et al. 2014; Zott and Amit 2010), organizational capabilities (e.g., Karimi and Walter 2015; Teece 2007) and IT (e.g., Sambamurthy et al. 2003; Vannoy and Salam 2010). This guideline contained 87 questions amongst others regarding meta information on the organization and the interviewee, the business model in general, marketing, users and actors, value propositions, resources and capabilities, execution, coordination and steering of transactions, technology, competitive environment, cooperation, financing and costs, and scalability. Table 6 highlights exemplary questions for each of the topics mentioned above.

The guideline was used to conduct 23 semi-structured interviews with top-level representatives of 17 sharing economy organizations operating in Germany. As all of our interviewees have decisive leadership roles in their respective organization

Table 5 Overview of case organizations

Organization	Description	Scope	Owns resources	Founded
P2P carpooling	Long-distance carpooling service operating worldwide. The company connects drivers and passengers willing to travel together between cities and who wish to share the costs of the ride. The service is available via smartphone apps, the web and mobile internet	Inter-national	No	2006
P2P ride-for-hire	On-demand ride-for-hire service operating globally in over 70 countries and approximately 600 cities. The company mediates rides among individuals on-demand and offers limousine services via a smartphone app. The company does not own the vehicles that are available on the platform	Inter-national	No	2009
B2C Carsharing 1	Station-based B2C car sharing service that operates in Augsburg, Germany. The company owns the vehicles and offers access via smartphone to approximately 70 vehicles distributed across 30 stations in the city. Additionally, the company offers access to vehicles of more than 170 partner car sharing organizations operating regionally	Regional	Yes	2015
B2C Carsharing 2	Free-floating B2C car sharing service that operates over 5000 vehicles in seven countries worldwide and 12 cities. The company owns all vehicles. Apps for mobile devices allow users to locate, reserve, open, and start the vehicle	Inter-national	Yes	2011
B2C Carsharing 3	Station-based B2C car sharing service that operates in 400 cities in Germany, the Netherlands, Austria, and Switzerland. The company owns the vehicles and offers access via smartphone to approximately 4000 vehicles distributed across 2500 stations	Inter-national	Yes	2009
B2C Carsharing 4	Station-based B2C car sharing service that operates in Munich, Germany. The company owns the vehicles and offers access via smartphone to approximately 50 vehicles in the city. The peculiarity of this service is that it only uses hydrogen-fueled fuel cell vehicles	Regional	Yes	2016
B2C Carsharing 5	Small free-floating B2C car sharing service that operates solely with four electric vehicles in Landau, Germany. The service is provided by a local energy provider	Regional	Yes	2017
B2C Carsharing 6	Station-based B2C car sharing service that operates in seven cities in Germany. The company owns the vehicles and offers access via smartphone to approximately 250 vehicles distributed across 130 stations	National	Yes	2013

Table 5 (continued)

Organization	Description	Scope	Owns resources	Foun-ded
B2C Carsharing 7	Free-floating B2C car sharing service that operates with 140 vehicles in Berlin, Germany. Apps for mobile devices allow users to locate, reserve, open, and start the vehicle	Regional	Yes	2016
P2P Carsharing 1	P2P car sharing service that operates throughout Germany and other countries. The company connects private car owners and individuals who have a temporary need for a car. The duration of the rental varies from four hours to several days.	Inter-national	No	2010
P2P Carsharing 2	P2P car sharing service that operates throughout Germany. The company connects private car owners and individuals who have a temporary need for a car. This company allows the spontaneous rental of private vehicles via smartphone by installing a telematics box in the cars	National	No	2015
B2C scooter sharing	B2C scooter sharing that operates in two cities in Germany. The company owns the scooters and enables access to them via smartphone. Similar to a free-floating car sharing service, the scooters can be parked throughout the operated cities.	Regional	Yes	2014
B2C ride-sharing	Taxi sharing service that operates in two cities in Germany. The company mediates taxi rides among passengers to share the cost of the taxi with fellow passengers via a smartphone app. All taxi rides are provided by traditional taxi companies	Regional	No	2014
Carsharing association 1	Noncommercial car sharing association that offers access to 20 vehicles in Renningen, Germany. Environmentally conscious citizens founded the association in 1992 to offer car sharing. In this early period, no technology was used for sharing the vehicles	Regional	Yes	1992
Carsharing association 2	Noncommercial car sharing association with 280 members that offers access to 19 vehicles distributed across 12 stations in Augsburg, Germany. Members pay an admission fee and a small monthly fee	Regional	Yes	2001
Carsharing association 3	Noncommercial car sharing association with 80 members that offers access to eight vehicles in Markt Schwaben, Germany. Members pay an admission fee and a small monthly fee	Regional	Yes	1993
Carsharing association 4	Noncommercial car sharing association with 390 members that offers access to 19 vehicles in Vaterstetten, Germany. Members pay an admission fee. There is no monthly fee	Regional	Yes	1992

Table 6 Exemplary questions of the interview guideline

Topic	Exemplary question
Meta information	When was the organization founded?
Business model (general)	What would you say makes your idea, your organization special?
Marketing	In which way do you do marketing?
Users and actors	How would you define your target group?
Value propositions	What promise do you make to your customers, partners and/or supporters of all kinds?
Resource and capabilities	Which resources are crucial for the operation of your business model?
Execution, coordination and steering of transactions	Please describe how the transactions or exchanges will take place
Technology	What role does information technology play in your company?
Competitive environment	What measures do you take to deal successfully with competition?
Cooperation	What role does cooperation play for your business model?
Financing and costs	What are the most important costs associated with your business model?
Scalability	What do you think constitutes the success of your organization? Why does the idea work?

and, thereby, intensively dealt with the phenomenon of the sharing economy over a longer period of time, they are proven experts with theoretical and practical knowledge in that area that ideally can contribute to answer our research question. An overview of the interviewed persons (including the interviewee's function in the organization, interview date and length) is provided in Table 7. We combined different sources of evidence and triangulated interview data with firm presentations and data extracted from newspapers and websites. Most of our investigated organizations provide websites or apps for smartphones. Accordingly, we were able to triangulate the interviewee statements regarding technologies or features by screening and using the actual services offered. Figure 2 visualizes the steps of the data collection.

The interviews were conducted, recorded, and transcribed between October 2015 and April 2018. They had an average duration of 58 min and led to 462 pages of transcribed material. We deductively developed a framework for the analysis of the interviews by combining the conceptualization of service innovation (Lusch and Nambisan 2015) with the dual role of IT (Nambisan 2013). To ensure high-quality data analysis, we adhered to the principles of interpretative research proposed by Klein and Myers (1999). A four-step coding approach was applied to analyze the interviews: (1) identification of service innovations, (2) mapping, (3) linkage to the roles of IT, and (4) aggregation.

We first coded the interviews inductively regarding the service innovations enabled, facilitated or triggered by IT. In a second step, we mapped the identified service innovation to the conceptualization of service innovation by classifying it according to one of the three perspectives of service innovation. Third, we linked service innovation to one of the roles of IT by distinguishing between service innovations facilitated by IT and service innovations triggered by IT. Finally, we connected the identified service innovations with existing theoretical concepts from the

Table 7 Overview of interviews

Organization	#	Function	Date	Length
P2P carpooling	1	General manager	Nov 2015	88 min
	2	Head of business development	May 2016	79 min
	3	Head of marketing	Jul 2016	63 min
P2P ride-for-hire	4	General manager	Dec 2015	44 min
	5	Head of public affairs	Nov 2015	47 min
B2C Carsharing 1	6	General manager	Nov 2015	59 min
	7	Head of sales	Jun 2016	49 min
	8	Head of operations	May 2016	67 min
B2C Carsharing 2	9	Head of sales	Sep 2015	87 min
	10	Head of operations	Sep 2015	53 min
B2C Carsharing 3	11	Head of business development	Feb 2018	47 min
B2C Carsharing 4	12	General manager	Feb 2018	55 min
B2C Carsharing 5	13	Project manager	Feb 2018	58 min
B2C Carsharing 6	14	General manager	Feb 2018	50 min
B2C Carsharing 7	15	General manager	Mar 2018	52 min
P2P Carsharing 1	16	General manager	Jun 2016	46 min
P2P Carsharing 2	17	General manager	Feb 2018	56 min
B2C scooter sharing	18	General manager	Nov 2016	59 min
B2C ride-sharing	19	Business development manager	Apr 2016	55 min
Carsharing association 1	20	Chairman	Feb 2018	36 min
Carsharing association 2	21	Chairman	Mar 2018	56 min
Carsharing association 3	22	Chairman	Apr 2018	62 min
Carsharing association 4	23	Chairman	Apr 2018	64 min

Fig. 2 Visualization of the data collection process

literature in an iterative process (Orlikowski 1993). Figure 3 visualizes the coding process.

The coding is exemplified by the following quote from the CEO of a P2P carpooling organization:

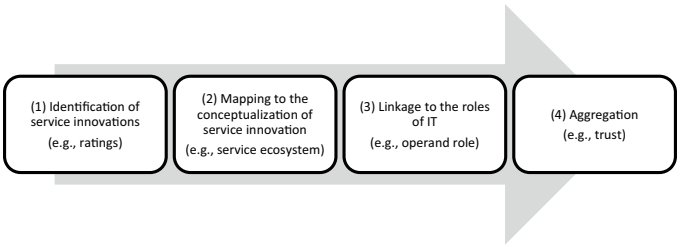

Fig. 3 Visualization of the coding process

> "With our products, we have to establish conditions […] that I step into his [a stranger's] car and ride with him from Berlin to Hamburg. This happens with ratings."

The organization uses technology (e.g., rating systems) to generate trust among the actors (driver and rider) (Newlands et al. 2019), which represents a service innovation. Because the rating system reduces uncertainty among a network of actors, this service innovation is mapped to the service ecosystem. Finally, the innovation has to be assigned to a role of IT. The rating system is used to execute a task (e.g., generation of trust) and acts as a facilitator. Therefore, this innovation can be classified as an operand resource. Then, we searched for other service innovations facilitating trust. Together with these other trust-enhancing service innovations (e.g., profiles and pictures of the driver), a higher category called "trust among actors" emerged. Accordingly, the rating system was aggregated to that higher category. In the very rare cases, that one interviewee from one organization initially disagreed on a specific statement of another interviewee of the same organization, we followed a consensual approach and asked them to develop a shared position on the statement

Table 8 Exemplary coding table

Overarching category	Sub-category	Description
Trust among actors	Ratings	Showing of ratings (e.g., star ratings) of the transaction partner (e.g., resource provider)
	User comments	User generated content on the characteristics of the shared resources or the transaction partner
	Pictures	Pictures of the shared resources or the transaction partner
	User profiles	Online available user profiles with descriptions of the transaction partner
	Content validation	Validated content by a third-party (e.g., verified user data)
	Background checks	Background checks necessary to offer resources for sharing on the platform (e.g., good-conduct certificates)
	Automatic recording/ tracking)	Automatic recording and tracking of the transaction (e.g., tracking of user location)
	Emergency features	Special trust-enhancing emergency features (e.g., SOS-button in an app)

(Kumar et al. 1993). This approach resolves potential discrepancies among the interviewees and increases the validity of the data (Glick et al. 1990). Table 8 exemplifies the aggregation process for the category trust among actors. A full coding overview can be found in the "Appendix".

4 Results

This section describes the analysis of the role of IT in service innovation. We structured the results according to the three elements of service innovation: service ecosystem, service platform, and value co-creation (Lusch and Nambisan 2015). The results are summarized in Table 9.

4.1 Service ecosystem

Our analysis shows that according to the service ecosystem perspective, the investigated organizations solely use IT as an operand resource. IT enables and facilitates the service ecosystem in four different ways. First, IT is used as a facilitator to ensure the transparency of the value created and to communicate how and what value is created by using the service. For instance, one organization achieves this by stating the advantages of using the service on its website:

> "One […] challenge is to communicate that value is created through the intermediation of millions of people and that this [intermediation] cannot be accomplished by two guys out of a garage." (I3)

> "The promise is to go from A to B […] at very low prices while being social and sustainable." (I2)

> "There is a considerable proportion of our customer group who are convinced that car sharing is about the environment, resources or the general public.

Table 9 The role of IT in service innovation in the sharing economy

Role of IT		Service Ecosystem	Service Platform	Value co-creation
Operand	Service Operation	Transparency of value Shared worldview Engagement in service	Digital platform Optimization of supply and demand (incl. pricing) Market liquidity	Matching of supply and demand Adaption of internal processes Mechanisms facilitating interaction among actors
	Transaction Evaluation	Trust among actors		Outcome transparency
Operant			Development of new services	Unique user experience

> Therefore, visibility for the fuel cell and hydrogen mobility is actually the most important issue for us." (I12)

Once users understand the benefits of using a particular sharing service, the initial effort to make them engaged should be kept as low as possible. Therefore, sharing platforms must ensure that cognitively distant actors have a common institutional logic and adopt a shared worldview. This includes a common set of values and cultural assumptions (Lusch and Nambisan 2015). IT facilitates the control of the ecosystems to identify users violating the desired standard of the network due to inappropriate behavior (e.g., harassment), the attempt to circumvent security features of the platform (e.g., identification of fake accounts), or undercutting quality standards for service provision (e.g., extreme driving style). This, for instance, leads to the exclusion of users from the service:

> "There is no obligation to admit everyone [to the network]. If someone writes that he will only pick up women under 30 […] then this is not the right platform [for him]. […] This is inappropriate and, therefore, we block them [this kind of user]." (I1)

> "This [user data] helps to decide, in extreme cases, if a user has to be blocked from the platform, since he does not behave in a way that we want or that the majority of fellow human beings expects." (I4)

Additionally, IT (e.g., social media) is used to react to circumstances negatively influencing the shared worldview (e.g., inaccurate information about the service) or positively affecting a shared worldview (e.g., the charging of electric vehicles):

> "There are many rumors and incorrect information. […] To be ready to always answer questions online, to conciliate or to deal with people, is central." (I3)

> "The important thing is to send a signal, especially through Facebook and other online media, that if you charge the cars, it will be a better experience for the next customer. Therefore, we try to encourage customers to charge them that way." (I10)

In addition to sharing a common worldview, encouraging actors to join the network is important for the usage of sharing offers. According to the service ecosystem perspective, IT can facilitate this activity by offering easy onboarding processes (e.g., user registration):

> "The onboarding process works fully digitally including the verification [of driver's licenses]. I scan my license via the app, upload it, and then I automatically receive a digital verification." (I18)

Encouraging actors to join the network also takes place by leveraging inexpensive approaches to marketing (e.g., social media and SEO), providing monetary incentives (e.g., discounts for new actors), or reactivating inactive users (e.g., CRM or push notifications on smartphones). The following quotes exemplify some of these activities:

> "For marketing, of course social media such as Facebook […] are very important aspects." (I19)

> "We have an Instagram account for local insider tips in Berlin. We try to establish a connection to our customers and want to say: go to the coolest locations with our cars." (I15)

> "We have collected a lot of money. 80% of it goes to price subsidies because our business only works at a low price if there is enough demand in the system and the drivers truly only have a few minutes' vacancy. The only way you can do that is to guarantee the price right from the start. You're actually paying 6€ for a ride, but it actually should cost 12€ for the driver to somehow make ends meet. We will then automatically add 6€ via our payment system." (I5)

In addition to the facilitation of operations, another important role of a market intermediary is to provide trust (Weber 2014). Some of the investigated organizations use several mechanisms facilitated by IT to generate trust among the involved actors, as highlighted by the following quote:

> "Evaluation and ratings, trust, and background checks, as well as verification of persons […] are major elements regarding technology." (I5)

In addition to popular online reputation systems such as ratings for transactions, user profiles, pictures of users and shared resources, background checks (e.g., proof of driver's license or certificates of good conduct) contribute to the creation of trust:

> "We tell our users, that […] it's not anonymous what happens here, lots of data will be verified, and you will get a rating at the end of the ride." (I1)

In certain circumstances, the popular trust-enhancing mechanisms mentioned above need to be extended with the additional collection of data (e.g., GPS tracking of a ride) or special emergency features (e.g., in-app SOS buttons) to support trust building:

> "We have found that good-conduct certificates are of no value in India. Anyone can have 24 rupees to wash them clean. That is why we have an SOS button in the app in India, that you can press at any time and that is directly connected to a police station. The police stations there have an overview of the trips and drivers and can then take direct action." (I4)

4.2 Service platform

From the service platform perspective, the investigated organizations employed IT as both an operand and operant resource. IT as an operand resource contributes to the provision of the digital platform, to optimize resources, pricing, and market liquidity, whereas IT as an operant resource triggers the development of new services.

IT is used as an operand resource to enable and facilitate the *Digital Platform* itself and contributes to the reliability, scalability, speed, flexibility, and usability of the digital platform. The digital platforms' dependence on technology is illustrated in the following quotes:

> "Without technology it [the service provision] would not be possible." (I7)

> "If the technology does not work, all the rest does not work." (I16)

> "The app is the linchpin of our business—including the other technologies that follow, such as in-car technology. Without IT, nothing would work. This is the core of the business idea." (I15)

Even for noncommercial car sharing associations that started their service offline 15 or more years ago, technology plays a crucial role for their service provision today:

> "Without the internet, our thing would not work. If we had to run a telephone hotline to make the reservations, we would die. Online booking is mandatory. Otherwise, car sharing is nonsense; you can offer a hotline if you are a giant organization, but for us it is not possible." (I22)

> "It would not be possible today without a smartphone. Fifteen years ago, we actually started with a key box to which everyone had access. Today, it is no longer conceivable that it could work in this form." (I20)

Furthermore, IT contributes as a facilitator to the optimization of supply and demand. To optimize the amounts of provided and demanded resources, the investigated organizations use target marketing (e.g., to increase supply of the shared resource):

> "Depending on the utilization […] it becomes very specific. […] We need more drivers on a certain route at a certain time. […] Then, we target our marketing to that area and try to address the users there more selectively." (I2)

Organizations also gather real-time data on the shared resource (e.g., location or fuel) to optimize the number of vehicles in a certain area, if the organization owns the shared resource, or to detect hotspot areas:

> "If a customer […] didn't park the car with a quarter of the fuel tank, […] then I could send an employee to refuel." (I8)

In addition to the above-mentioned examples, IT also facilitates the optimization of supply and demand by enabling different pricing strategies. The investigated organizations either use IT to identify the customer's willingness to pay, apply surge pricing, give price suggestions (e.g., automated calculated prices) to the resource provider, or adjust prices depending on the time of the day:

> "If you have high demand and the supply side cannot serve the demand, then the prices increase. […] Higher prices mean that first demand is decreasing,

> […] and second drivers [supply side] get motivated to stay online or to get online, because they earn more money." (I4)

> "We have the rule that prices we suggest are clearly below operating costs, and even if a driver wants to increase the price, he can increase the suggested price only by a maximum of 50%." (I1)

Balancing demand and supply only makes sense if there are enough users on both sides of the market. Accordingly, IT also plays a facilitating role in increasing market liquidity. Most of the investigated organizations connect their service to partners to increase the reach of potential customers on the supply and demand sides. This is achieved with interfaces, for instance, by using application programming interfaces (API) to enable data exchange with other service providers and to connect the service through booking portals and websites:

> "We have an API […] where these corporations [online travel agencies] have access. They are able to retrieve [information] on all of our rides, […] and you just have to click to get redirected [to the organization's platform]." (I2)

By contrast, instead of opening their own systems, organizations can also connect to other partner organizations. IT, for instance, facilitates access to the services of other organizations using the same technology (e.g., the vehicles of other station-based car sharing providers) or cooperation with other mobility providers:

> "We begin to connect ourselves as an ecosystem for mobility, to get into […] booking systems, connect to airlines […] to get broader access." (I5)

As mentioned above, according to the service platform perspective, IT is also used as an operant resource. One organization uses data mining on the shared resources to discover novel opportunities for service provision. By collecting tremendous amounts of data and identifying idle capacities, new potentials for service provision (e.g., delivery services for food and parcels) were discovered:

> "Once the systems are running in the cities, you can strap on food delivery or parcel delivery." (I5)

4.3 Value co-creation

From a value co-creation perspective, IT in our sample is also used as an operand and operant resource. In its operand role, IT facilitates the matching of supply and demand, adoption of internal processes to accommodate different actors, interaction among actors, and increased transparency regarding the outcome of a transaction. As an operant resource, technology triggers new user experiences.

As an operand resource, IT contributes to the matching of supply and demand and, therefore, to value creation itself. Most of the transactions moderated by sharing economy organizations theoretically could be performed without the usage of technology, but IT enables an easy and extensive matching that facilitates the creation of value and the rapid development of the phenomenon:

> "We have to assemble a technology which enables matching [of supply and demand] in an easy manner. […] Before the internet, in Germany, this was done by car sharing agencies. […] That was so complicated. Therefore, it did-not become a large phenomenon." (I1)

After matching supply and demand, the investigated organizations offer various measures to support the subsequent transactions in the form of adopting their processes to accommodate different actors. For instance, the execution of the transaction is facilitated by offering usability features to support the connection of digital and physical resources (Frey et al. 2019), such as the opening of car sharing vehicles by smartphone:

> "[We offer] technical solutions for access to vehicles, […] that you can open the car with your smartphone, even if the car is parked in underground parking with no network connection." (I16)

> "We have a partner with whom we cooperate on the telematics boxes in the cars. With us you can click on the screen of the app and the car opens directly." (I17)

Additionally, booking systems with online payments and automated billing support the transactions:

> "The debit occurs automatically via PayPal. […] I don't have to do anything for the payment." (I4)

In addition to these examples, the adaption of workflows to local conditions (e.g., special versions of the app for different countries) also facilitates the execution of the transaction:

> "For user experience improvements, we adapt the entire workflows of the app. [This is] partially regional, since customers in the USA are used to dealing with an app differently than [customers] in Europe." (I9)

Another important area of support for value creation is the facilitation of interaction among actors (Lusch and Nambisan 2015). The investigated organizations use IT as an operand resource to communicate with customers directly or to support interaction among the actors involved in the intermediated transaction. IT is, for instance, used to gather direct feedback from the customers (e.g., for service improvements), to facilitate complaint management (e.g., if the customer is not satisfied with the transaction or the service in general), or to proactively identify potential problem users, to contact them and to take remedial actions (e.g., training for drivers with bad ratings):

> "In the beginning […] we had a kind of website, where [customers] could enter suggestions which other users could judge […]. Thereby, we got a lot of feedback regarding product extensions." (I9)

> "You can reply to every email receipt […], no matter where you are, in every language, and you will get redirected to employees able to speak the language, and you can complain or give feedback." (I4)

> "There is a cascade of offenses someone can do, and there are appropriate triggers [to take remedial actions]. […] Then, they [users with bad ratings] are convoked for extra trainings." (I5)

In addition to direct interaction with customers, IT is used to facilitate interaction among the involved actors to support the actual execution of the transaction. Booking systems with communication tools (e.g., chats) and mechanisms for supporting the physical meeting of actors (e.g., maps to display locations of the shared resource or to locate other actors) improve the transaction:

> "If I cannot display the exact location of a vehicle, the customer will always pass by and wonot find it; that's the death of our business model." (I18)

> "I see the name, the number plate, the kind of car, how far he [the driver] is away from me, and I see him approaching me on the map. Then, I get into the vehicle and have already entered the destination." (I4)

Additionally, IT supports the transfer of the shared resource (e.g., with smartphone support), as illustrated by the following quote:

> "You don't necessarily need a smartphone [for the handover of a vehicle], […] but you can do it with a digital handover by smartphone." (I16)

Lusch and Nambisan (2015) argue that IT can be important in enhancing transparency in value creation activities. Organizations exploiting IT to create trust among actors in the service ecosystem also use IT as a facilitator for creating transparency regarding the outcome of a transaction. This is achieved by displaying certain characteristics of the transaction that could potentially influence the perceived quality of the transaction (e.g., ladies-only options, accepted luggage, or detour) or the characteristics of the actual service provider (e.g., communication level of actors or driving style):

> "You can say that you want to get picked up in front of your door, or you can say that you accept a 5 min walk to get picked up. […] Everything is communicated via the app." (I19)

> "You specified on your profile, that you don't smoke and that you like pets. […] Here, you have three potential drivers, choose one." (I2)

Although having specified preferences and characteristics, there are some special conditions (e.g., higher prices) that may lead to increased potential for conflict. Therefore, the investigated organizations offer a transaction confirmation, which contributes to the outcome transparency of a transaction and ensures that the expectations of actors are aligned:

> "If the demand is high, the ride costs 1.2 or 1.5 times the normal price. As the user, you have to state explicitly "yes," […] and then later on you cannot claim 'I did not recognize it [the higher price]'." (I4)

In general, improvements in service depend substantially on technology, as highlighted by the following quote:

> "Of course, we try to improve our service, and 90% of this is always an IT question. Therefore, there are very few things they can improve without IT, maybe to clean the cars more often. However, it's almost always about IT." (I14)

We also find evidence that IT serves as an operant resource by triggering the creation of a unique user experience. For instance, if the IT initiates new changes (e.g., unique algorithms) that enable a radical reduction in the waiting time for transactions by pooling formerly non-connected transactions to reduce costs for each of the involved actors:

> "The system recognizes, when you are arriving […] and takes this calculation into account in advance […] to patch that with the next ride [of that driver]. […] Through this technology, you will get a car which is closer to you. […] And that implementation of technology is hard to achieve." (I5)

Additionally, the smart integration of different transport modes into a single application creates a unique user experience for the user and serves as a competitive feature for the organization:

> "[The basic functions of our service] can be easily developed by competitors—it's not rocket science. What is much more difficult is the integration of several transport modes, which we all have in our portfolio as a rail company and integrate quite simply." (I11)

In addition to smart integration with other services, sharing economy organizations also need to integrate the real world and the digital world due to the physical element inherent in sharing transactions. New technologies could trigger new options to connect physical and digital goods (e.g., special hardware for unlocking electronic scooters), as illustrated by the following quote:

> "We integrate an electronic data transmission system in the scooter. […] It's a challenge to operate that system with the existing [poor] power sources [in a scooter]." (I18)

We conducted a cross-case analysis to explore differences in the role of IT in the service innovation of the investigated organizations. To do so, we compared the different areas of service innovation and the corresponding role of IT in each case organization. Thereby, we identified similarities and differences in our cases. We identified unexplored interdependencies between the service ecosystem and value co-creation. We also found that not all investigated organizations exploit IT as an operant resource from the service platform or the value co-creation perspective and that not all organizations use IT as an operand resource for supporting transaction evaluation. We grouped the case organizations according to the patterns that emerged in the different areas of service innovation. Accordingly, four different archetypes for the role of IT in service innovation emerged, as discussed below.

5 Discussion

The aim of this study was to gain insights into the role of IT in digital service innovation by drawing on qualitative data from sharing economy organizations. We find that the role of IT is dependent on the heterogeneity of actors and shared resources and the intention of the organization to standardize transactions. Based on four identified archetypes, we discuss the interplay between service innovation and the role of IT as exploited by sharing economy organizations. The section concludes by highlighting the contributions and limitations of the study and provides opportunities for future research.

5.1 Archetypes for the role of IT in service innovation

The cross-case analysis reveals four different archetypes for the role of IT in service innovation as illustrated in Table 10 and discussed below. The columns indicate the role of IT exploited by each case organization for specific service innovation areas, whether the organizations share resources that they own and the archetype assigned to each case organization.

All investigated organizations use IT as an operand resource to facilitate the operation of the service from all three perspectives on service innovation, for instance, to create a shared worldview in the service ecosystem, to optimize the proportion of resources from the service platform perspective, or to facilitate interaction among actors from the value co-creation perspective. Only organizations enabling the sharing of outside resources (not owned by the organization) use IT to facilitate transaction evaluation (e.g., to create trust among the actors or to enhance the outcome transparency of a transaction). Organizations exploiting both operand roles of IT without using IT as an operant resource are described by the archetype broad facilitator, whereas organizations simply relying on the operand role of IT as a service operation facilitator are referred to as service operation facilitators. Four of the investigated organizations apply IT as an operant resource from the value co-creation perspective (e.g., algorithms to provide new user experiences), and one of the organizations additionally uses IT as an operant resource in the service platform (e.g., data mining to discover new value propositions). We refer to an organization using IT as an operant resource from the value co-creation perspective as value creation differentiator and organizations exploiting both operant roles of IT as broad differentiators.

Providing consistent quality of sharing transactions is important for the success of a sharing economy organization (Täuscher and Kietzmann 2017). Therefore, the archetype service operation facilitator seems to be suitable for organizations offering highly standardized transactions by sharing their own resources (e.g., a B2C car sharing company or a noncommercial car sharing association) and having very limited resources for technology development. Because the provider of the resource is known and the outcome of every transaction is standardized, there is no need to facilitate transaction evaluation (e.g., trust among actors or enhancing outcome transparency). In contrast to the B2C car sharing 2 and 3 in our sample,

Table 10 Case organizations and the exploited role of IT

Role of IT	Operand		Operant		Sharing own resources	Archetype
Cases	Service operation	Transaction evaluation	Platform differentiation	Value creation differentiation		
P2P carpooling	X	X			No	Broad facilitator
B2C ride-sharing	X	X			No	Broad facilitator
P2P carsharing 1	X	X			No	Broad facilitator
P2P carsharing 2	X	X			No	Broad facilitator
B2C carsharing 1	X				Yes	Service operation facilitator
B2C carsharing 4	X				Yes	Service operation facilitator
B2C carsharing 5	X				Yes	Service operation facilitator
B2C carsharing 6	X				Yes	Service operation facilitator
B2C carsharing 7	X				Yes	Service operation facilitator
Carsharing association 1	X				Yes	Service operation facilitator
Carsharing association 2	X				Yes	Service operation facilitator
Carsharing association 3	X				Yes	Service operation facilitator
Carsharing association 4	X				Yes	Service operation facilitator
B2C scooter sharing	X			X	Yes	Value creation differentiator
B2C carsharing 2	X			X	Yes	Value creation differentiator
B2C carsharing 3	X			X	Yes	Value creation differentiator
P2P ride-for-hire	X	X	X	X	No	Broad differentiator

the other investigated B2C car sharing services applying this approach offer a car sharing model with regional focus. Therefore, their resources for developing or sensing new (operant) technologies are limited. However, providing segment-specific services (e.g., limited to a certain region) may enable organizations to compete in the sharing economy (Mocker and Fonstad 2017). The following quote confirms this statement:

> "We want to complete the local public transport [in the operating city] with car sharing. […] We will connect to others [car sharing providers], but that is not our core. We want to serve [name of city], and […] that is a different approach." (I6)

Organizations exploiting the broad facilitator approach mediate resources that belong to different actors without providing their own resources. Due to the heterogeneity of actors (e.g., driving style or social characteristics) and resources (e.g., condition of the car), trust among actors and the outcome transparency of the transaction are very important aspects. This finding is in line with the numerous studies on trust in the sharing economy (e.g., Ert et al. 2016; Hawlitschek et al. 2018; Hofmann et al. 2017; Huurne et al. 2017; Shao and Yin 2019). Additionally, this kind of organization enables the sharing of personal resources that generally have high emotional or monetary value that could affect someone's life (e.g., the car itself or a service operated in a car). Even if technology could trigger smart and new ways to mitigate these issues and to reduce the necessity for personal interaction (e.g., Pazaitis et al. 2017), users might prefer a high level of personal interaction or involvement in the transaction itself (Newlands et al. 2019). This fosters the idea that the sharing economy is an experience economy (Johnson and Neuhofer 2017). Similar to the findings of Wiles and Crawford (2017) in the context of the hospitality sector of the sharing economy, the following quotes highlight the importance of personal interaction in transactions for broad facilitators in the mobility sector of the sharing economy:

> "For all involved parties, it's important to know, […] if that truly is the registered person. […] The hirer wants to know who is driving my car, and the renter wants to know whose car he's riding in." (I16)

> "We know that for many regular drivers, the social aspect is very important. […] They meet some younger people, which they would not get in contact with normally and have a nice conversation. […] That is truly a central argument." (I3)

Our data indicate that sharing economy organizations, although heavily reliant on technology (e.g., Heo 2016; Möhlmann 2015), rarely exploit IT as an operant resource. As users of sharing economy services perceive utilitarian value when using these offers (Akbar 2019; Hwang and Griffiths 2017), organizations implementing IT as an operant resource for value creation seem to focus on standardizing the transaction and thereby increasing the efficiency of their service and reducing the personal interaction among the involved actors. First, organizations in our sample achieve a high standardization of the transaction by providing their own,

homogenous resources for sharing. As mentioned above, therefore, there is no need to facilitate transaction evaluation. Second, to additionally increase the efficiency of the service, this kind of organization needs to enhance the connection between the digital and physical worlds (Frey et al. 2019). To connect actors with the physical resource used for the transaction, value creation differentiators, for instance, develop unique hardware to connect vehicles with consumers or unique algorithms, taking into account the locations of actors or resources for a more efficient matching and to reduce the need for personal interaction, as illustrated in the following quotation:

> "You press [a button], go down the stairs […] and if you arrive downstairs, it [the car] goes on ahead. […] There is no need to talk [to the driver]. […] You reach the destination, and in the end the app is handling the routing and there is no need to handle money." (I5)

We also identified an archetype exploiting IT as an operant resource from both the service platform and value co-creation perspectives (broad differentiator). Organizations following that approach seem to strive for standardization and efficiency in their transactions and reducing personal interaction, although not sharing own resources. Unique algorithms for increasing efficiency and reducing the need for personal interaction are operant resources from the value co-creation perspective. As leveraging existing capabilities is a way to gain competitive advantage in the sharing economy (Mocker and Fonstad 2017), these organizations use IT as an operant resource according to the service platform perspective (e.g., data mining) to discover novel value propositions. Thereby, our results underpin the important role of data for these kinds of organizations (e.g., Trabucchi and Buganza 2019; Urbinati et al. 2019). However, due to high investments to achieve efficiency in the system, other options for generating revenue are necessary and to achieve liquidity in the system to make the business model work in the long run. This confirms the finding by Constantiou et al. (2017), that complementing existing product portfolios with related services is an effective countermeasure against competitors in the sharing economy. Furthermore, as a result of the usage of outside resources, mechanisms for enhancing the transaction evaluation (operand) are preferable for this kind of organization.

In summary, it became apparent that the more transactions are standardized and the more the business model is dependent on efficiency, the more IT acts as an operant resource. Table 11 provides an overview of the applicability of the different archetypes.

5.2 Contributions and limitations

The exploration of the role and scope of IT in service systems remains at an early stage (Akaka and Vargo 2014). Therefore, the aim of this study is to contribute to literature in two ways. First, we respond to the call for future research by Barrett et al. (2015) and enrich the understanding of digitally enabled service innovation in the context of transformational information and communication technologies. We empirically validate the conceptual framework of service innovation

Table 11 Applicability of archetypes

Archetype	Broad facilitator	Service operation facilitator	Value creation differentiator	Broad differentiator
Applicability	+Sharing of outside resources +Heterogeneous actors and resources +High level of personal interaction	+Sharing of own resources +Standardized transactions +Limited resources for technology development	+Sharing of own resources +Standardized transactions +Resources to develop unique technology	+Sharing of outside resources +Standardized transactions and efficiency +Low level of personal interaction

developed by Lusch and Nambisan (2015) in the context of the sharing economy. Additionally, we extend the conceptualization of service innovation (Lusch and Nambisan 2015) by the operand and operant role of IT (Nambisan 2013) to gain an even deeper understanding of service innovation. Thereby, we complement studies on the enabling role of technology for innovation in other areas (Dell Era et al. 2018) and on the importance of operant resources in the sharing economy (Abhari et al. 2019). According to Trenz et al. (2018), the investigation of the value creation is one of the most urgent topics in sharing economy research. We contribute to this literature stream by assessing value creation in service innovation while distinguishing between different roles of the digital resources and actors involved (Nambisan 2018). Our results substantiate findings that consumers extract a combination of functional and social value from sharing economy offerings (e.g., Catulli et al. 2017; Richter et al. 2017). We also contribute to the service innovation literature by uncovering different areas for service innovation within the S-D framework (e.g., transaction evaluation). The more fine-grained understanding of those areas enabled us to identify previously unexplored dependencies between two elements of the service innovation framework, namely, between the service ecosystem and value co-creation for transaction evaluation. Our study provides guidance for combining particular service innovations and illustrates the operand and operant role of IT. We show which resources, actors and value co-creation practices are needed for service innovation in the context of the sharing economy. Thereby, our study sheds light on the more granular components that shape service innovation and, correspondingly, responds to the rather abstract discourses of value creation in the sharing economy (Rihova et al. 2015).

Second, we propose a typology of four archetypes of the role of IT in service innovation and provide an understanding of how and why sharing economy organizations exploit IT. As the identification of archetypes is important for knowledge integration (Okhuysen and Bonardi 2011), we discovered four archetypes for the role of IT in service innovation: broad facilitator, service operation facilitator, value creation differentiator, and broad differentiator. Thereby, we provide novel insights into the exploitation of technology in service firms and contribute to the service innovation literature by linking formerly isolated views on the different roles of IT and service innovation. For sharing economy

organizations bridging physical and digital services (Frey et al. 2019), it appears that the choice of a particular role for IT is conditional on the level of heterogeneity and standardization of the mediated transaction. Thus, IT-driven service innovations are exploited to overcome the unique constraints that sharing business models can entail. Witell et al. (2016) argue that an overall perspective on service innovation facilitates theory building and effective operationalization of service innovation in future studies. Accordingly, other researchers could use our findings to make the further examination of this phenomenon more manageable by delimiting their work to certain archetypes or to create an overarching understanding of service innovation in the context of the sharing economy. Additionally, this may serve as foundation for the generalization (Bailey 1994) of the role of IT in service innovation in further works.

This also leads to several implications for practice. This study highlights certain roles of IT applied in sharing economy organizations and provides insights for technology and platform development in these firms. Managers of these organizations could use our findings to guide their decisions on whether to invest in IT-driven service innovations and to specify areas for new developments. This, for instance, enables decision-makers and business development managers of sharing economy organization to systematically improve and expand their business. In manufacturing, the emergence of technologies such as 3D printing or the internet of things has already exhibited disruptive impact on entire value chains (Ferrás-Hernández et al. 2019), often referred to as Industry 4.0 (Agarwal and Brem 2015). For service firms, practitioners could use the framework consisting of the areas for service innovation and the role archetypes to spot such disruptive innovations early. Using the framework would help to identify developments in their market environment and to compare their business with competitors, for instance, to identify and develop platform features to improve their service offerings. This also enables a systematic identification of advantages and disadvantages of the offering (e.g., Wiprächtiger et al. 2019) and consequently supports executives of sharing economy organizations in their considerations on strategic investments such as the adoption of blockchain technology (Pazaitis et al. 2017), the integration of virtual reality components in their service, or opening the service to partner organizations for external collaboration (Jugend et al. 2018; Olk and West 2019). Based on the operand and operant roles, managers can also identify how IT can be used as a competitive resource for differentiating their business when entering the sharing economy market. Depending on the available resources and the desired transaction type, some managers may decide to focus on the development of unique technology as a competitive strategy, whereas others may use standard technologies and differentiate their business by partnerships (e.g., to get exclusive access to parking spaces for car sharing vehicles).

However, we need to acknowledge some limitations of our study. First, we focused on sharing economy organizations in Germany in the mobility sector. Although the results might be different for other countries or sectors, we chose a sample within the same regulatory system and industry to ensure comparability of the cases. Second, in line with our interpretive qualitative stance, we acknowledge

that reality is socially constructed and collected data are subject to human interpretation (e.g., Walsham 1995). To address this issue, we triangulated our collected data with other sources such as newspaper, websites or company reports (Yin 2009). As most of these services provide websites or apps for smartphones, we were able to review the statements of the interviewees regarding technologies or features by screening and using these services for ourselves.

Third, in contrast to quantitative research with high sample sizes, our results may be limited in statistical generalizability due to the relatively small sample size compared to a quantitative survey. However, interpretative case study research doesn't strive for statistical generalization but rather for contributing to understanding the phenomenon in its specific context (Orlikowski 1993). According to (Yin 2013), the manner of generalizing from case study research is more in the form of making a conceptual generalization and, therefore, should provide explanations for how and why the object of investigation produced results (or not). As we are able to provide explanations for how and why IT is used for service innovation in sharing economy organizations, we argue that our findings can be conceptually generalized for sharing economy organization acting in the mobility sector.

5.3 Opportunities for future research

Our findings and the described limitations lead to promising avenues for future research. First, our study focused on sharing economy organizations providing mobility services. Although we chose this focus to delimit our work and to make the findings comparable, validating our results in other contexts could be very promising (e.g., Chandna and Salimath 2018). For instance, a replication of our study in the context of accommodation sharing services such as Airbnb or wimdu could lead to interesting findings since the booking of an accommodation typically is well planned and takes place in advance. Therefore, hosts and guests may not require a high degree of efficiency and standardization of the shared accommodations. This could lead to different implications of the role of IT in service innovation for accommodation sharing platforms. Our study also focused on sharing economy organizations in Germany. The political debate surrounding Uber and Airbnb shows that different countries and even municipalities are taking different regulatory steps against or in favor of the sharing economy (e.g., Biber et al. 2017; Loewenstein 2017; Zale 2016). The differences in the regulatory setting could also have direct implications for the technology that sharing economy firms exploit to operate their business. Therefore, it would be interesting to compare our study with results from other countries that are less regulated or even more restrictive in dealing with the sharing economy than Germany.

Second, our results indicate how and why IT is exploited for service innovation in sharing economy organizations. However, it remains unclear how the different roles of IT contribute to the long-term success of these organizations. Therefore, the influence of the different service innovations and the corresponding value they create

on the firm performance remains unclear. A promising way to answer this question is a quantitative research approach. In the context of manufacturing firms, studies already provide empirical evidence on positive financial effects when implementing selected innovative technologies such as blockchain (Pan et al. 2019). To assess the impact that IT-based service innovations with different roles play in sharing economy organizations, future research could develop measurement scales to operationalize the different roles of IT for these kinds of organizations. In a second step, these measurements could be used to quantify the impact of the different roles of IT on the performance of the investigated organizations, for instance, by linking the role of IT to financial data of the organization. This would provide first insights, on potential relationships among the role of IT and the organizational performance. Benitez et al. (2018a) showed that this relationship may vary over time for manufacturing firms. Therefore, an investigation of the long-term success of sharing economy organizations should consider panel data to uncover the dynamic relationship between roles of IT and performance metrics.

Third, building on our findings from this study, we observed that the majority of the identified service innovations are focused on the creation of functional and utilitarian value (e.g., efficiency gains or matching supply and demand), although social or aesthetic aspects are an important part of value creation (e.g., D'Ippolito and Timpano 2016; Helkkula et al. 2018; Xue 2019). It remains unclear how service innovations for the creation of noneconomic value such as gamification features or mechanisms to improve the social experience of the service contribute to the success of a sharing economy platform. Therefore, future studies could investigate how platform features to create noneconomic value influence the perceived value of a sharing economy platform and how this leads to usage of sharing offers on that platform.

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Appendix

See Table 12.

Table 12 Coding table

Overarching category	Sub-category	Exemplary statements
Service ecosystem		
Transparency of value	Perception of value	"… promise to come from A to B at very low prices …"
	Communication of value	"…challenge is to communicate that value is created through the intermediation…"
Shared worldview	Handling inappropriate behavior	"… a user has to be blocked […] since he doesn't behave in a way that we want…"
	Reaction on negative behavior	"… there are a lot of rumors or incorrect information. To be ready to always conciliate […] is central…"
	Facilitating positive behavior	"… we try to encourage customers to put [the electric vehicles] charging…"
Encouraging actors to join the network	Easy onboarding processes	"… onboarding process works fully digitally…"
	Cheap ways for marketing	"…we have an Instagram account […] to establish a connection to our customers…"
	Monetary incentives for users	"… we have collected quite a lot of money. 80% of it goes in price subsidies…"
	Reactivation of inactive users	"… with CRM we try to reactivate inactive users, for instance, by trigger mails…"
Trust among actors	Ratings	"…ratings […] are major elements…"
	User comments	"… it's important to know which experiences users made with a certain driver…"
	Pictures	"…it's important to strengthen the network character […], for instance, by using photos…"
	User profiles	"… we need to create trust among the actors by offering user profile functions …"
	Content validation	"… it's not anonymous what happens here, several data will be verified…"
	Background checks	"… we have background checks for documents and driver licenses…"

Table 12 (continued)

Overarching category	Sub-category	Exemplary statements
	Automatic recording/tracking)	"… we saw via GPS tracking which road the driver took…"
	Emergency features	"…we have a SOS button in the app […] that is directly connected to a police station…"
Service platform		
Digital platform	–	"…without technology it [service provision] would not be possible…"
Optimization of demand and supply	Balancing demand and supply	"…we need more drivers on a certain route […] we target our marketing to that area…"
	Assure operation	"… through real time data we see, if a customer did not park the car with a quarter of the fuel tank, I could send an employee to refuel…"
	Pricing	"… if you have high demand […] then the prices increase […] and drivers are motivated to stay online…"
Market liquidity	Open own system to partner providers	"… we have an API where [partner] firms have access […] to retrieve our entire rides […] to get redirected to our platform…"
	Connect to other mobility providers	"… we begin to connect ourselves as a ecosystem for mobility…"
Development of new services	–	"…once the systems are running […] you can strap on food delivery or parcel delivery…"
Value co-creation		
Matching of supply and demand	–	"… we have to assemble a technology which enables matching [of supply and demand} in an easy manner…"

Table 12 (continued)

Overarching category	Sub-category	Exemplary statements
Adoption of internal processes	Usability features to connect physical and digital world	"… [we offer] technical solution for access to vehicles [„.] with your smartphone…"
	Facilitation of transaction (back end)	"…the debit occurs automatically via PayPal…"
	Adoption of workflows to local conditions	"…we adopt the entire workflows of the app […] since customers in the USA are used to deal with an app differently than in Europe…"
Mechanisms facilitating interaction among actors	Direct contact with customers	"…you can reply to every e-mail receipt […] and you will get redirected to employees able to speak your language…"
	Support for physical meeting	"…I see […] him [driver] approaching me on the map…"
	Facilitation of resource handover	"… you don't need necessarily a smartphone [for the handover], […] but you can do it with a digital handover by smartphone …"
Outcome transparency	Displaying transaction characteristics	"… you specified […] that you do not smoke and that you like pets. […] Here you have three potential drivers, choose one…"
	Transaction confirmation	"… as user you have to state explicitly yes […] that you later cannot claim 'I did not recognize it [the higher prices]…"
Unique user experience	–	"… The game changer is that you do not have to think about how to get to your destination anymore, you just press a button in the app and go down the stairs and your car will drive up…"

References

Abhari K, Davidson EJ, Xiao B (2019) Collaborative innovation in the sharing economy: profiling social product development actors through classification modeling. Internet Res. https://doi.org/10.1108/INTR-03-2018-0129

Acquier A, Daudigeos T, Pinkse J (2017) Promises and paradoxes of the sharing economy: an organizing framework. Technol Forecast Soc Change 125:1–10

Agarwal N, Brem A (2015) Strategic business transformation through technology convergence: implications from general electric's industrial internet initiative. Int J Technol Manag 67(2/3/4):196–214

Akaka MA, Vargo SL (2014) Technology as an operant resource in service (eco)systems. IseB 12(3):367–384

Akbar P (2019) Guiding empirical generalization in research on access-based services. J Bus Res 100:16–26

Bailey KD (1994) Typologies and taxonomies: an introduction to classification techniques. Sage, London

Bardhan IR, Demirkan H, Kannan PK, Kauffman RJ, Sougstad R (2010) An interdisciplinary perspective on IT services management and service science. J Manag Inform Syst 26(4):13–64

Bardhi F, Eckhardt GM (2012) Access-Based consumption: the case of car sharing. J Consum Res 39(4):881–898

Barnes SJ, Mattsson J (2016) Understanding current and future issues in collaborative consumption: a four-stage Delphi study. Technol Forecast Soc Change 104:200–211

Barrett M, Davidson E, Prabhu J, Vargo SL (2015) Service innovation in the digital age: key contributions and future directions. MIS Q 39(1):135–154

Baumber A, Scerri M, Schweinsberg S (2019) A social licence for the sharing economy. Technol Forecast Soc Change 146:12–23

Belk R (2014) Sharing versus pseudo-sharing in Web 2.0. The Anthropologist 18(1):7–23

Benitez J, Chen Y, Teo TSH, Ajamieh A (2018a) Evolution of the impact of e-business technology on operational competence and firm profitability: a panel data investigation. Inform Manag 55(1):120–130

Benitez J, Ray G, Henseler J (2018b) Impact of information technology infrastructure flexibility on mergers and acquisitions. MIS Q 42(1):25–43

Bertschek I, Erdsiek D, Trenz M (2016) IT outsourcing-a source of innovation? Microeconometric evidence for Germany. Manag Decis Econ 38:941–954

Bhatt GD, Grover V (2005) Types of information technology capabilities and their role in competitive advantage: an empirical study. J Manag Inform Syst 22(2):253–277

Biber E, Light SE, Ruhl JB, Salzman J (2017) Regulating business innovation as policy disruption: from the Model T to Airbnb. Vanderbilt Law Rev 70(5):1561–1626

Boons F, Bocken N (2018) Towards a sharing economy – Innovating ecologies of business models. Technol Forecast Soc Change 137:40–52

Botsman R, Rogers R (2010) What's mine is yours: the rise of collaborative consumption, 1st edn. Harper Business, New York

Cainelli G, Evangelista R, Savona M (2006) Innovation and economic performance in services: a firm-level analysis. Camb J Econ 30(3):435–458

Carr NG (2003, May) IT doesn't matter. Harvard Business Review, pp 5–12

Casprini E, Di Minin A, Paraboschi A (2019) How do companies organize nascent markets? The BlaBlaCar case in the inter-city shared mobility market. Technol Forecast Soc Change 144:270–281

Catulli M, Cook M, Potter S (2017) Consuming use orientated product service systems: a consumer culture theory perspective. J Clean Prod 141:1186–1193

Chakravarty A, Grewal R, Sambamurthy V (2013) Information technology competencies, organizational agility, and firm performance: enabling and facilitating roles. Inform Syst Res 24(4):976–997

Chan SL (2000) Information technology in business processes. Bus Process Manag J 6(3):224–237

Chan YE, Huff SL, Barclay DW, Copeland DG (1997) Business strategic orientation, information systems strategic orientation, and strategic alignment. Inform Syst Res 8(2):125–150

Chandna V, Salimath MS (2018) Peer-to-peer selling in online platforms: a salient business model for virtual entrepreneurship. J Bus Res 84:162–174

Chen J-S, Tsou HT, Huang AY-H (2009) Service delivery innovation: antecedents and impact on firm performance. J Serv Res 12(1):36–55

Cohen B, Kietzmann J (2014) Ride on! Mobility business models for the sharing economy. Organ Environ 27(3):279–296
Constantiou I, Eaton B, Tuunainen VK (2016) The evolution of a sharing platform into a sustainable business. In: HICSS 2016 Proceedings, Koloa, USA
Constantiou I, Marton A, Tuunainen VK (2017) Four models of sharing economy platforms. MIS Q Exec 16(4):231–251
Coombs R, Miles I (2000) Innovation, measurement and services: the new problematique. In: Metcalfe JS, Miles I (eds) Innovation systems in the service economy. Springer, New York, pp 85–103
Cui T, Wu Y, Tong Y (2018) Exploring ideation and implementation openness in open innovation projects: IT-enabled absorptive capacity perspective. Inform Manag 55(5):576–587
Cullen J (2008) Catalyzing innovation and knowledge sharing Librarian 2.0. Bus Inform Rev 25(4):253–258
D'Ippolito B, Timpano F (2016) The role of non-technological innovations in services: the case of food retailing. Creat Innov Manag 25(1):73–89
Darke P, Shanks G, Broadbent M (1998) Successfully completing case study research: combining rigour, relevance and pragmatism. Inform Syst J 8(4):273–289
Dell Era C, Altuna N, Verganti R (2018) Designing radical innovations of meanings for society: envisioning new scenarios for smart mobility. Creat Innov Manag 27(4):387–400
Dewan S, Ren F (2011) Information technology and firm boundaries: impact on firm risk and return performance. Inform Syst Res 22(2):369–388
Dominguez-Péry C, Ageron B, Neubert G (2013) A service science framework to enhance value creation in service innovation projects. An RFID case study. Int J Prod Econ 141(2):440–451
Dörner N, Gassmann O, Gebauer H (2011) Service innovation: why is it so difficult to accomplish? J Bus Strategy 32(3):37–46
Dotzel T, Shankar V, Berry LL (2013) Service innovativeness and firm value. J Mark Res 50(2):259–276
Dreyer B, Lüdeke-Freund F, Hamann R, Faccer K (2017) Upsides and downsides of the sharing economy: collaborative consumption business models' stakeholder value impacts and their relationship to context. Technol Forecast Soc Change 125:87–104
Eardley A, Shah H, Radman A (2008) A model for improving the role of IT in BPR. Bus Process Manag J 14(5):629–653
Eisenhardt KM (1989) Building theories from case study research. Acad Manag Rev 14(4):532–550
Eisenmann TR, Parker G, Van Alstyne MW (2006) Strategies for two-sided markets. https://hbr.org/2006/10/strategies-for-two-sided-markets. Retrieved 6 Jul 2015
Ert E, Fleischer A, Magen N (2016) Trust and reputation in the sharing economy: the role of personal photos in airbnb. Tour Manag 55:62–73
Ertz M, Durif F, Arcand M (2016) Collaborative consumption: conceptual snapshot at a buzzword. J Entrep Educ 19(2):1–23
Ferrás-Hernández X, Armisen-Morell A, Sabata-Alberich A, Tarrats-Pons E, Arimany-Serrat N (2019) The new manufacturing. in search of the origins of the next generation manufacturing start-ups. Int J Innov Technol Manag 16(02):1950014
Freese C, Schönberg T, Horstkötter D (2014) Shared mobility—how new businesses are rewriting the rules of the private transportation game. https://www.rolandberger.com/publications/publication_pdf/roland_berger_tab_shared_mobility_1.pdf. Retrieved 28 Apr 2019
Frey A, Trenz M, Veit D (2019) Three differentiation strategies for competing in the sharing economy. MIS Q Exec 18(2):6. https://aisel.aisnet.org/misqe/vol18/iss2/6
Gansky L (2010) The mesh why the future of business is sharing. Penguin Publishing Group, New York
Gawer A (2014) Bridging differing perspectives on technological platforms: toward an integrative framework. Res Policy 43(7):1239–1249
Geissinger A, Laurell C, Sandström C (2018) Digital disruption beyond Uber and Airbnb—tracking the long tail of the sharing economy. Technol Forecast Soc Change. https://doi.org/10.1016/j.techfore.2018.06.012
Ghazawneh A, Henfridsson O (2013) Balancing platform control and external contribution in third-party development: the boundary resources model. Inform Syst J 23(2):173–192
Giessmann A, Legner C (2016) Designing business models for cloud platforms. Inform Syst J 26(5):551–579
Glick WH, Huber GP, Miller CC, Doty DH, Sutcliffe KM (1990) Studying changes in organizational design and effectiveness: retrospective event histories and periodic assessments. Organ Sci 1(3):293–312

Gregor S, Martin M, Fernandez W, Stern S, Vitale M (2006) The transformational dimension in the realization of business value from information technology. J Strateg Inform Syst 15(3):249–270
Grenha Teixeira J, Patrício L, Huang K-H, Fisk RP, Nóbrega L, Constantine L (2017) The MINDS method: integrating management and interaction design perspectives for service design. J Serv Res 20(3):240–258
Grosse-Ophoff A, Hausler S, Heineke K, Möller T (2017) How shared mobility will change the automotive industry| McKinsey. https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/how-shared-mobility-will-change-the-automotive-industry. Retrieved 21 May 2019
Hagiu A (2009) Multi-sided platforms: from microfoundations to design and expansion strategies. Harvard Business School Strategy Unit Working Paper 09–115, pp 1–26
Häikiö J, Koivumäki T (2016) Exploring digital service innovation process through value creation. J Innov Manag 4(2):96–124
Hamari J, Sjöklint M, Ukkonen A (2015) The sharing economy: why people participate in collaborative consumption. J Assoc Inform Sci Technol 67(9):2047–2059
Hawlitschek F, Notheisen B, Teubner T (2018) The limits of trust-free systems: a literature review on blockchain technology and trust in the sharing economy. Electron Commer Res Appl 29:50–63
Helkkula A, Kowalkowski C, Tronvoll B (2018) Archetypes of service innovation: implications for value cocreation. J Serv Res 21(3):284–301
Henten AH, Windekilde IM (2016) Transaction costs and the sharing economy. Info 18(1):1–15
Heo CY (2016) Sharing economy and prospects in tourism research. Ann Tour Res 58:166–170
Hertog PD, Gallouj F, Segers J (2011) Measuring innovation in a 'low-tech' service industry: the case of the dutch hospitality industry. Serv Ind J 31(9):1429–1449
Hofmann E, Hartl B, Penz E (2017) Power versus trust—what matters more in collaborative consumption? J Serv Mark 31(6):589–603
Huurne M, Ronteltap A, Corten R, Buskens V (2017) Antecedents of trust in the sharing economy: a systematic review. J Consum Behav 16(6):485–498
Hwang J, Griffiths MA (2017) Share more, drive less: millennials value perception and behavioral intent in using collaborative consumption services. J Consum Mark 34(2):132–146
Johnson A-G, Neuhofer B (2017) Airbnb—an exploration of value co-creation experiences in Jamaica. Int J Contemp Hosp Manag 29(9):2361–2376
Joshi A, Bollen L, Hassink H, De Haes S, Van Grembergen W (2018) Explaining it governance disclosure through the constructs of IT governance maturity and IT strategic role. Inform Manag 55(3):368–380
Jugend D, Jabbour CJC, Alves Scaliza JA, Rocha RS, Junior JAG, Latan H et al (2018) Relationships among open innovation, innovative performance, government support and firm size: comparing Brazilian firms embracing different levels of radicalism in innovation. Technovation 74–75:54–65
Kamal P, Chen J (2016) Trust in sharing economy. In: PACIS 2016 Proceedings, Chiayi, Taiwan
Karimi J, Walter Z (2015) The Role of dynamic capabilities in responding to digital disruption: a factor-based study of the newspaper industry. J Manag Inform Syst 32(1):39–81
Klein HK, Myers MD (1999) A set of principles for conducting and evaluating interpretive field studies in information systems. MIS Q 23(1):67–93
Kumar N, Stern LW, Anderson JC (1993) Conducting interorganizational research using key informants. Acad Manag J 36(6):633–1651
Laudon KC, Laudon JP (2014) Management information systems: managing the digital firm, 13th edn. Pearson Education Limited, Essex
Loewenstein MJ (2017) Agency law and the new economy. Bus Lawyer 72(4):1009–1045
Lusch RF, Nambisan S (2015) Service innovation: a service-dominant logic perspective. MIS Q 39(1):155–175
Lusch RF, Vargo SL, Tanniru M (2010) Service, value networks and learning. J Acad Mark Sci 38(1):19–31
Lutz C, Newlands G (2018) Consumer segmentation within the sharing economy: the case of Airbnb. J Bus Res 88:187–196
Maglio PP, Spohrer J (2008) Fundamentals of service science. J Acad Mark Sci 36(1):18–20
Malhotra A, Van Alstyne M (2014) The dark side of the sharing economy … and how to lighten it. Commun ACM 57(11):24–27
Mata FJ, Fuerst WL, Barney JB (1995) Information technology and sustained competitive advantage: a resource-based analysis. MIS Q 19(4):487–505

Mitra S (2005) Information technology as an enabler of growth in firms: an empirical assessment. J Manag Inform Syst 22(2):279–300
Mocker M, Fonstad NO (2017) How AUDI AG is driving toward the sharing economy. MIS Q Exec 16(4):279–293
Möhlmann M (2015) Collaborative consumption: determinants of satisfaction and the likelihood of using a sharing economy option again. J Consum Behav 14(3):193–207
Nambisan S (2013) Information technology and product/service innovation: a brief assessment and some suggestions for future research. J Assoc Inform Syst 14(4):215–226
Nambisan S (2018) Architecture vs. ecosystem perspectives: reflections on digital innovation. Inf Organ 28(2):104–106
Nambisan S, Lyytinen K, Majchrzak A, Song M (2017) Digital innovation management: reinventing innovation management research in a digital world. MIS Q 41(1):223–238
Nan N, Tanriverdi H (2017) Unifying the role of IT in hyperturbulence and competitive advantage via a multilevel perspective of IS strategy. MIS Q 41(3):937–958
Newlands G, Lutz C, Fieseler C (2019) The conditioning function of rating mechanisms for consumers in the sharing economy. Internet Res. https://doi.org/10.1108/INTR-03-2018-0134
O'Cass A, Wetzels M (2018) Contemporary issues and critical challenges on innovation in services. J Prod Innov Manag 35(5):674–681
Oh W, Pinsonneault A (2007) On the assessment of the strategic value of information technologies: conceptual and analytical approaches. MIS Q 31(2):239–265
Okhuysen G, Bonardi J-P (2011) The Challenges of building theory by combining lenses. Acad Manag Rev 36(1):6–11
Olk P, West J (2019) The relationship of industry structure to open innovation: cooperative value creation in pharmaceutical consortia. R&D Manag. https://doi.org/10.1111/radm.12364
Ordanini A, Parasuraman A (2011) Service innovation viewed through a service-dominant logic lens: a conceptual framework and empirical analysis. J Serv Res 14(1):3–23
Orlikowski WJ (1993) CASE tools as organizational change: investigating incremental and radical changes in systems development. MIS Q 17(3):309–340
Overby E, Bharadwaj A, Sambamurthy V (2006) Enterprise agility and the enabling role of information technology. Eur J Inform Syst 15(2):120–131
Pan X, Pan X, Song M, Ai B, Ming Y (2019) Blockchain technology and enterprise operational capabilities: an empirical test. Int J Inform Manag. https://doi.org/10.1016/j.ijinfomgt.2019.05.002
Parente RC, Geleilate J-MG, Rong K (2018) The sharing economy globalization phenomenon: a research agenda. J Int Manag 24(1):52–64
Pazaitis A, De Filippi P, Kostakis V (2017) Blockchain and value systems in the sharing economy: the illustrative case of Backfeed. Technol Forecast Soc Change 125:105–115
Pedersen ERG, Netter S (2015) Collaborative consumption: business model opportunities and barriers for fashion libraries. J Fash Mark Manag 19(3):258–273
Plattfaut R, Niehaves B, Voigt M, Malsbender A, Ortbach K, Poeppelbuss J (2015) Service innovation performance and information technology: an empirical analysis from the dynamic capability perspective. Int J Innov Manag 19(4):1–30
Plewnia F, Guenther E (2018) Mapping the sharing economy for sustainability research. Manag Decis 56(3):570–583
PWC (2017). Sharing economy report. https://www.pwc.de/de/digitale-transformation/share-economy-report-2017.pdf. Retrieved 28 Apr 2019
Ravichandran T, Lertwongsatien C (2005) Effect of information systems resources and capabilities on firm performance: a resource-based perspective. J Manag Inform Syst 21(4):237–276
Richter C, Kraus S, Brem A, Durst S, Giselbrecht C (2017) Digital entrepreneurship: innovative business models for the sharing economy. Creat Innov Manag 26(3):300–310
Rifkin J (2014) The zero marginal cost society: the internet of things, the collaborative commons, and the eclipse of capitalism. Palgrave Macmillan, New York
Rihova I, Buhalis D, Moital M, Gouthro M-B (2015) Conceptualising customer-to-customer value co-creation in tourism: C2C co-creation in tourism. Int J Tour Res 17(4):356–363
Rivard S, Raymond L, Verreault D (2006) Resource-based view and competitive strategy: an integrated model of the contribution of information technology to firm performance. J Strateg Inform Syst 15(1):29–50

Roberts N, Grover V (2012) Leveraging information technology infrastructure to facilitate a firm's customer agility and competitive activity: an empirical investigation. J Manag Inform Syst 28(4):231–270
Sambamurthy V, Bharadwaj A, Grover V (2003) Shaping agility through digital options: reconceptualizing the role of information technology in contemporary firms. MIS Q 27(2):237–263
Santhanam R, Hartono E (2003) Issues in linking information technology capability to firm performance. MIS Q 27(1):125–153
Sarker S, Xiao X, Beaulieu T (2013) Qualitative studies in information systems: a critical review and some guiding principles. MIS Q 37(4):3–28
Schumpeter JA (1934) The theory of economic development. Harvard University Press, Cambridge
Shao Z, Yin H (2019) Building customers' trust in the ridesharing platform with institutional mechanisms: an empirical study in China. Internet Res. https://doi.org/10.1108/INTR-02-2018-0086
Shin N (2001) The impact of information technology on financial performance: the importance of strategic choice. Eur J Inform Syst 10(4):227–236
Skålén P, Gummerus J, von Koskull C, Magnusson PR (2015) Exploring value propositions and service innovation: a service-dominant logic study. J Acad Mark Sci 43(2):137–158
Snyder H, Witell L, Gustafsson A, Fombelle P, Kristensson P (2016) Identifying categories of service innovation: a review and synthesis of the literature. J Bus Res 69(7):2401–2408
Sordi JD, Perin MG, Petrini M de C, Sampaio CH (2018) Construal level and collaborative consumption: an exploratory approach. Int J Consum Stud 42(2):264–273
Statista (2017) Ranking der wertvollsten digitalen Start-Ups weltweit 2017| Statistik. https://de.statista.com/statistik/daten/studie/157889/umfrage/ranking-der-wertvollsten-digitalen-start-ups/. Retrieved 16 Aug 2018
Sundararajan A (2016) The sharing economy: the end of employment and the rise of crowd-based capitalism. The MIT Press, Cambridge
Tallon PP (2010) A service science perspective on strategic choice, IT, and performance in US banking. J Manag Inform Syst 26(4):219–252
Tallon PP, Kraemer KL, Gurbaxani V (2000) Executives' perceptions of the business value of information technology: a process-oriented approach. J Manag Inform Syst 16(4):145–173
Täuscher K, Kietzmann J (2017) Learning from failures in the sharing economy. MIS Q Exec 16(4):253–264
Teece DJ (2007) Explicating dynamic capabilities: the nature and microfoundations of (sustainable) enterprise performance. Strateg Manag J 28(13):1319–1350
Tiwana A, Konsynski B, Bush AA (2010) Research commentary—platform evolution: coevolution of platform architecture, governance, and environmental dynamics. Inform Syst Res 21(4):675–687
Trabucchi D, Buganza T (2019) Fostering digital platform innovation: From two to multi-sided platforms. Creat Innov Manag, 1–14
Trenz M, Frey A, Veit D (2018) Disentangling the facets of sharing: a categorization of what we know and don't know about the sharing economy. Internet Res 28(4):888–925
Tussyadiah IP (2016) Factors of satisfaction and intention to use peer-to-peer accommodation. Int J Hosp Manag 55:70–80
Urbinati A, Bogers M, Chiesa V, Frattini F (2019) Creating and capturing value from Big Data: a multiple-case study analysis of provider companies. Technovation 84–85:21–36
Vannoy SA, Salam AF (2010) Managerial interpretations of the role of information systems in competitive actions and firm performance: a grounded theory investigation. Inform Syst Res 21(3):496–515
Vargo SL, Lusch RF (2004) Evolving to a new dominant logic for marketing. J Mark 68(1):1–17
Vargo SL, Lusch RF (2007) Service-dominant logic: continuing the evolution. J Acad Mark Sci 36(1):1–10
Veit D, Clemons E, Benlian A, Buxmann P, Hess T, Kundisch D et al (2014) Business models—an information systems research agenda. Bus Inform Syst Eng 6(1):45–53
Walsh B (2011) 10 ideas that will change the world in time magazine. http://content.time.com/time/specials/packages/article/0,28804,2059521_2059717_2059710,00.html. Retrieved 17 Aug 2018
Walsham G (1995) Interpretive case studies in IS research: nature and method. Eur J Inform Syst 4(2):74–81
Wang N, Liang H, Zhong W, Xue Y, Xiao J (2012) Resource structuring or capability building? an empirical study of the business value of information technology. J Manag Inform Syst 29(2):325–367
Weber TA (2014) Intermediation in a sharing economy: insurance, moral hazard, and rent extraction. J Manag Inform Syst 31(3):35–71

Webster J, Watson RT (2002) Analyzing the past to prepare for the future. MIS Q 26(2):13–23
Wiles A, Crawford A (2017) Network hospitality in the share economy: understanding guest experiences and the impact of sharing on lodging. Int J Contemp Hosp Manag 29(9):2444–2463
Wiprächtiger D, Narayanamurthy G, Moser R, Sengupta T (2019) Access-based business model innovation in frontier markets: case study of shared mobility in Timor-Leste. Technol Forecast Soc Change 143:224–238
Witell L, Snyder H, Gustafsson A, Fombelle P, Kristensson P (2016) Defining service innovation: a review and synthesis. J Bus Res 69(8):2863–2872
Xue J (2019) An investigation into the effects of product design on incremental and radical innovations from the perspective of consumer perceptions: evidence from China. Creat Innov Manag. https://doi.org/10.1111/caim.12329
Yin RK (2009) Case study research: design and methods, 5th edn. Sage Publications, Los Angeles
Yin RK (2013) Validity and generalization in future case study evaluations. Evaluation 19(3):321–332
Zale K (2016) When everything is small: the regulatory challenge of scale in the sharing economy. San Diego Law Rev 53(4):949–1016
Zervas G, Proserpio D, Byers J (2017) The rise of the sharing economy: estimating the impact of Airbnb on the hotel industry. J Mark Res 54(5):687–705
Zott C, Amit R (2010) Business model design: an activity system perspective. Long Range Plan 43(2):216–226