![LUT University logo]

Design knowledge for digital business ecosystems: towards design principles for digital engagement platforms

Michalke Simon, Lohrenz Lisa, Siemon Dominik, Lattemann Christoph, Robra-Bissantz Susanne

Please cite the publication as follows:

Design knowledge for digital business ecosystems: towards design principles for digital engagement platforms

Simon Michalke, Lisa Lohrenz, Dominik Siemon, Christoph Lattemann and Susanne Robra-Bissantz

<a>INTRODUCTION

Modern technologies, globalization, and deregulation have led to the development of co-creative organizational ecosystems heavily reliant on digital technologies (Senyo et al., 2019). In these ecosystems, heterogeneous actors integrate knowledge and resources to their mutual benefit (Edvardsson et al. 2011). This co-creation of value in complex ecosystems has created some of the most successful companies such as Amazon, Apple, and Google, further driving other competitors to engage in co-creative interactions as well. However, the management of value co-creation was and still remains a challenge (Senyo et al. 2019). To address this challenge, a new view is needed that considers firms as part of ecosystems that engage in complex modes of collaboration, compared to viewing them as isolated entities. The Service Logic (Vargo and Lusch, 2004; Grönroos 2011; Lusch and Nambisan, 2015) encloses this perspective and defines three central elements: value co-creation, service platforms, and service ecosystems (Lusch and Nambisan, 2015). With the digital transformation, these service platforms and ecosystems increasingly rely on information and communication technologies (ICT) and therefore become digital business ecosystems (DBE) (Nachira et al. 2007) and digital service platforms (Göbel and Cronholm, 2016).

Actors on these platforms contribute a specific set of resources, which are - on an individual level - not sufficient for a comprehensive service provision. Therefore, value co-creation is of pivotal importance. The term "actors" includes companies, government agents, customers, or any other contributor of valuable, complementary resources. These heterogeneous actors join DBE to efficiently and effectively integrate resources to co-create value for the (mutual) benefit of one or multiple actors. E.g., the DBE that has been established by Uber provides a highly efficient platform to customers and mobility service providers. While Uber provides the underlying digital platform, other actors integrate central resources such as cars and drivers. The DBE then further relies on mechanisms to ensure these resources, costs, and revenues contribute to the actors' (mutual) benefits of successfully building a larger user base and motivating them to participate (Lohrenz et al., 2021b). Drawing from this example, the importance of digital platforms to enable and facilitate value co-creation in DBE is widely acknowledged (Hein et al. 2019). However, as the term digital platform lacks conceptual clarity (de Reuver et al. 2018), we rely on the concept of engagement platform (EP) in this paper. Breidbach and Brodie (2017) define an EP as a "physical or virtual touchpoint designed to provide structural support for the exchange and integration of resources, and thereby co-creation of value, between actors in a service (eco)system." (p. 594) Google, for example, established several EPs to control the customer's experience in a vast EP landscape by providing both physical (Chrome book) and virtual touchpoints (e.g., Google Playstore). The concept of EP stems from central themes of Service Logic, thus providing a fitting lens and conceptual basis for assessing interaction on EPs that constitute the density, structural integrity, and liquefaction of resources in DBE (Lusch and Nambisan, 2015).

The successful development and management of an EP relies on the design of governance structures and mechanisms that need to attract and bind a critical mass of actors, balance their heterogeneous interests, and ensure future success by service innovation, i.e., improving the service experience of actors (Alt 2020, Tiwana et al. 2010, Lusch and Nambisan, 2015).

In order to facilitate value co-creation in a DBE, an EP needs to enable and enhance co-creation, co-learning, and co-design of novel services and improved service experiences (Fu et al., 2018; Lusch and Nambisan, 2015; Ordanini and Parasuraman, 2011). While the digital platform literature is rapidly growing in Information Systems (IS) research, there is a lack of prescriptive guidelines on designing

and implementing mechanisms to improve the core feature of EP: enabling and fostering value co-creation among its actors (Fischer et al. 2020, Senyo et al. 2019). Therefore, our research question is: *How can value co-creation on EPs be enabled and improved?*

Conceptually, our study design draws from 1) the Service Logic, which is inherently focused on value co-creation of actors in (service) ecosystems (e.g. Vargo et al., 2008; Lusch and Nambisan, 2015), and from 2) the methodological approach Design Science Research (DSR) (Hevner et al. 2004, Gregor et al. 2020) that describes a practice-informed process to identify and solve complex problems which are undoubtedly existent in the design of an EP. The DSR approach provides an important addition to description-driven research that explains a problem´s nature yet lacks prescriptive insights about managerial solutions (Gregor and Jones, 2007). By employing this approach, we seek to provide more relevant and applicable findings to practitioners, while also contributing to the existing design knowledge formulated by scholars. The combination of DSR and Service Logic is motivated by two calls for research: Firstly, while Service Logic literature is growing in popularity, there is still a lack of practical knowledge in this domain (Vargo and Lusch 2016; Blaschke et al. 2019). Combining the theoretical foundation of Service Logic and the prescriptive DSR approach, thus provides a clear fit to address practical relevance. Secondly, de Reuver et al. (2017) calls specifically for DSR to shed light on how digital platform providers may shape platforms to enter and survive in constantly changing markets successfully. By linking DSR, Service Logic, and digital platform literature, we address related design problems and solutions with specific design principles. To this end, 14 semi-structured expert interviews have been conducted to derive a comprehensive set of design principles.

This paper´s remainder is structured as follows: First, we outline and link the theoretical concepts of Service Logic, DBE and EPs, followed by describing our methodological approach. In the results section, we will present our established design principles alongside the identified mechanisms and enactors. Finally, we conclude this paper by discussing our findings and outlining which topics to focus on in the future.

THEORETICAL BACKGROUND

This section provides an overview of core concepts and presents how Service Logic and DBE research streams are interconnected.

Digital Business Ecosystems and Engagement Platforms

The rapid technological advances of recent decades have led to the development of collaborative networks heavily reliant on digital technologies (Senyo et al. 2019). This affords organizations with innovative information technology structures to respond to customer needs. Consequently, competitive advantages arise that can be realized in most industries and have led to a surge in DBE activity and growth across industries (Hein et al. 2019). Senyo et al. (2019, p. 54) define DBE "as a socio-technical environment of individuals, organizations and digital technologies with collaborative and competitive relationships to co-create value through shared digital platforms." Stemming from this definition and drawing from the substantially growing literature on DBE, a digital platform is a central component that enables and enhances value co-creation in DBE (Hein et al. 2019; Senyo et al. 2019). The actors that engage in value co-creation on EPs include customers, service providers, customer communities, and corporate networks with distinctive needs and resources (Edvardsson et al., 2011). Therefore, the key challenge lies not necessarily in developing the technological architecture but instead in governing a heterogeneous group of actors within an interrelated ecosystem, striving to address constant external and internal change (Schreieck et al., 2016).

As EPs usually host two or more distinctive actor groups (e.g., suppliers, buyers, platform vendors, third-party service providers), an initial and potentially persisting challenge of balancing and growing an actor base with complementary or rivaling interests exists (Gawer and Cusumano, 2014). To this end, EPs need to support a continued influx of new actors, e.g., by lowering the barriers to adapt to existing processes and cultures (Göbel and Cronholm, 2016). Additionally, collaboratively developed pricing and cost mechanisms that remain fair throughout the ecosystem´s existence should be introduced, thereby ensuring a motivating environment for established and new actors on the EP (Blaschke et al., 2019).

Supporting value co-creation, as stated earlier, is a central property of an EP. Activities and mechanisms to improve value co-creation include involving external actors and communities to improve the density of value co-creation on EPs (Blaschke et al., 2019; Hein et al., 2019), coordination and control of the interaction, but also to provide the freedom to (collaboratively) introduce new and improved offerings among heterogeneous actors (Aulkemeier et al., 2019). While the support of value co-creation in the DBE through EP is essential (Göbel and Cronholm, 2016), attracting and maintaining a critical mass of actors relies on the ability to offer new or enhanced services and improve the overall service experience (Breidbach et al., 2015). Otherwise, rivaling platforms might benefit from low switching costs and technological advances and thus exert pressure on incumbent platforms to improve the actor´s service experience (Fu et al., 2018; Hein et al., 2020).

As illustrated above, DBE and platform research achieved an overwhelming consensus that the success of EPs is directly reliant on their ability to allow and enhance value co-creation (i.e., the process in which diverse actors integrate resources for their mutual benefit) and service innovation (Lusch and Nambisan, 2015). Against this backdrop, the Service Logic is a widely popular and highly appropriate lens to examine value co-creation processes in DBE and the EPs with noticeable conceptual ties (e.g., Hein et al., 2019). To provide an overview of the specific theoretical background we draw from in this chapter, figure 1 depicts five concepts related to ecosystems, platforms, and value co-creation. The relationship of these concepts is elaborated further in the next section.

Place Figure 1 about here

Figure 1: Conceptualizations of ecosystem, platform, and value co-creation from information systems and Service Logic literature

<b>Service Logic and Engagement Platforms in digital Business Ecosystems

For more than a decade, there has been a major discussion on the conceptualization of services before Vargo and Lusch (2004) developed and popularized an overarching Service Logic, which resonates with researchers across diverse fields (Barrett et al., 2015). To simplify the terminology, and in line with the suggestion from Ojasalo and Ojasalo (2018), the term "Service Logic" is used in this research, referring to the basic principles of the service-dominant logic (Vargo and Lusch, 2004), service logic (Grönroos, 2011) and customer-dominant logic (Heinonen et al., 2010) which are tightly interwoven.

A central principle of this Service Logic is that a service´s value is not provided but offered by an actor as a value proposition that can be engaged to co-create value (Vargo and Lusch, 2004). Therefore, value is always co-created with one or multiple beneficiaries and contributes to the well-being of multiple actors, sometimes even those unaware of each other (Vargo and Lusch, 2017). The co-created value is always phenomenologically determined by the beneficiary depending on their particular context of use (value-in-use) (Grönroos, 2011; Vargo and Lusch, 2004). The context in which value is created for the beneficiary underlies constant changes as actors and their resources join and leave service ecosystems (Lusch and Nambisan, 2015). Service ecosystems are "relatively self-contained self-adjusting systems of resource-integrating actors connected by shared institutional arrangements and mutual value creation through service exchange" (Vargo and Lusch, 2017, p. 11).

Enabling and enhancing co-creation, co-learning, and co-design of novel services highlight an EP´s potential towards value co-creation facilitation on DBE (Fu et al., 2018; Ordanini and Parasuraman, 2011). With a growing number of heterogeneous actors and their distinctive needs, developing and sustaining successful DBEs depends on successfully governing a heterogeneous group of actors within an interrelated service ecosystem striving to address constant external and internal change. Thus, the digital infrastructure that enables value co-creation, i.e., the EP, needs to provide actor-specific solutions via a singular technological platform (Schreieck et al., 2016). To vitalize value co-creation activities on EPs, different ways of organizing actors to reach innovation opportunities (i.e. structural flexibility) and mechanisms to understand and design actor interactions in a network (i.e. structural integrity) should be considered to foster DBEs (Lusch and Nambisan, 2015). This effort, however, requires close attention to how individuals within the focal DBE are influenced by structural properties (Edvardsson et al., 2011). Therefore, EPs must equally support value co-creation and provide space to collaborate.

Consequently, successful EPs rely on a set of activities to enable and foster value co-creation (Lohrenz et al., 2021a).

<a>METHODOLOGY

We base our research project on the systematic and iterative DSR paradigm proposed by Hevner et al. (2004). The overarching goal and the contribution of DSR are the generation of so-called design knowledge, which can take different forms and is used to design artifacts more rigorously than traditional design or engineering methods. Vom Brocke et al. (2020) state that in order to create design knowledge, the accumulation and evolution across different artifacts and application areas (in our case, EPs) is substantial and a resilient relationship between problem and solution spaces is necessary. By accumulating different justified components (e.g., design principles and instantiations) of design knowledge, design theories emerge. Design knowledge and especially design theories are important for both research and practice to understand how various artifacts and mechanisms work and how they should be designed to reach a constituted goal (e.g., actor acceptance) (Gregor et al. 2020). Therefore, DSR is an essential addition to description-driven research that explains the nature of a problem, yet usually neglects to produce prescriptive insight about managerial solutions (Gregor and Jones, 2007). Consequently, our objective is to contribute design knowledge for EPs to improve value co-creation among DBE actors in the form of design principles.

As single contributions and fields of application "tend to remain isolated with little to no relation to other solutions" (vom Brocke et al. 2020, p. 3), we gather insights from 14 existing EPs in order to create comprehensive and transferable design knowledge by conducting qualitative expert interviews. We opted to employ a qualitative approach as we suspect DBE and EP to be dynamic rather than a static environment with a reality that is hardly "measurable" (Minchiello et al. 1990). These 14 identified artifacts also serve as expository instantiations, as they describe existing and functioning EPs.

A list of 136 relevant EPs with active communities in the DACH region (Germany (D), Austria (A), and Switzerland (CH)) was composed based on publicly available data. In May 2020, 14 companies agreed to give interviews that lasted, on average, 52 minutes. Participants are, on average, 40 years old, with three female and eleven male experts. The interviews were conducted via phone and video conference tools. To ensure homogeneity and the interviewees' qualification as experts, we limited our sample to either founders, CEOs, or managers of two-sided B2C transaction platforms in the personal service sector that exist for at least two years.

Platform (Focus)	Position
Animus (Living Quarters)	Bus. Dev. Mgr
Care (Childcare)	New Bus. Mgr.
Einkaufshelden (Local Shopping)	Founder
ExtraSauber (Cleaning Services)	Founder
Homesitter-Eu (House Sitting)	Founder
Jobruf (Consumer Services C2C)	Founder
MyFeelix (Finance and Insurance)	Sales Manager
MyHammer (Craftsman Services)	CEO
MyHelpBuddy (Multi-lingual Assist)	Founder
Nebenan (Neighborhood Activities)	Founder
Notfallmamas (Childcare)	Founder
Pengueen (Collaboration Activities)	CEO
Sandkasten (Student Initiatives)	Founder
Yoopies (Childcare)	Sales Manager

Table 1. Interview partners

An interview guideline was developed based on existing design requirements and principles for EPs (Fischer et al. 2020). It consisted of five parts: (1) introduction of the interviewee and basic information of the company, (2) elaboration of functional aspects and actor constellations on the platform, (3) elaboration of interaction and value co-creation activities, (4) elaboration of service innovation processes, approaches and actor engagement and (5) elaboration of additional platform design aspects. In line with Miles and Hubermanns (1994), we used codes to analyze the data at hand and defined an initial set of general codes based on four key categories for designing EP (Fischer et al., 2020). As several coding cycles are needed for analyzing qualitative data, we analyzed the data in three cycles, going from a general analysis with deductive coding to more specific inductive codes (Saldaña 2009). The coding was done collaboratively by two researchers to distribute the effort of conducting and coding the interviews and to get different views on the qualitative data.

In the first cycle, deductive coding provided an initial overview of the data relying on the four categories for EP design "easing the entry", "mutual problems and needs", "value co-creation", and "service innovation" (Fischer et al. 2020). In the second coding cycle, the data were analyzed inductively to identify additional details and themes that supplement, contradict, or support the codes from the first cycle. As a result, we identified more than 382 codings with a total number of 34 codes describing individual activities that the platform owners conduct to improve their EP. This set of activities was further assessed to identify overarching aims, mechanisms, and enactors to define design principles. Consequently, in a third coding cycle, the second cycle´s codes and codings were iteratively sorted and refined.

The third cycle´s primary finding was that the platform owners implement mechanisms and supporting enactors to achieve four aims (A): A1 to attract and bind actors on the platform, A2 to achieve mutual growth, A3 to foster interaction and value co-creation, and A4 to improve competitiveness by coordinated service innovation. Despite being derived inductively, these aims resonate strongly with the initial set of codes derived through a literature review (presented in detail in Fischer et al. 2020), thereby supporting and extending our previous findings. As the aims rely on mechanisms to be achieved, a total of 13 mechanisms (M) have been identified. Based on our findings, these mechanisms have 32 additional components that we refer to as enactors (see table 3). Some mechanisms support two aims, while some enactors also contribute to multiple mechanisms. We argue that this overlap is a natural consequence of EP´s complex and socio-technical nature, as well as the overlap of conceptual themes in practice, e.g., support and the improvement of value co-creation (i.e., service innovation) may both be achieved by implementing and monitoring feedback channels. In line with Gregor et al. (2020), the identified aims, mechanisms, and enactors were validated and refined using corresponding literature by providing theoretical and empirical justifications.

By combining aims, mechanisms, and enactors, they form a set of four design principles. The design principles are described and visualized in figure 2 and table 3. These design principle components are directly related to the codes applied in the interview transcripts. To provide anecdotal insights, several components are corroborated with quotes from the expert interviews.

<a>RESULTS

The design principles are described in more detail in each specific subsection. The subsection headlines are related to the four aims. Each aim is pursued by employing multiple mechanisms that, in turn, rely on enactors to be effective. To reduce redundancy, we present the four design principles based on their respective aims, describe the 13 underlying mechanisms in each context (see figure 2), and give a tabular overview of 32 enactors and respective examples from the interviews in table 3.

<b>Attract and bind Actors

To foster a steady influx of new actors, who provide and demand offerings, the EPs employ varying mechanisms to attract and bind actors to foster resource integration. The potential value of a DBE relies on the ability to connect heterogeneous actors efficiently and effectively to afford the dynamic bundling of resources to co-create value. An EP or the overarching DBE needs a critical mass of actors to ensure these properties. Initially, EPs need to increase their visibility, thus attracting potential actors. Thereby,

EPs instrumentalize existing social media platforms, physical events, marketing campaigns, and B2B partners to **raise their awareness (M1)** and be noticed by potential actors. Afterward, supporting **actor onboarding (M2)** helps to attract and bind new users to the EP by familiarizing them with the platform´s respective features and decreasing the chance of leaving shortly after joining an EP. When the POs were asked what assistance was given with the platform´s usability and onboarding process, one PO replied as follows: "*We have a help center, a Zendesk, where we answer questions about the most common questions on the platform. We also have many suggestions, tips, and tricks in our magazine, i.e., an accompanying blog. We partly give advice by phone, have a hotline for customers by email, and can be reached by phone ... We have small videos and tutorials on registration processes or functionalities. We have designed instructions and checklists for event formats, and sometimes our foundation also conducts webinars. There, larger groups can be brought together interactively.*"

Besides properly assisting new users with support features, the initial service experience of new actors also relies on establishing trust with the actors almost immediately. The **employment of trust-building symbols and activities (M3)** gives actors a sense of trust and security when using the EP and thus strengthens the DBE community. As a PO emphasizes, it also helps "*to be honest and transparent. We are close and accessible. As mediators, we try to create understanding for the other side*". Besides, this can be further increased by allowing cooperatively developed, **risk-based pricing and cost (M4)** mechanisms that allow fair distribution of risk, costs, and revenues among the heterogeneous actors. Designing fair pricing models, e.g., only charging upon using certain features or based on monetary success, is more attractive to actors who are not yet familiar with a respective DBE.

To achieve a feeling of familiarity, personal meetings at, e.g., public conferences, are a valuable opportunity to establish a sense of community between the actors. **Attending interpersonal events (M5)** allows POs to get into conversation with possible new actors or to identify the problems of existing actors early on. Thereby, establishing a **connection between existing and new partners (M6)** is, on the one hand, beneficial to use the level of popularity of the partners and, on the other hand, to use the trustworthiness of supposedly better known and perhaps even larger partners for your DBE. E.g., one interviewee stated that they "*...rather rely on established companies that have already built up trust.*" And that it presented a significant challenge "*...to establish a company, which has no name yet.*" Practices associated with M2 are standard among the DBEs and were often adopted after initially focusing on building a consumer base by attracting private households/consumers. Drawing from the conducted interviews and the highlighted quotes, we derive the first design principle.

Design principle 1: *For POs to **attract and bind actors** on EPs, they should raise awareness (M1), support actor onboarding (M2), employ trust-building symbols and activities (M3), establish risk-based costs and pricing (M4), attend interpersonal events (M5) and connect to existing and new partners (M6) in order to foster resource integration.*

Achieve mutual Growth

To solidify the overall competitive position of a DBE in ever-changing markets, mutual problems and needs must be addressed to achieve mutual growth. The collaborative identification of these factors decreases misguided resource allocation and innovation activities within the ecosystem, on the one hand, while increasing the transparency and awareness of latent capabilities among actors as well as a shared understanding and direction for future developments on the other.

In order to be prepared for future challenges, e.g., legal changes, the **connection of existing and new partners (M6)** should be used to react to unforeseen circumstances with potential more diversified partners, as mentioned by the POs. When **participating in interpersonal events (M5)**, new partners can be acquired through direct conversation, which may be more convincing than recruiting via a website or telephone call. Here, the mechanism **establishing fair risk-based costs and pricing (M4)** plays a decisive role in attracting actors and thus making joint growth possible in the first place. For example, one PO stated: "*We do not demand a fee from the company when I place an advertisement or when I create my profile, but up to the point where I want to get in contact with the applicants, the usage is completely free.*" Being open and transparent about the pricing strategies signals to the actors that fair treatment is a high priority in the DBE.

This ties into **treating actors as equal partners (M7),** which implies that the needs of all partners and actors of a DBE are considered, and problems are addressed. "*Respectful interaction at eye level ensures*

a good relationship. For this purpose, we have published a netiquette: It consists of four golden rules: Be nice, be polite, be honest, and be helpful." If the actors feel respected, they are more open towards collaborating and recommending the EP. When collaborating with the actors, new ideas and solutions for unsolved problems are identified. Seeing this benefit, the POs introduced activities towards **being open towards new solutions (M8)** as addressing existing problems based on collaborative efforts yields significant long-term advantages such as lower innovation costs and ensuring actors that the EP adapts based on their needs. As the presented quotes underline the importance of achieving growth among actors and PO in a DBE, we propose the second derived design principle as follows:

*Design principle 2: For POs to **achieve mutual growth** in EPs, they should establish fair risk-based costs and pricing (M4), participate in interpersonal events (M5), connect to existing and new partners (M6), treat actors as equal partners (M7), and be open towards new solutions (M8) in order to address mutual problems and needs.*

<b>Foster Interaction and Value Co-creation

Value co-creation is only enabled through the integration of resources by various actors. Thus, all actors´ inclusion and engagement of all actors are naturally a major driver of a DBE´s success. Therefore, to enhance resource integration among heterogeneous actors, the POs need to consider their relationships and resource integration processes on the EP. Addressing these tasks appropriately requires the **connection of existing and new partners (M6)** in design processes, so the EP is catered to the actors´ needs and provides the required functionalities. This also includes the choice of communication channels so actors *"can communicate via our platform if they like, but they can also communicate outside the platform"* as various chat tools, and contact possibilities also drive the interaction among actors", as one PO states.

To enable the best possible cooperation between the actors in a DBE, the EP should be **designed to ensure intuitive usability (M9)**. As one PO puts it: *"So the app is, with respect, self-explanatory."* Hence, the EP design should be guided by already known platforms to utilize the familiarity with this platform. This includes designing a simple process for **supporting actor onboarding (M2)**, increasing the chance for new actors to join the DBE. Furthermore, by learning about crucial functionalities at an early stage, it can be ensured that distinctive features are noted and utilized early on. Knowing about the EP´s possibilities and limits helps identifying areas for **co-creating new and useful features (M10)**. Through the actors´ interaction, resources can thereby be integrated in a new way, e.g., implementing ad hoc offerings of external actors as core functionalities. One PO stated that *"it is really all users who are driving this* (ideas) *forward. As we are an agile project, we don't have a fixed feature set… and everything that is reported back to us ends up in the roadmap. With an appropriate priority, of course.**"**
After the resources have been integrated and bundled due to interaction and value co-creation, suitable opportunities must be created for **resource exchange (M11)** among actors, both virtually and in the real world. In this regard, linking inherently physical aspects of interaction in the overall DBE, e.g., sharing tools with neighbors via a neighborhood platform, needs special consideration towards designing EP mechanisms that enable and support these interactions. Therefore, interviewed POs welcome and support that actors also *interact in real life* to improve the overall service experience and increase loyalty. One interviewee even stated that: *"this is what guides us, so we say we do not want to be an online tool that draws people online for its own sake, but rather a platform that is a useful online tool and always results in real added value offline as well"*.
Based on the presented findings, we derive the third design principle
*Design principle 3: For POs to **foster interaction and value co-creation** in EPs, they should support actor onboarding (M2), connect to existing and new partners (M6), design for usability (M9), create new and useful features (M10), and define mechanisms for resource exchange (M11) in order to enhance value co-creation.*

<b>Improve Competitiveness by coordinated Service Innovation

As markets are continually changing and actor demands increase, EPs must ensure feasible and sustainable service innovation. This overarching goal is central to the idea of EPs that enable ways for service innovation through increasing resource liquefaction and resource density of service ecosystems.

Being open towards new solutions (M8) seems to be a core premise of the POs we surveyed, as this is what enables innovations to emerge in the first place and allows the respective companies to remain competitive. As one PO states: "*So innovations are actually always new functions for us. They can also come from us since we are always eager to develop our platform further. So, we are always on the road at trade fairs, reading the latest news about what is happening in digitalization…*". Since the POs are committed to **creating new, useful features (M10)**, close cooperation with the platform's actors seems to be sensible in order to implement features catered to their distinctive needs. "*We have our own call center for both end customers and companies. We get feedback every day. If we do something that people do not like, we hear it immediately. But there are always people who say "Hey, I have a great idea, have you thought about this and that". We get a lot of ideas and I think they are great and we always take them".* Therefore, they **utilize feedback channels for innovation (M12),** e.g., customer hotlines, click-stream data, and UX-testing, and claim that the actors in the DBE mainly drive service innovation. "*These can be customers who send us a short email with suggestions for improvement. For example, that they get an automatic calendar invitation when booking... We think it is great when customers interact with us in this way, and then we can implement it quickly."* Thereby*,* it is equally important to process the feedback so that the implementation can be tracked and reported back to feedback providers. By **connecting existing and new partners (M6)** it allows the POs to incorporate competencies that would otherwise have to be developed in their own company, and thus, they can innovate their services faster. This provides them with an advantage over potential competitors and **signals to the actors that they are future-proof (M13)**, i.e., can react swiftly to market changes or legal requirements.

The challenges of remaining competitive were strongly emphasized in the interviews, which is why our fourth derived design principle states

Design principle 4: *For POs to **improve competitiveness by coordinated service innovation** in EPs, they should connect to existing and new partners (M6), be open towards new solutions (M8), create new, useful features (M10), utilize feedback channels for innovation (M12) and signal to actors that they are future proof (M13) in order to ensure service innovation.*

Place Figure 2 about here

Figure 2: Aims and mechanisms for the design of engagement platforms

<b>Enactors for Mechanisms

According to Gregor et al. (2020), a mechanism involves enactors that may have respective design principles. Enactors are human (i.e. actor groups like moderators) or non-human (i.e. processes, activities or other artifacts) change agents. In table 2, the enactors are presented according to their corresponding mechanism. If an enactor is part of more than one mechanism, the additional mechanisms are depicted in brackets after the respective enactor. An enactor is printed in bold if more than three experts mentioned it. For this publication, we will not discuss the design principles of individual enactors but give examples of what activities, processes, or artifacts are related. This being said, the table only provides an overview of enactors utilized and mentioned by the PO in our sample. The listed enactors should be combined with the information regarding aims and mechanisms presented in the prior section to create suitable change agents (i.e. processes, activities and roles) to support the aspired outcome.

Mechanism	Enactor	Example
(1) Raising Awareness	Marketing campaigns	run advertising to draw attention to the platform
	Social media presence	be active in relevant social media channels
(2) Support actor onboarding	**Tutorials and instructions**	provide instructions on how to use the platform
	Similarity to familiar apps	orientate the design on well-known apps
(3) Employ trust-	**Human moderation of content**	offer additional personal discussions for user questions

building symbols and activities	Refund systems	offer refunds for the service provided if the user is unsatisfied
	Quality certificates	display certificates on the platform, e.g., TÜV certified
	Welcome packages	send the new user physical material about the platform
	Personal touches	share user stories and success stories
	Real-world artifacts and symbols (5)	provide physical brochures and information material
(4) Implementing Fair cost and revenue Mechanisms	**Involve actors in platform changes (7, 13)**	have key actors approve of new features
	Attracting corporate partners (existing networks) (3,5)	find companies that promote and use the platform
(5) Attending interpersonal events	**Establish a personal bond with key actors**	try to get to know key actors and their needs better
(6) Connect existing and new partners	**(Manual) matching (2,11)**	bring together suitable offers with the right users
	Communication tools (11)	provide the user with multiple communication channels
	Recommender systems	provide recommendations that point actors to relevant offerings
	Search functionalities	enhance the search on EPs, e.g., by collaborative filtering
(7) Treating actors as equal partners	Workshops to identify mutual problems (5,8)	host actor workshop to identify actor needs
	Integration of innovation partners	involve key partners to develop features according to their needs
8) Being Open towards new solutions	**White label solutions**	individualize the platform for specific focus groups
	Third-party Innovation and offerings	integrate features from other partners into the platform
(9) designing for usability	**Feedback channels (12)**	implement feedback channels and use data, e.g., click-streams to analyze user behavior
(10) creating new, useful features	Idea realization	follow up on received feedback and implement the actor ideas
	Innovation workshops with actors (12, 13)	conduct regular meetings to discuss offerings and improvements
(11) Define functionalities for resource exchange	Ease the exchange of resources	create channels for the exchange of physical and digital goods
	Quality specifications and standards	provide clear instructions and rules on what an offering should include or what is insufficient
	Rules of interaction	ensure respectful interaction among users
(12) Utilise Feedback Channels for Innovation	Trend scouting	participate in trade fairs and identify current trends
	KPI tracking and reporting	use technology to identify and improve user behavior
	Implement rating and endorsement Systems	allow users to rate the platforms to get feedback from them
(13) Convince actors of being future proof	**Prevent exploitation (8)**	ensure that the platform business model cannot be undermined
	Agile processes (12)	use agile development to react faster to, e.g. legal changes

Table 2: Mechanisms and enactors for the design of engagement platforms

<a>DISCUSSION

This chapter employs DSR to generate prescriptive knowledge in the form of design principles for EPs to support value co-creation in DBE. The expert interviews have been coded and conceptually evaluated through the lens of Service Logic and platform research. By conducting empirical research with 14 POs, our contribution encompasses several aspects. Mainly, we present the managerial implications of Service Logic and provide four design principles that consist of four aims, 13 mechanisms, and 32 enactors to enable and enhance co-creation and service innovation on EPs. The prescriptive knowledge at hand informs POs of incumbent and newly founded EPs on improving interaction among actors in DBEs. As DBEs increasingly rely on EP as core structures to enable and facilitate value co-creation, prescriptive research provides ample advice to inform the design of mechanisms related to DBE governance, growth and innovation. By that, we also contribute to existing research gaps concerning a) applicable research that draws from Service Logic (Vargo and Lusch, 2017), the call for actionable information for practitioners designing EPs (Blaschke et al., 2019), and c) a lack of research on the digitalization of personal services (Lattemann et al., 2020).

The interviewed PO business models are mainly relying on B2C interactions. While there are corporate complementors and customers, the major influx of income is generated by private customers or private households. In this context, the heterogeneity of actors and their distinctive needs is higher compared to homogeneous DBEs that consist purely of corporate actors or simple B2C relationships (Hein et al., 2020). As the EP needs to support various, sometimes contracting needs via a singular technological platform (Schreieck et al., 2016), we tried to assess a wide array of critical mechanisms, thus contributing to a better understanding and design of actor interactions in a DBE. We also acknowledge physical and non-virtual components that contribute to these mechanisms, e.g. personal meetings, workshops, marketing material, handbooks, training. By that, we contribute to the EP literature that deliberately considers both physical and virtual touchpoints (Breidbach and Brodie, 2017). Consequently, our research provides a broader and more pragmatic overview of activities, processes, rules and roles to improve EPs than studies that focused only on virtual aspects.

Drawing from Service Logic, we often refer to heterogeneous groups as actors (Lusch and Nambisan, 2015). As a result, our analysis remains rather vague on the mechanisms and specific needs of specific complementors, customers or other agents of the DBE. Also, the set of 32 exemplary enactors is only presented as an overview and, due to the heterogeneity of enactors employed by the PO, needs further empirical analysis to provide a more consistent and robust set of factors to consider. The level of detail also remains low for specific and highly complex design principles, e.g. the formulation of pricing and cost mechanisms that remain fair. To provide a more precise and detailed analysis, additional research is needed. Another limitation of this research is the limited discussion of co-creative vs individual contribution, considering the different mechanisms we present. As value co-creation (Vargo and Lusch, 2004) is a central theoretical lens, little attention has been paid to the activities of individual actors and specific actor groups.

For future studies, we will incorporate a more diverse set of stakeholders and validate the proposed set of design principles not only argumentatively but also statistically. Additionally, we will evaluate the generalizability of the design principles by conducting additional interviews with experts from the B2B domain to contrast differences and highlight similarities between the two sectors.

<a>CONCLUSION

Based on the DSR approach, we developed four design principles based on 14 expert interviews. The results include four aims that may provide a framework for assessing and discussing mechanisms and enactors in EP literature. To further assess the validity of our findings, we reflected the unique mechanisms against related work (see figure 2). By offering this set of prescriptive findings and insight on which mechanisms and enactors platform owners employ to foster co-creation on EPs, we answer to research calls for a more detailed assessment of technology-enabled value co-creation (Breidbach et al. 2015) and more practical implications of Service Logic (Vargo and Lusch 2017). Each of the identified components presents research opportunities for theoretical and further DSR research. By employing the DSR approach, we also developed practical knowledge for practitioners in EP and DBE contexts. We provide actionable design principles that may also inform strategic and operational decisions both for incumbent platform owners and those in the early stages of planning or implementation.

Even though we are confident that the results of this study support the endeavors of practitioners, as well as provide new theoretical insights, we have to make a few limitations. As we limited the interview sample to experts from the DACH region and the sector of personal services, we may only argue that our findings must be compared to other EPs. Also, resulting from the deliberate choice to interview experts in the B2C sector, we refrained from interviewing consumers. The selection of experts for our interviews was more robustly ensured by relying on established and measurable criteria such as job position and time in the market. We further argue that the mechanisms and enactors mentioned are not complete, and there exist additional ones that will need to be investigated in future studies.

EPs are increasingly popular and powerful means to enable co-creation and service innovation. In this study, we conducted expert interviews with founders, CEOs, and managers of 14 EP companies from the personal and household-related service sector to gain insights into essential success factors and related activities and mechanisms. Hence, this paper's contribution is interesting for designing future EPs, as it provides the reader with suitable design principles, including aims, mechanisms, and enactors that can be followed and implemented. Four major aims, namely A1, attract and bind actors, A2 achieve

mutual growth, A3 foster interaction, and co-creation and A4 improve competitiveness by coordinated service innovation, were derived and presented. Besides, mechanisms and enactors were identified that further specify these aims. These findings should be applied to new and existing platforms to refine and evaluate the four derived design principles stemming from the significant aims in a future study.

<a>ACKNOWLEDGEMENT

<a>REFERENCES

Alt, R. (2020). Evolution and perspectives of electronic markets. *Electronic Markets 30*, 1–13.

Aulkemeier, F., Iacob, M.-E., van Hillegersberg, J. (2019). Platform-based collaboration in digital ecosystems. *Electronic Markets 29*, 597-608.

Barrett, M., Davidson, E., Prabhu, J., Vargo, S.L. (2015). Service Innovation in the Digital Age: Key Contributions and Future Directions. *MIS Quarterly 39* (1), 135–154.

Blaschke, M., Riss, U., Haki, K., Aier, S. (2019). Design principles for digital value co-creation networks: a service-dominant logic perspective. *Electronic Markets 29*, 443–472.

Breidbach, C.F., Brodie, R.J. (2017). Engagement platforms in the sharing economy: Conceptual foundations and research directions. *Journal of Service Theory and Practice 27* (4), 761–777.

Breidbach, C.F., Chandler, J.D., Maglio, P.P. (2015). The Duality of Second Screens: A Phenomenological Study of Multi-platform Engagement and Service Experiences. *Proceedings of the 48th Hawaii International Conference on System Sciences*, 1432–1441.

Chesbrough, H.W. (2003). *Open innovation: the new imperative for creating and profiting from technology*. Harvard Business School Press, Boston, Mass.

de Reuver, M., Sørensen, C., Basole, R.C. (2018). The Digital Platform: A Research Agenda. Journal of *Information Technology 33* (2), 124–135.

Edvardsson, B., Tronvoll, B., Gruber, T. (2011). Expanding understanding of service exchange and value co-creation: a social construction approach. *Journal of the Academy of Marketing Science 39*, 327–339.

Fischer, S., Lohrenz, L., Lattemann, C., Robra-Bissantz, S. (2020). Critical Design Factors for Digital Service Platforms - A Literature Review. *Proceedings of the 28th European Conference on Information Systems (ECIS)*, 1–18.

Fu, W., Wang, Q., Zhao, X. (2018). Platform-based service innovation and system design: a literature review. *Industrial Management & Data Systems 118* (5), 946–974.

Gawer, A., Cusumano, M.A. (2014). Industry Platforms and Ecosystem Innovation: Platforms and Innovation. *Journal of Product Innovation Management 31* (3), 417–433.

Gregor, S., Chandra Kruse, L., Seidel, S. (2020). The Anatomy of a Design Principle. *Journal of the Association for Information Systems 21* (6), 1622-1652.

Gregor, S., Jones, D. (2007). The Anatomy of a Design Theory. *AIS Educator Journal 8* (5), 312-335.

Göbel H., Cronholm S. (2016) Nascent Design Principles Enabling Digital Service Platforms. In: Parsons J., Tuunanen T., Venable J., Donnellan B., Helfert M., Kenneally J. (eds) Tackling Society's Grand Challenges with Design Science. DESRIST 2016. *Lecture Notes in Computer Science 9661*. Springer, Cham, 52–67.

Grönroos, C. (2011). Value co-creation in service logic: A critical analysis. *Marketing Theory 11* (3), 279–301.

Hein, A., Böhm, M., Krcmar, H. (2019). *Digitale Plattformen*, in: Dahm, M.H., Thode, S. (Eds.), Strategie und Transformation im digitalen Zeitalter. Springer Fachmedien Wiesbaden, Wiesbaden, 181–199.

Hein, A., Schreieck, M., Riasanow, T., Setzke, D.S., Wiesche, M., Böhm, M., Krcmar, H. (2020). Digital platform ecosystems. *Electronic Markets 30*, 87–98.

Heinonen, K., Strandvik, T., Mickelsson, K.-J., Edvardsson, B., Sundström, E., Andersson, P. (2010). A customer-dominant logic of service. *Journal of Service Management 21* (4), 531–548.

Hevner, A.R., March, S.T., Park, J., Ram, S. (2004). Design science in information systems research. *MIS Quarterly 28* (1), 75-105.

Lattemann, C., Robra-Bissantz, S., Ziegler, C. (2020). Die Komposition personennaher Dienstleistungen von morgen. *HMD Praxis der Wirtschaftsinformatik 57*, 639-654.

Lohrenz, L., Michalke, S., Lattemann, C. Robra-Bissantz, S. (2021a). Fostering Visibility, Commitment and Trust on Digital Platforms: Insights into Personal Engagement Platforms from the DACH Region. *Proceedings of the 53rd Hawaii International Conference on System Sciences (HICSS)*.

Lohrenz, L., Michalke, S., Robra-Bissantz, S., Lattemann, C. (2021b). Mechanismen zur Gestaltung erfolgreicher digitaler Plattformen. *Wirtschaftsinformatik und Management.* Springer Gabler.

Lusch, R.F., Nambisan, S. (2015). Service Innovation: A Service-Dominant Logic Perspective. *MIS Quarterly 39* (1), 155–175.

Minichiello, V. (1990). *In-Depth Interviewing: Researching People.* Longman Cheshire.

Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis: An expanded sourcebook* (2nd ed.). Sage Publications, Inc.

Nachira, F., Dini, P., Nicolai, A. (2007). A Network of Digital Business Ecosystems for Europe: Roots, Processes and Perspectives. In: *Digital Business Ecosystems*. Ed. by F Nachira et al. European Commission, 1–20.

Ojasalo, J., Ojasalo, K. (2018). Service Logic Business Model Canvas. *Journal of Research in Marketing and Entrepreneurship 20*(1), 70–98.

Ordanini, A., Parasuraman, A. (2011). Service Innovation Viewed Through a Service-Dominant Logic Lens: A Conceptual Framework and Empirical Analysis. *Journal of Service Research 14*(1), 3–23.

Saldaña, J. (2009). *The coding manual for qualitative researchers*. Sage, Los Angeles, Calif.

Schreieck, M., Wiesche, M., Krcmar, H. (2016). Design and Governance of Platform Ecosystems – Key Concepts and Issues for Future Research. *Proceedings of the 24th European Conference on Information Systems (ECIS)*.

Senyo, P.K., Liu, K., Effah, J. (2019). Digital business ecosystem: Literature review and a framework for future research. *International Journal of Information Management 47*, 52-64.

Spagnoletti, P., Resca, A., Lee, G. (2015). A Design Theory for Digital Platforms Supporting Online Communities: A Multiple Case Study*, Journal of Information Technology, 30*(4), 364–380.

Tiwana, A., Konsynski, B., Bush, A.A. (2010). Platform Evolution: Coevolution of Platform Architecture, Governance, and Environmental Dynamics. *Information Systems Research 21*(4), 675–687.

Vargo, S.L., Lusch, R.F. (2017). Service-dominant logic 2025. *International Journal of Research in Marketing 34*(1), 46–67.

Vargo, S.L., Lusch, R.F. (2004). Evolving to a New Dominant Logic for Marketing. *Journal of Marketing 68*(1), 1–17.

vom Brocke, J.; Winter, R.; Hevner, A.; Maedche, A. (2020). Special Issue Editorial – Accumulation and Evolution of Design Knowledge in Design Science Research: A Journey Through Time and Space, *Journal of the Association for Information Systems 21*(3), 520-544.