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Value Creation in Business Ecosystems – A Design Theory for a Reference Model

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Completed Research

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Abstract

Business ecosystems are dynamic network structures of autonomous actors who contribute individual resources and capabilities towards a shared purpose. This study proposes a design theory to develop a model that describes the fundamental value creation activities in business ecosystems. This research endeavor is embedded in a consortium research project following design science and builds on both the current body of academic knowledge and the experience of. The paper makes three main contributions. Firstly, the study defines a specific problem space, identifies justificatory knowledge, and develops design requirements and principles as the theory's core. Secondly, a reference model is developed that describes value creation, providing a conceptual grid for further theoretical analysis. Thirdly, the model provides an analytical framework for practitioners, who need to understand which activities should be performed and how these activates should be configured to generate advantages relative to others.

Keywords

Business ecosystem, value co-creation, collaboration, design science, design theory, reference model

Introduction

Value is rarely created solely in a single organization, but increasingly co-created in complex networks (Adner 2017). Organizations collaborate in so-called business ecosystems, to which they contribute complementary services for a greater goal or purpose (Adner and Kapoor 2010; Jacobides et al. 2018; Moore 1993). One party does not need to build up all assets and capabilities alone and the ability to orchestrate assets in such networks can actually increase company value (Cusumano et al. 2020).

Interest in networks grew significantly over the years (Jacobides et al. 2018). One example of a player in such networks is the Chinese peer-to-peer payment solution Alipay. Since its launch in 2009, the platform grew quickly and offered a conglomerate of adjacent services focusing on further "growing their ecosystem exposure" in the future (Ant Group 2020). Now, Alipay connects more than one billion annual users with merchants, insurers, mobility providers, etc. Thus, value is not created by a single party but through the various connections between these parties, shifting the concept of value creation from an organization-centric (Prahalad and Ramaswamy 2004) to a system perspective (Moore 1993; Normann and Ramirez 1993).

Conceptual tools are already available for organization-centric perspective, e.g. the value chain (Porter 1985) or the value shop (Stabell and Fjeldstad 1998). They help (1) to understand what activities an organization should perform and (2) to understand the configuration of activities, which enables the organization to add value and to compete with others (Amit and Zott 2001). However, frameworks show limited explanatory power in interorganizational setups, where value does not just flow from left to right (Eisenmann et al. 2006; Normann and Ramirez 1993). This research problem is underpinned by Peppard & Rylander (2006), who suggest that traditional concepts of value creation and competitive dynamics require a shift in perspective. Jacobides et al. (2018) indicate that the rules of participation in business ecosystems are still not fully understood, where activities of one party are expected to influence those of other parties. Autio & Thomas (2018) further state that understanding the configuration of business ecosystems requires understanding of the specific elements of value co-creation. Therefore, this study defines the research gap as a lack of conceptual guidance to identify fundamental value creation activities

in order to analyze their configuration in interorganizational networks like business ecosystems. This lays the foundation to understand participation and competitive dynamics in business ecosystems.

To help fill this gap, this study develops a model for the conceptualization of value creation in business ecosystems and proposes a design theory for the task at hand (Gregor and Jones 2007). Specifically, it tries to answer the following research question: **How can a model for value creation in business ecosystems be designed**? This research project is embedded in a consortium (Oesterle and Otto 2010) and follows the design science approach (Hevner et al. 2004; Peffers et al. 2007). Therefore, it builds on both the body of academic literature and practical experience. The paper makes several contributions. Firstly, it extends the business ecosystem literature by developing a conceptual model for interorganizational value creation that can be used to identify and analyze the configuration of activities. Secondly, the paper proposes a design theory including the following aspects: (a) validation of the problem space and its relevancy, (b) development of design requirements, and (c) development design principles as the core of the design theory. Thirdly, the model serves as a conceptual grid for practitioners who conceptualize business ecosystem offerings consisting of multiple interacting parties. The next section of this paper will provide the theoretical background, after which the methodology will be described. Afterwards, the results are presented and discussed. A critical reflection, limitations, and a research outlook will conclude the paper.

Conceptual Background

The fragmentation of the traditional value creation process (Iansiti and Levien 2004), triggered by reduced transaction costs due to new technologies (Peppard and Rylander 2006) leads to complex value creation networks, e.g. business ecosystems (Adner 2017; Autio and Thomas 2018; Jacobides et al. 2018). This phenomenon first appeared in academic literature in the early 1990s (Moore 1993) and describes network structures of autonomous yet interdependent actors who coordinate their activities towards a common goal (Adner 2017; Williamson and de Meyer 2012). Originally borrowed from biology, three essential constructs describe the concept (Pickett and Cadenasso 2002): (**A**) the **relationships** between the inhabitants (i.e. through the exchange of energy), (**B**) the **biotic component** (i.e. different species), and (**C**) the **abiotic component** (i.e. the physical or functional structure in which it is embedded). These components are helpful to specify the characteristics of business ecosystems, hereafter referred to as ecosystems.

The **relationship component** (**A**) describes how the participants interact. Ecosystems contain a shared vision or purpose, towards which all activities are directed (Adner 2017; Moore 1993). While some scholars explicitly use a focal value proposition (Adner 2017), this paper builds on a shared purpose in the context of Selznick's organizational purpose (1948). A purpose leaves significant room for autonomous decisions while a central value proposition implies a centralistic view. This goes in line with non-hierarchical control as well as a prevailing coordination need, which are both prerequisites for ecosystems to emerge (Jacobides et al. 2018). Furthermore, relationships are characterized by value co-creation, where each party is considered an active part of value creation (Autio and Thomas 2018; Ceccagnoli et al. 2012; Vargo and Lusch 2011) and maintains links to multiple other parties (Adner 2017). This results in interdependency (Helfat and Raubitschek 2018) of complementary services (den Hartigh and van Asseldonk 2004) and a modular architecture (Baldwin and Clark 1997; Jacobides et al. 2018), which forms the offering.

The **biotic component** (**B**) describes the participants in an ecosystem. Actors in an ecosystem pursue different roles (Betz et al. 2019), each of which is characterized by needs and capabilities. A prominent role falls to the orchestrator (Adner 2017; Nambisan and Sawhney 2011), who coordinates and directs activities towards the overall purpose. Attention on this role is high, as many of these ecosystem leaders are able to grow to a significant size in terms of market capitalization (Cusumano et al. 2020). Furthermore, the participants are characterized by high individual autonomy (Jacobides et al. 2018). Actors make self-directed decisions, where one party does not fully control all activities. Ecosystems therefore represent a unique organizational structure on the spectrum of full integration and free market (Fuller et al. 2019).

The **abiotic component** (**C**) characterizes the environment of the different actors in an ecosystem. This includes a functional structure which determines how the different participants interact with each other. This refers to a common architecture e.g. a platform (Gawer and Cusumano 2014). Different participants can contribute services or interact with others via a platform. Additionally, shared institutional logics (Autio and Thomas 2018) specify how the actors collaborate. While ecosystems are considered open systems (Post

et al. 2007), this component can be understood as setting the boundary conditions, for example by regulating access to a platform or specific resources while at the same time establishing rules for interaction.

These three components are used to derive a framework of value creation in ecosystems. **(B)** describes the specific actors and their value creation activities in their respective roles. Jacobides et al. (2018) performing value creation activities in a modular fashion is considered a prerequisite for ecosystems to emerge. **(A)** describes the relationships between these actors, which refers to how these actors are coordinated. A coordination need due to the specific complementarities, is a second prerequisite for ecosystems to emerge (Jacobides et al. 2018). While **(A)** and **(B)** describe who is performing activities and how they are interlinked, **(C)** describes the structure and institutional logics (Autio and Thomas 2018) according to which the ecosystems evolves (Helfat and Raubitschek 2018; Teece 2017). An organization is the sum of value creation tasks **(B)** and the necessary coordination activities **(A)** (Mintzberg 1983). In addition, a dynamic component is necessary **(C)**, which describes how the relationships evolve over time. This leads to three fundamental activity classes: **offering assembly activities** (what actors do), **orchestration activities** (how they interact), and **change activities** (how relationships evolve).

Methodological Approach

Overall Research Design

The paper aims at developing a purposeful artifact (March and Smith 1995) to support practitioners and researchers and to develop prescriptive knowledge (Gregor 2006) for the artifact design. Therefore, design science research (DSR) is used as an overarching methodology (Hevner et al. 2004; March and Smith 1995). This provides both guidance and structure for the artifact design (Hevner et al. 2004), but also helps to extract universal statements (Walls et al. 1992) in the context of Gregor's (2007) design theory, focusing on: (**i**) purpose and scope (**ii**) constructs (**iii**) principles of form and function, (**iv**) artifact mutability, and (**v**) justificatory knowledge. We utilized Peffers' six steps for design science research (2007), see figure 1.

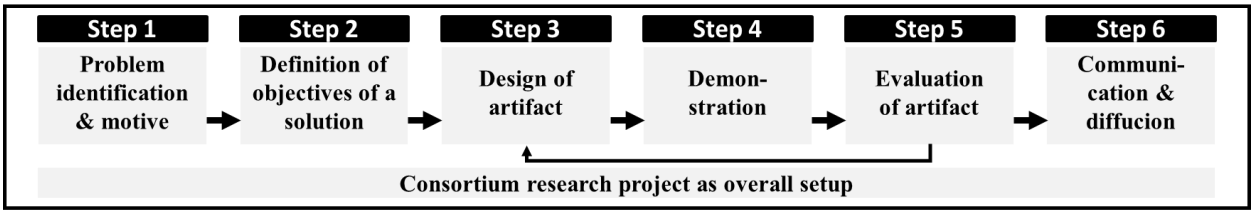

Figure 1: Research setup based on Oesterle and Otto (2012) and Peffers (2007)

In step 1, the problem space was validated with the practitioners. In step 2, design requirements and design principles were developed building on practical and theoretical insights (Gregor et al. 2020). During step 3, researchers and practitioners iteratively worked on the artifact of the type model, a simplified representation of relationships among specific constructs (March and Smith 1995). More specifically, a reference model was designed, which "(…) set[s] the basis for general business solutions that can be adapted to individual customer needs" (vom Brocke 2006, p. 48). To build the model, the researchers leveraged prescriptive knowledge of vom Brocke (2006) and construction guidelines of Becker & Delfmann (2007).(Becker and Delfmann 2007). The fundamental tasks were to identify relevant meta value creation classes and to develop suitable subcomponents that can be reused in specific instances. In step 4, the artifact was demonstrated in focus group interviews (Morgan 1996) with practitioners. During step 5, the practitioners discussed the results and evaluated the artifact according to Sonnenberg & vom Brocke (2012). In step 6, the research results were formalized. This study was embedded in a consortium research project with 16 companies from financial services in Austria, Germany, and Switzerland (Oesterle and Otto 2010).

Meetings were conducted during February 2020 and February 2021 to operationalize the six steps. Three workshops (February, June, September 2020) took place in a physical form with specific safety measures due to the COVID-19 pandemic, while one workshop (February 2021) was conducted virtually. During the workshops, the researchers presented background information and intermediary results. After the presentations, the group was split into three subgroups to discuss results and provide additional input in a focus group setting (Morgan 1996). Virtual working groups were conducted via Microsoft Teams with 8-10 representatives from 8 different companies to refine intermediary results.

Problem Identification and Motivation

In the context of the proposed design theory, the purpose and scope (Gregor and Jones 2007) were defined. Initially, researchers and practitioners started with a kick-off workshop, where current insights on ecosystems were discussed and practitioners shared their expertise. The participants were then split into three separate focus groups (Morgan 1996). The problem space was clarified, and challenges experienced by the practitioners were gathered during the focus group interviews and aggregated by the researchers.

Development of Requirements and Design Principles

Developing design requirements and principles is crucial for a design theory (Gregor and Jones 2007). Therefore, a requirements mining process based on Meth et al. was used (2015). During the first workshop, initial goals and practical requirements were gathered. These practical requirements (**PR**) have been refined in the second workshop and brought to a similar aggregation level. One aspect of design theorizing is the theoretical grounding in terms of justificatory knowledge (Gregor and Jones 2007). Therefore, a literature review using the databases BESCO, ABI/INFORM, and Emerald was conducted to derive the theoretical requirements (**TR**). Concepts such as value creation, value chain, orchestration, and coordination in the context of business ecosystems and platform ecosystems were used. Backward research was conducted as well (Webster and Watson 2002). The results were used to create design requirements (**DR**) and design principles as prescriptive knowledge (Gregor and Jones 2007). The design principles were formulated according to Gregor et al. (2020). The development of the design requirements and principles was an iterative process, in which the requirement mining and design process mutually influenced each other. Finally, design features (**F**) were derived from the design principles upon which the artifact design was based. Requirements are shown in table 1, design principles and features in table 2.

Design and Evaluation of the Artifact

During the meetings, the state of the model was continuously reviewed and specific design decisions were discussed. Feedback from practitioners was continuously integrated into the design process. During the last workshop in February 2021, the artifact was evaluated by the practitioners. In addition to focus group discussions, the practitioners were asked to fill out an evaluation survey. The evaluation dimensions of Sonnenberg & vom Brocke (2012) were used according to the artifact type model. The dimensions included **(a)** completeness, **(b)** fidelity with real world phenomena, **(c)** internal consistency, **(d)** level of detail, and **(e)** robustness. The evaluation was done using a 7-point-Likert scale. The results are shown in table 3.

Results

Problem Identification and Motivation

Ecosystems describe a unique organizational form on the spectrum of integration and free market (Fuller et al. 2019) where value creation is not restricted to one organization (Adner 2017; Autio and Thomas 2018). A linear, sequential value creation logic, as suggested by Porter (1985), does not fully describe the value creation logic in ecosystems (Eisenmann et al. 2006; Normann and Ramirez 1993; Peppard and Rylander 2006). Autio & Thomas (2018) mention that understanding the specific elements of value co-creation in ecosystems is crucial, requiring a perspective shift.The problem space and the need for a reference model that structures value creation across organizational borders was mentioned by practitioners. Other tools (e.g. value networks (Stabell and Fjeldstad 1998), the e^3-value ontology (Gordijn 2004)) were discussed, however, they are organization-centric and do not provide appropriate activity classes (e.g. coordinating activities). One practitioner says that “a general template that combines all components in one model and can be further used to analyze the details in the specific context may be useful”.

Development of Requirements, Design Principles and Artifact Features

According to Meth et al. (2015) overarching design requirements (**DR**) were derived by combining data from the practitioners (**PR**) and theory (**TR**), as shown in table 1.

Practical Requirements (PR)	**Theoretical Requirements (TR)**
PR1: The model should depict distinct value creation components and subcomponents.	**TR1**: Distinct levels of analysis must be considered for value creation in business ecosystems: a network level and a service level (Betz and Jung 2021)
DR1: The model must differentiate distinct value creation components.	
PR2: A model must include a dimension that describes the service provision since an ecosystem consists of different service building blocks.	**TR2:** There are complementary services that are linked together in an ecosystem and form the overall offering (Jacobides et al. 2018; Ramirez and Mannervik 2016) .
	TR3: The consumer is considered an active part of value creation (Autio and Thomas 2018; Vargo and Lusch 2011).
DR2: The model must show a service component with the customer as an active part.	
PR3: Orchestration is an important aspect of value creation in ecosystems.	**TR4:** A focal actor "coordinates, influences and directs" other organizations (Dhanaraj and Parkhe 2006; Nambisan and Sawhney 2011, p. 40)
PR4: A set of rules and a governance structure are necessary to create structure	**TR5:** Alignment towards a common goal is necessary (Adner 2017; Jacobides et al. 2018)
DR3: The model must describe orchestration and coordination.	
PR5: Ecosystems are dynamic systems; therefore, the model must reflect the evolution of the ecosystem.	**TR6:** The ecosystem continuously evolves over time (Betz and Jung 2021; Helfat and Raubitschek 2018)
	TR7: There are different development phases in ecosystems that describe how an ecosystem continuously changes over time (Moore 1993)
DR4: The model must contain a dynamic component that explains its evolution.	
PR6: An ecosystem perspective that is independent of one organization is necessary.	**TR8:** There is a shared value purpose towards that each participant directs his own activities (Betz and Jung 2021; Jacobides et al. 2018)
PR7: The shared purpose must be reflected in the model.	
DR5: The model must be used with a shared purpose independent of a single organization.	

Table 1. Design Requirements and underlying practical and theoretical requirements

Based on the interaction with practitioners and insights from the literature review, 5 **DR** were derived. In the next step, the **DR** were used to derive design principles (**DP**) as precriptive design knowledge. The **DP** were formulated according to the anatomy of design principles based on Gregor et al. (2020): (i) implementor, aim, user, (ii) context, (iii) mechanism, and (iv) rational. Additionally, artifact features (**F**) were derived from the **DP** as suggested by Meth et al. (2015). The result of the process is shown in table 2.

Design Principles (DP)	**Features (F)**
DP1: To describe value creation in business ecosystems, researchers and practitioners must apply the model independent of a single organization in the context of a shared purpose because it understands value creation to take place beyond a single organizational boundary. *(addressed by DR1, DR5)*	**F1:** The value creation components and subcomponents are used independent of a single actor or role with the shared purpose as a reference point
DP2: To conceptualize value creation in business ecosystems, researchers and	**F2:** An offering is being assembled by creating, exchanging and using services or service components.

practitioners must differentiate between offering assembly, orchestration, and change activities because each component describes a specific source of value in an inter-organizational context. *(addressed by DR1, DR2, DR3, DR4)*	**F3:** Orchestration activities must describe how the actors are being coordinated, directed, and influenced in an ecosystem.
	F4: Existing components can be either reconfigured or new components can be added or taken out to describe change.

Table 2. Design principles and features of the reference model

Presentation of the Reference Model

The design of the model was facilitated with the practitioners based on Becker and Delfmann (2007) and vom Brocke (2006). According to **DR1**, three major value creation categories can be identified. First, offering assembly activities describe how individual actors perform their activities to materialize complementary services. Second, orchestration activities describe, how the individual actors are coordinated, influenced, and directed towards the shared purpose (Nambisan and Sawhney 2011). These activities ensure, that all service assembly activities are synchronized so that the overall offering materializes. Third, change activities describe, how the orchestration or service assembly activities evolve over time (Betz and Jung 2021; Helfat and Raubitschek 2018). This may affect existing actors or services, which are already part of the ecosystem: reconfigured (Normann and Ramirez 1993). However, it also describes new entrants or new services that are introduced to enrich the existing offering. Thus, this last component, the change activities, affects the other two components. This reflects the three activity classes as outlined in the section conceptual background. Figure 2 describes the model with its components.

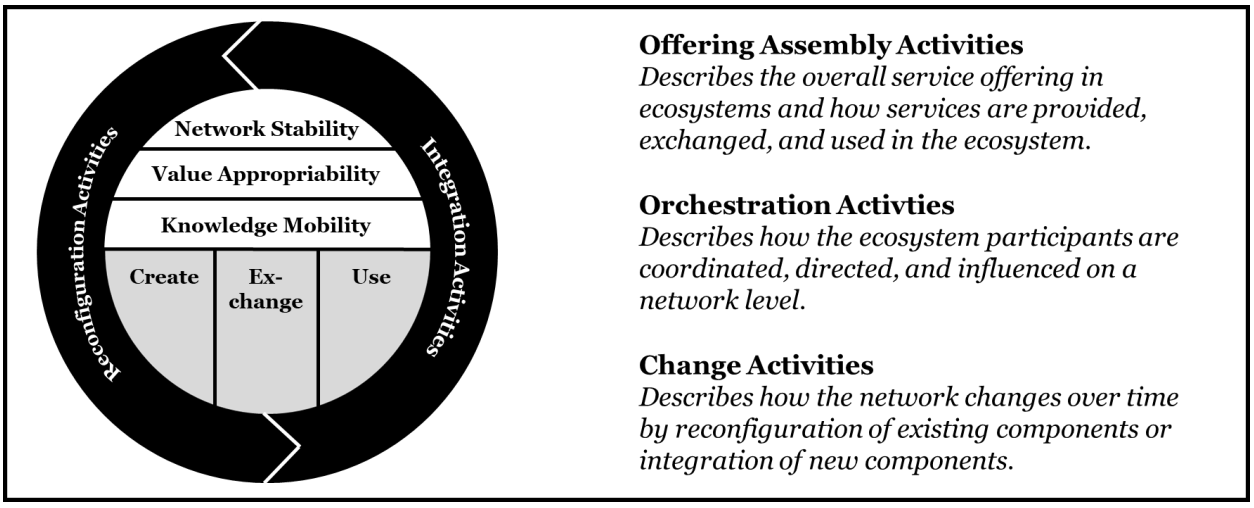

Figure 2. Design of the reference model: the value sphere

Generic sub-activities for the offering assembly component have been chosen (create, exchange, use) to ensure maximal reusability of the model. These sub-activities describe how the service offering and its particular components are configured. According to the **DR2**, not only are *create* and *exchange* necessary offering assembly activities, but also *use* from the perspective of the service beneficiary (Autio and Thomas 2018; Vargo and Lusch 2011). The orchestration component was designed according to **DR3** building on the conceptual basis of Nambisan and Sawhney (2011) and Dhanaraj and Parkhe (Dhanaraj and Parkhe 2006) and consists of the management of knowledge mobility, innovation appropriability, and network stability. These activities describe orchestration activities and how other actors are coordinated, influenced, and directed (Dhanaraj and Parkhe 2006, p. 659). According to **DR4**, the reference model also reflects a dynamic component, which describes how the ecosystem evolves. The sub-activities are reconfiguration (Normann and Ramirez 1993), which describes how the existing resource base is changed, and integration, which describes the continuous in-and outflow of actors in the open ecosystem. While **DR1-DR4** are considered functional requirements, describing the actual design (**DR5**) is considered a non-functional requirement and reflects how the model is used, namely by treating the model as independent of single organisational entities with a focus on the shared purpose.

Evaluation of the Reference Model

The evaluation approach from Sonnenberg & vom Brocke (2012) was applied in a survey using a 7-point-Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree) in five dimensions. The focus group interviews revealed a strong approval for the reference model. However, the practitioners agreed that further instantiation might be necessary to validate the reference model. In the survey all five dimensions revealed either a tendency towards confirmation (dimensions 1, 4, and 5) with an average between 5.36 and 5.97 but with a higher standard deviation between .97 and 1.07. Dimensions 2 and 3 revealed strongest confirmation of 5.87 and 6.14 combined with the lowest standard deviations of .90 and .88. Feedback from the interviews was integrated (e.g. orchestration activities building on Dhanaraj and Parkhe (2006)).

Criteria	Ave	StD	Comments from participants (excerpt)
Completeness	*5.97*	*1.03*	"I see a couple of items that could be added: what about items like service/ offering marketing, actor enabling"
Fidelity with real world phenomena	*5.87*	*0.90*	"For me the separation of the three components offering assembly, orchestration, and reconfiguration is not sharp enough"
Internal consistency	*6.14*	*0.88*	"The framework represents ecosystems very well, but there might be differences in the model regarding ecosystem types"
Level of detail	*5.66*	*0.97*	"Detailed descriptions of the sub activities are necessary, and examples would help to better grasp the meaning"
Robustness	*5.36*	*1.07*	"It would be beneficial if offering assembly, orchestration, and change activities would be made more visible graphically"
Ave: average; StD: standard deviation; n=30			

Table 3: Evaluation of research artifact according to Sonnenberg & vom Brocke (2012)

Discussion

As a result of the design process, an artifact of the type model was developed (vom Brocke 2006). It provides an analytical lens to analyze the fundamental value creation activities from an organization-independent perspective with three main components. First, offering assembly with activities that are performed to create the service offering. We try to extend existing literature on value creation (Ceccagnoli et al. 2012; Jacobides et al. 2018) by including not only partners but also users in the value creation model ("use" component). Second, orchestration includes key activities which are conducted to coordinate others and to align activities towards the shared purpose. This is a necessary activity class as the coordination need is considered a prerequisite for ecosystems to emerge (Jacobides et al. 2018). Third, a change component was identified that describes the continuous evolution to account for the evolutionary aspect of ecosystems (Helfat and Raubitschek 2018). Thus, we see three major activity classes as important for ecosystems: service assembly (what is done), orchestration (how it is coordinated) and change (how it evolves).

In terms of the proposed design theory, we addressed (**i**) purpose and scope during the first step. Together with experts and backed by theoretical insights, we concluded that a linear, sequential value creation logic, is no longer fully applicable in the context of ecosystems. This is important because existing concepts do not provide a suitable analytical angle and conclusions about competitive dynamics cannot be easily drawn. During the design process, several (**ii**) constructs were used as underlying building blocks as suggested by Gregor (2007). Insights from these constructs resulted in the differentiation among different artifact components and their respective sub-activities (orchestration activities). Based on the body of theoretical knowledge and the practitioners' expertise, we derived (**iii**) principles of form and function, which are considered the core of the design theory. They provide prescriptive knowledge (Walls et al. 1992) and can be understood as abstract insights from the design process that provide guidance for related design endeavors in the described problem space. As for (**iv**) artifact mutability, the design process revealed a flexibility and the possibility for design refinements. The artifact components provide a framework of value creation in ecosystems, where sub-activities can be refined, if necessary, to a specific scenario or shared purpose. This is especially important, as the reference model may lead to differing configurations depending on varying ecosystem types, as suggested by one practitioner during the final evaluation. Finally, the artifact is underpinned by (**v**) justificatory knowledge from the ecosystems, innovation, and system theory domain.

However, Gregor's (2007) design theory contains three additional elements that have not been explicitly addressed. First, testable propositions are necessary for validation of the design (Walls et al. 1992). This component is problematic since verified design knowledge does not necessarily lead to "correct" design (Gregor and Jones 2007). Second, a design theory contains principles of implementation (Gregor and Jones 2007), which were not discussed to avoid generic statements for the meta-design. Third, a design theory contains an expository instantiation, which was addressed partially by providing the exemplary design.

Conclusion

The study proposes a design theory to conceptualize an artifact for value creation in ecosystems. The study makes several contributions. From a theoretical perspective, the problem space has been defined with the purpose and scope. Based on the interaction with the practitioners and underpinned by the theoretical body of knowledge, we developed design requirements, design principles, and artifact features. The artifact was subsequently developed and evaluated. From a practical perspective, the artifact provides an analytical angle that supports the identification and the analysis of the fundamental value creation activities in order to (1) understand what activities an organization should perform and to (2) understand the configuration of activities that enables the organization to add value and compete with others (Amit and Zott 2001).

However, the research reveals some limitations. Firstly, there is currently no overarching theory available for ecosystems. Despite the theoretical grounding in ecosystems and other related domains, the unique value creation characteristics require further analysis to better understand the phenomenon. Secondly, as mentioned in the previous section, Gregor's (2007) anatomy of design theory was used as a conceptual grid, although not all aspects were fully addressed in this research. This includes testable propositions, principles of implementation, and an expository instantiation. Further instantiation to specific scenarios may be necessary to fully develop all elements of the proposed theory and to evaluate the usefulness of the proposed design and the underlying theoretical implications. Thirdly, as the research is embedded in a consortium research project with organizations from financial services, there may be limited generalizability in terms of industry-specific situations. Therefore, further investigation across industry borders may be beneficial.

The reference model may be helpful as an analytical grid when identifying value creation activities and understanding their configuration. However, a classification of ecosystems from an interorganizational perspective may be useful to specify value creation and identify, if and how there are differences. Additional elements of the design theory could be addressed in future research and instantiations of the reference model may also provide insights for the proposed theory to help evaluate its applicability for practitioners.

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