Ecosystems in the Business Environment: Investigating Competitive Advantages of the Firm

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„Coming together is a beginning,
staying together is progress,
working together is success.“
Henry Ford

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Abstract

In times of increasing digitalization and rapidly changing environments, it is becoming ever more important for organizations not only to rely on their own core competencies, but also to further expand their resource base and capabilities. Due to the dynamics of this ongoing development, which in the context of digitization is justified among other things by a higher degree of customer centricity, organizations can no longer manage this adaptation to these changes on their own. The expansion of their own core competencies through networking with other players, even across industry boundaries, is becoming essential for their continued existence, and in case of doubt, even for their survival.

Business ecosystems represent precisely this train of thought. Business ecosystems consist of different actors, who may belong to different industries, joining forces for the purpose of sharing complementary resources and creating joint value through interaction, also known as value co-creation. Due to the purpose-bound interconnectedness of the actors, the actors' relationship can be characterized by coopetition, meaning the simultaneous existence of cooperative as well as competitive relationships. Business ecosystems represent robust and resilient systems due to their ability to dynamically adapt to the environment, and they have gained significant prominence in both academia and industry over the past decade. However, despite the increasing number of publications, value creation has so far been considered as a rather peripheral factor in scientific studies. For this reason, this thesis sheds light on influencing factors that can have an optimizing or reducing effect on the value creation of business ecosystems, depending on their deployment and application. Thus, this thesis takes a strategic perspective to consider the impact of the individual influencing factors.

Contributing to this overarching goal, this thesis investigates three relevant areas of influencing factors. In this context, dynamic capabilities are seen as a fundamental area of influencing factors for increasing competitiveness. Building on this, innovation capabilities, in particular the exchange of knowledge, are key factors for increasing value creation and thus competitiveness for both the actors as well as the entire business ecosystem. Social factors in turn form the foundation for interaction and the mutual, complementary exchange of resources among the actors in the ecosystem. Finally, yet importantly, gaining the trust of customers is becoming increasingly important within ecosystems, since customer centralization plays a crucial role, especially in business ecosystems. To consider the respective influencing factors and their areas, this thesis is divided into three corresponding research goals.

First, I seek to conceptualize dynamic capabilities in the ecosystem literature. For this purpose, Research Article #1 contains a classification of platform-based ecosystems, which are categorized against the background of traditional strategic theories such as the resource-based view (RBV), the knowledge-based view (KBV) and the dynamic capabilities view (DCV). From this, strategic recommendations for action can be derived on an aggregated level. Research Article #2 builds on these considerations by demonstrating that the theories of RBV, KBV, and DCV separately have only limited explanatory power for business ecosystems. For this reason, Research Article #2 represents a call for further research. Research Article #3 illustrates the foundation for the state-of-the-art for selective revealing and thus uncovers another research gap in the field of dynamic capabilities. Therefore, the paper is likewise a further development of the first research article. Research Article #4 focuses on the establishment of entrepreneurial ecosystems in developed and emerging markets and identifies key factors, which are distinctive for entrepreneurial ecosystems against the background of specific regional differences. In this way, the research article sheds light on relevant levers for the establishment of entrepreneurial ecosystems.

Second, I attempt to shed more light on innovation capabilities in terms of how they are acquired, how they are built and integrated, and, relatedly, how obstacles are overcome during their establishment. Research Article #5 reveals a framework with specific success factors for implementing a successful knowledge exchange process within innovation ecosystems. In Research Article #6, a maturity model was created for the establishment of cognitive computing systems (CCS) in the public sector, which represent a basic technology for cross-sector networking. Research Article #7 looks at overcoming obstacles to the further development of business model innovations in the automotive industry. The article provides recommendations for overcoming obstacles in the implementation of business model innovation for automotive incumbents who are in the process of establishing digital business ecosystems.

Third, I seek to foster a more thorough understanding of social factors. Research Article #8 therefore examines the influence of the most critical social factors on value creation. Research Article #9 considers the design of trust-aware business processes using a trust management framework as an example of a digital business ecosystem.

Regarding the approach to addressing the respective research goals, this thesis employs a multi-methodological research approach due to its cumulative nature in order to address the respective research questions appropriately.

Concisely, this thesis provides a fundamental understanding of dynamic, innovative, and social capabilities as factors influencing value creation. In addition, by taking a deeper look at and reflecting on these capabilities, recommendations for action can be derived for practice based on frameworks, maturity models, and process designs. Both approaches stimulate further research into the development and expansion of dynamic capabilities and their influence on the optimization of value creation.

Keywords: Business ecosystems, value co-creation, dynamic capabilities, innovation capabilities, social capabilities

Table of Contents

I. Introduction

1 Relevance of the Research Topic and Research Motivation

The dynamic transformation of living environments is a challenge for many organizations and pushes them to their capacity limits. Faster innovation cycles, the shift from traditional to digital business models, and increasingly in-depth technical expertise are just some of the many factors that make up this challenge. On the other hand, these new technologies and the continuous evolution of digitalization enable numerous new opportunities for organizations to further expand their resource base and capabilities. Consequently, the discovery of new dynamic capabilities and especially their application is defined as a tool for creating as well as expanding competitive advantages and thus optimizing the value proposition. Due to the dynamics of this constant change, it is increasingly important for organizations to join forces with other organizations in order to jointly master these challenges. The idea of this association is to complement each other's resources and capabilities in very different areas such as supply chains, digitalization, innovation, entrepreneurship, and services, among others. In this context, Tidd et al. (2005, p. 54) state that organizations are no longer islands.

A term that has become established in academic literature across different research directions in the last decade in this context is the term *business ecosystem*. Business ecosystems represent the amalgamation of different, sometimes cross-industry, actors who strive to optimize the value proposition. Key characteristics of business ecosystems are the simultaneous existence of competitive and cooperative relationships between the actors, and the fact that they are both interconnected yet interdependent due to the ecosystem structure. Often, business ecosystems emerge from innovations that serve to satisfy customer needs and consequently the value proposition to customers. In this context, the complementary exchange of resources among the actors within the ecosystem can give rise to this innovation, which in turn can result in the creation of value and thus competitive advantages for each of the ecosystem actors.

Against the backdrop of business ecosystems as the underlying concept of ecosystems, different types of ecosystems have emerged over time according to different research streams. The established streams of these research trends include the digital, platform-based, innovation, entrepreneurial, and service ecosystem. What they all have in common is that they drive value creation in the respective ecosystem. Nevertheless, due to digitization traditional economic systems are increasingly changing as value creation is progressively based on linking hardware and software. This shift is primarily due to two aspects: the increasing monopolization of value

creation by a focal coordinator (orchestrator) and the intelligent networking of value-creating elements in ecosystems. Business ecosystems thus break through traditional, linear value creation and interlink single value creation elements to form a joint value creation, so-called value co-creation. Value co-creation thus opens up new opportunities for creating and ensuring competitive advantages as well as adapting dynamically to the rapidly changing environments of organizations.

In the academic literature, interest in the study of business ecosystems has grown rapidly in the last decade. Depending on the area of research, the individual studies set specific foci. However, one overarching focus has prevailed in all the different research interests, at least in part, and that is that of value creation. Thus, value co-creation is addressed in almost every study, at least in passing, and is repeatedly identified as a key feature of business ecosystems across different research fields. Nevertheless, value co-creation as a key focus as well as influencing factors enabling value co-creation remain largely unaddressed in current studies. The reasons for this are of different natures. On the one hand, the term 'business ecosystem' has grown so quickly in research interest that a uniform understanding of the different ecosystem types has so far been lacking. This weakens the understanding of the basic unit to be analyzed. Following on from this idea, organizations are only gradually beginning to build and expand ecosystems, so in-depth case studies and long-term observations are scarce. As a result, the methodological consideration of ecosystems is limited and mainly based on conceptual and qualitative considerations. However, an in-depth understanding of optimized value creation in business ecosystems is still largely lacking.

For this reason, this thesis is motivated by a wish to explore a more concrete consideration and analysis of the prevailing scientific literature on the classification of business ecosystems to create a general understanding of the key characteristics of established ecosystem types and their delimitation. The individual research articles, in turn, attempt to examine and explore the factors influencing the optimization of value creation in business ecosystems as an overarching research aim. Thus, this thesis answers the following overarching research question (RQ):

RQ: Which factors influencing the optimization of value creation can be derived from the academic literature as well as from practical observations and to what extent do they influence value creation?

2 Thesis Structure and Embedding of the Research Articles

In order to answer this overarching research question, this thesis is structured as follows. Sections 2 and 3 form the theoretical framework of this thesis. Section 2 describes the establishment of business ecosystems and their development against the background of different research directions and combines the findings on characteristic features of the established ecosystem types in a classification. Furthermore, section 2 describes the underlying aspects of value creation, which are in line with the main part and thus the individual research contributions. Section 3 contains the classification of the individual research articles in the respective research area. Overall, the second research question is examined based on three research areas: dynamic capabilities and the role of competitive advantages, innovation capabilities and the role of knowledge, and social capabilities and the role of trust. Each of these three research areas include the derivation of an overall research goal as well as the introduction of the research question of the respective research article. Section 4 describes each research article in the context of its publication history and research design. Section 5 summarizes the findings of each research outcome. Section 6 ends with a discussion and a conclusion.

In sum, my research contributes to a fundamental understanding of dynamic capabilities in relation to business ecosystems through conceptual considerations (Research Articles #1, #2, and #4) and a practice-oriented analysis of the application of dynamic capabilities (Research Article #3) representing research goal one. The second research goal, innovation capabilities and the role of knowledge, is considered by means of a conceptual model (Research Article #5) as well as two practice-oriented contributions, which considers the integration of innovative technologies in the public sector (Research Article #6) as well as the derivation of recommendations on how incumbent firms can overcome the hurdle of business model innovation against the background of automotive incumbents trying to establish a digital business ecosystem (Research Article #7). Based on the third research goal, social capabilities and the role of trust, the relevance of social factors with regard to the value creation of business ecosystems is conceptually examined (Research Article #8) and the value of trust is analyzed using the Gojek case study (Research Article #9). The present work thus contributes fundamentally to a consideration of the factors influencing value creation in business ecosystems. A conceptual basis is created for each area of influence, which is then examined in greater depth based on interviews or case studies.

II. Theoretical Foundation

1 Typologization and Delineation of Selected Ecosystem Types

1.1 From Biological Ecosystems to Business Ecosystems

In the context of economics, the term ecosystem is analogous to the biological concept of ecosystems (Briscoe & Sadedin, 2009, p. 49). Tansley (1935, p. 299) coined the term in his research study "The use and abuse of vegetational concepts and terms" in ecology, which is defined as "the branch of biology that deals with the relations of organisms to one another and to their physical surroundings." (Stevenson, 2010, p. 557). However, according to lore, the term originated in a conversation between A. G. Tansley and A. R. Clapham in the early 1930s, in which A. R. Clapham coined the term in response to a request from A. G. Tansley (Willis, 1997, p. 268). Tansley's intention was to replace the then used terms "complex organism" and "biotic community" and to introduce a general term to describe the biological and physical components of an environment based on their interactive relationship as a unit (Blew, 1996, p. 171; Guggenberger et al., 2020, p. 3). A. R. Clapham then proposed the term ecosystem. Thus, the term “eco” in ecosystem describes organisms, which live together in delineated areas. These areas, in turn, consist of interrelated and interdependent components, which the term "system" in ecosystem expresses (Kast & Rosenzweig, 1972, p. 450). Systems can include, for example, companies, countries, markets, and organizations, and thus represent economic entities (Treshchevsky et al., 2018, p. 3). This compound interpretation of the two words goes back to Haeckel's (1866) understanding of ecology, as well as systems in a physical context (Lindeman, 1942, p. 400; Stevenson, 2010, p. 557; Tansley, 1935, p. 299). Since Haeckel (1866) did not know the term ecosystem at that time, he did not mention ecosystems in his writing (Weigmann, 2007, p. 18).

The term ecosystem consequently describes organisms, which exist in association with one another in the form of a community (F. C. Evans, 1956, p. 1127; Tansley, 1935, p. 299). These organisms change, die, interact, move, and reproduce (Briscoe & Sadedin, 2009, p. 50). The interconnectedness of these systems is expressed in various process types of interaction and selection, ultimately resulting in a complex, network-like interconnectedness of internal and external organisms that leads to dependent structures within and outside the ecosystem (Levin, 1998, p. 431). This interdependent relationship can simultaneously ensure the survival of the ecosystem (Jax, 2016, p. 40; Nambisan & Baron, 2013, pp. 1071-1072). Ergo, a central aspect of ecosystems is a nonlinear structure that allows the ecosystem to dynamically adapt to sudden

environmental changes with no or minimal loss of function (Briscoe & Sadedin, 2009, p. 52; Levin, 1998, p. 431). This dynamic adaptation is achieved primarily by the fact that through the constant interaction of the actors as well as the permanent exchange of information, resources, and knowledge, the ecosystem is constantly evolving (Ben Letaifa et al., 2016, p. 1933; Lütjen et al., 2019, p. 508). For this constant evolution, the ecosystem needs dynamic capabilities such as agility, adaptability, cognitive ability, and evolvability (Ramezani & Camarinha-Matos, 2019, p. 605), which the ecosystem promotes, among other things, through the integration and interaction of different actors (Lütjen et al., 2019, p. 508). Due to the ability to dynamically adapt to changing environments, ecosystems are therefore said to be robust and resilient (Briscoe & Sadedin, 2009, p. 48; Ramezani & Camarinha-Matos, 2019, p. 604; Ryan et al., 2020, p. 36). The core idea of the ecosystem in the economic sense is hence that it is designed for interaction rather than transaction (Denning, 2021, p. 6). Consequently, the structure of the value chain is nonlinear and provides the opportunity to scale (Briscoe & Sadedin, 2009, p. 52).

Since the concept of ecosystem was established in ecology, researchers have transferred it to different fields of research. For example, Rothschild (1990, p. xii) was the first to introduce the basic idea of biological ecosystem into economics. Three years later, Moore (1993, p. 76) also metaphorically used the basic idea of the biological ecosystem in economics and has since been considered the originator of the term business ecosystem in many publications (Briscoe & Sadedin, 2009, p. 52). Due to the broad focus of economics, the term has evolved against the backdrop of different research streams within it. For example, since its introduction, the business ecosystem has represented a central research object not only in the information science literature, but also in the management literature, particularly in strategic management research (Guggenberger et al., 2020, p. 3). However, the different research interests have also led to the concept of business ecosystems evolving in different directions since it entered the business sciences against the backdrop of different research areas (Gupta et al., 2019, p. 100). Consequently, numerous, different definitions exist (Gupta et al., 2019, p. 100) by placing a prefix in front of the root word ecosystem (Guggenberger et al., 2020, p. 2). Thus, some authors use the term interchangeably with other types of ecosystems (Gupta et al., 2019, p. 100), or as an umbrella term subsuming different approaches and topics (Aarikka-Stenroos & Ritala, 2017, p. 24). The interchangeable usage of the term makes it difficult to delineate ecosystem types, and at the same time also impairs the consolidation and expansion of knowledge for academia and

industry (Gupta et al., 2019, p. 100). For example, the term business ecosystem is used synonymously for digital (business) ecosystems (Senyo et al., 2019, p. 53), platform-based (Rong et al., 2018, p. 175), innovation (Gawer & Cusumano, 2014, p. 417; Overholm, 2015, p. 14; Zahra & Nambisan, 2012, p. 220), entrepreneurial (Ryan et al., 2020, p. 36), and service ecosystems (Vargo et al., 2017, p. 117). This ambiguity inhibits the unambiguous and efficient use of the term and thus affects the understanding of ecosystems in the context of economics (Gupta et al., 2019, p. 100). As a result, vague and non-separable application of the ecosystem metaphor occurs, weakening the explanatory power of the ecosystem concept (Hakala et al., 2020, p. 10). At the same time, individual ecosystem types differ based on their characteristics, so that a delineation of the established ecosystem types seems necessary and useful. For this reason, the following chapter is motivated to be a first step in the classification of selected ecosystem types, which can be derived and delimited from each other as basic research directions (Table 1). This creates a separable and consistent understanding of the interpretation to the relevant ecosystem research directions and at the same time prepares a fundamental understanding of the basis for this thesis as well as the classification of the individual research articles.

1.2 Typologization of Ecosystems

Classification describes a process that groups entities based on certain characteristic features, such as similarity (Bailey, 2003, p. 4). Classifications can be conducted using two different approaches, namely taxonomy and typology. The creation of a taxonomy is based on the empirical derivation of taxa (classification categories) and is an established, common methodological approach to the classification of entities primarily in the information systems literature (Benedict, 2018, p. 453; Nickerson et al., 2013, p. 39; Webster & Watson, 2002, p. xiii). Typology, on the other hand, is based on the conceptual derivation of types (Doty et al., 1993, p. 232) and is also an established, common methodological approach in information systems as well as management literature (Baden-Fuller & Morgan, 2010, p. 156; S. Lambert, 2006, p. 1; S. C. Lambert, 2015, p. 51).

Since this thesis aims to derive general ecosystem types based on deductively derived characteristics, which is accompanied by the search for ideal-type patterns (Weber, 1949, p. 90), the present delineation and classification is positioned as a typology rather than a taxonomy. This is accompanied not only by the explanation of reality using models (in this case ecosystems), but also by the explanation of variations so that delimitations can be made (Doty et al., 1993,

p. 1200). In order to make these delimitations, the derived characteristics of the different types must be general rather than specific, which in turn requires (strong) abstraction and generalization (McKinney, 1950, p. 238).

Therefore, the idea of biological ecosystems forms the basic concept of ecosystems in different research fields through its use as a root term (Song, 2019, p. 569). From the basic idea of the business ecosystem, different research streams have developed in parallel in the ecosystem literature that consider different ecosystem types (Gomes et al., 2018, p. 30). Established streams of these ecosystem types include the business, entrepreneurial, innovation, platform, and service ecosystem in the information system as well as management literature (Aarikka-Stenroos & Ritala, 2017, pp. 24-25). Based on the findings of Guggenberger et al. (2020, p. 4), these established streams are further extended by another established stream in this thesis: digital ecosystems. At this point, it is noted that Guggenberger et al. (2020) use the term software ecosystem in their study, but in their description, it corresponds to the digital business ecosystem defined in this thesis. For this reason, this ecosystem type is assigned to digital business ecosystems. Established means that the enumerated ecosystem types are research streams that are intensively discussed in the academic literature, that accordingly have a supporting role in research (for example, by frequently referring to this type of ecosystem), and that can be clearly distinguished from each other. In addition to the established research streams, there are emerging streams that show increasing research interest from the respective research areas. These include, for example, the knowledge, software, and technology ecosystem (Clarysse et al., 2014, p. 1165; Hyrynsalmi & Hyrynsalmi, 2019, p. 2; Manikas & Hansen, 2013, p. 1294). Furthermore, numerous considerations of ecosystems are emerging focusing on specific aspects. One major grouping is that of industry-based ecosystems, which include automotive, energy, finance, healthcare, insurance, and tourism, among others. Looking at digital-enabling aspects, such as augmented reality, artificial intelligence, blockchain, cloud, digital twin, and Internet of things (IoT), for instance, can be considered another major grouping within the emerging research streams. Due to the manifold orientations and the micro perspective view of partly single research articles, this thesis only considers the established research streams of ecosystem types. Furthermore, with regard to the categorization of established ecosystem flows, this thesis follows the findings of the study by Guggenberger et al. (2020) and deliberately adopts a different categorization than, for example, the study by Aarikka-Stenroos and Ritala (2017).

The individual ecosystem types are presented in the following consideration based on five different areas as well as their associated criteria.

The first area covers fundamental characteristics such as the definition and purpose of the ecosystem. The ecosystem's objectives and core values describe the core value of the ecosystem, which ultimately leads to benefits within the ecosystem. Ecosystem structure refers to the primary orientation of the ecosystem in terms of socio-economic or socio-technical interaction. Socio-economic refers to the social-interactional focus of ecosystem actors (Treshchevsky et al., 2018, p. 6). These systems combine both social relationships and economic decision-making (Orcutt, 1957, p. 116). Socio-technical considers the set of interacting actors in relation to the technologies associated with the interactions (Morgan-Thomas et al., 2020, p. 714-715). In literature, socio-technical systems are considered a special case of complex adaptive systems (Kim & Kaplan, 2006, p. 35).

The second area includes relational characteristics and therefore sheds more light on the interaction of actors. Relational connectivity describes to what extent the relationship structures are independent or dependent and whether they are co-existing or co-evolving actors. Co-existing describes the fact that ecosystem actors can exist independently to each other before entering the ecosystem. In this case, they are not dependent on the ecosystem unless becoming a member. Co-existing describes actors that exist and act independently of each other, even through interconnectedness within an ecosystem. Co-evolution describes the ability of a system to dynamically adapt its infrastructure to changes in the environment. This adaptation involves optimizing processes, products, services, and technologies in such a way as to create innovation and thus novelty (Minami et al., 2014, pp. 2, 7). What the identified ecosystem types have in common is that actors, if they act as members in the ecosystem, naturally have a dependency relationship (Song, 2019, p. 570). However, not all actors are naturally interdependent with respect to the ecosystem. Therefore, the category refers to the fundamental alignment of actors with each other, not the dependency that naturally exists in the interaction within the respective ecosystem (Song, 2019, p. 570). The competitive relationship between actors can be either primarily determined by coopetition, i.e., the interplay of collaboration and competition (Le Roy & Czakon, 2016, p. 3), or primarily determined by cooperation (Hannah & Eisenhardt, 2018, p. 3166). While coopetition is characterized by asymmetric relationships and divergent interests, which can lead to opportunistic behavior, cooperation, on the other hand, represents consensual collaboration on the same level with reduced asymmetry or, ideally, no asymmetry

in the relationship at all. Asymmetry is defined primarily by differences in hierarchy, capabilities, resources, and knowledge. Thereby, coopetition can be used consciously in strategic management to increase the performance of the organization (Dagnino & Rocco, 2009, p. 46; Le Roy & Czakon, 2016, pp. 3-4). All ecosystem types have in common that a certain degree of competition cannot be excluded. However, there are differences in the fundamental orientation of the ecosystem types to the competitive attitude. Thus, not all actors are necessarily competitors. Accordingly, the category refers to the fundamental competitive orientation. Orchestration represents a tool for coordinating the activities, interactions, and partnerships of actors, providing value propositions, and guiding the strategic direction of the ecosystem (Linde et al., 2021, p. 3). Actors are entities both inside and outside the ecosystem, involved in the activities and happenings of the ecosystem, and occupying different roles in the interaction (Lütjen et al., 2019, p. 508).

Special characteristics, the third area, include aspects that are characteristic of the ecosystem in question, such as the degree of openness. The aspect of openness can be differentiated into architectural openness and cooperative openness (Cenamor & Frishammar, 2021, p. 2). Whereas architectural openness is enabled by modular interfaces and open innovation (Ethiraj & Levinthal, 2004, p. 159), collaborative means the openness of sharing activities (Cenamor & Frishammar, 2021, p. 2). In this context, closed innovation describes innovative processes fully inside a company's boundaries, whereas third-party innovation is undertaken completely outside (Parmentola et al., 2018, p. 868). In addition, each ecosystem type is characterized by certain key features, which vary depending on the ecosystem type, so that a general description cannot be made. In addition, ecosystems differ in terms of their platform focus. Platforms represent an asset (for instance, a service or technology) that provides a solution to others in the ecosystem (Iansiti & Levien, 2004, p. 69). Because not every ecosystem type necessarily requires a digital platform as a core asset, the platform is not a defining characteristic for every ecosystem type in the sense of a platform ecosystem (Fuller et al., 2019, p. 9; Rong et al., 2018, p. 169). Rather, the platform may also be multi-sided markets (Helfat & Raubitschek, 2018, p. 1392). The geographic proximity of the individual actors to each other represents another delimitation criterion. The criterion includes local, regional, national, and global focus (Acs et al., 2017, p. 7). Finally, yet importantly, tendency statements can be made regarding the focus of the value chain. Although almost all authors address value co-creation in the individual ecosystem types, and some even use it synonymously for the entire value chain process, the individual ecosystem types can be distinguished based on value capture and value creation, at least

in nuances (Jacobides et al., 2018, p. 2256). For example, value co-creation plays a dominant role in most ecosystem types, but is not always the primary focus and in some cases is considered more of a logical precursor (Masucci et al., 2020, p. 1).

The fourth area highlights the research-relevant aspects, which include the main research field, the key research topics, and the leading scholars.

The fifth area covers the industrial view and includes both exemplary industries as well as real-word examples for each ecosystem type. The industry focus is derived from scientific studies. The real-word-examples are derived from both specific case studies and exemplary mentions in different scientific studies. Table 1 summarizes the relevant results in an overview.

1.2.1. Business Ecosystems

Fundamental characteristics

Moore (1993, p. 76) defines business ecosystems as follows: "In a business ecosystem, companies evolve capabilities around a new innovation: they work cooperatively and competitively to support products, satisfy customer needs, and eventually incorporate the next round of innovations. [...] A business ecosystem [...] gradually moves from a random collection of elements to a more structured community." The basic understanding of Moore's idea of business ecosystems is thus the interaction of interconnected, interacting stakeholders for a collectively defined economic purpose (Moore, 1993, p. 76). This interaction is expressed in mutually supportive (Moore, 1996, p. 76) and complementary behavior (Aksenova et al., 2019, p. 318; Jacobides et al., 2018, p. 2255-2256). The purpose of business ecosystems is predominantly strategic (Gupta et al., 2019, p. 103; Zahra & Nambisan, 2012, pp. 220-221). Thus, the primary goal of business ecosystems is to satisfy customer needs (Graça & Camarinha-Matos, 2017, p. 246; Tripathi & Gupta, 2021). This satisfaction is achieved by enhancing existing products and services (core value) through innovative change (Denning, 2021, p. 2). To this end, the players in the business ecosystem make use of their own core competencies and resources and try to exploit synergies (Hakala et al., 2020, p. 16). As a consequence, competitive advantages and, in the best case, even economies of scale can be achieved (Hakala et al., 2020, p. 20; Kanter, 2012, p. 147). In extreme cases, the goal of the business ecosystems is survival (Iansiti & Levien, 2004, p. 74). Business ecosystems therefore represent socio-economic systems (Ramezani & Camarinha-Matos, 2019, p. 607).

Relational characteristics

The relationships among the actors are initially characterized by loose dependence (Aksenova et al., 2019, p. 318; Rong et al., 2018, p. 172), which only changes into interdependence through the ecosystem relationship (Aksenova et al., 2019, p. 318). Hence, the relationships are initially co-existing, but changing into co-evolving relationships over time due to the ecosystem interaction (Hakala et al., 2020, p. 13). Since the actors in the ecosystem have both collaborative and competitive structures, the tension of coopetition shapes the relationship structure (Hakala et al., 2020, p. 13). At the same time, there are different resource holdings and hierarchies in the business ecosystem, so the relationships can be assumed to be asymmetric (Rong et al., 2018, p. 171). In the business ecosystem, the ecosystem leader takes over the orchestration (Awano & Tsujimoto, 2021, p. 1). Actors in the business ecosystem include competitors, customers, distributors, end-users, financing institutions, focal actors, leading manufacturers, outsourcing firms, and suppliers (Tsujimoto et al., 2018, p. 52). Depending on the industry focus, this group can be expanded to include additional actors.

Special characteristics

Business ecosystems usually form around existing, established companies and are primarily focused on the supply chain as well as the end customer (Graça & Camarinha-Matos, 2017, pp. 238, 240; Rong et al., 2013, p. 78). The willingness to open up to other actors is made on a socio-economic basis and concerns the collaborative level (Graça & Camarinha-Matos, 2017, p. 237). The actors of business ecosystems are often located in close, local geographic proximity (Graça & Camarinha-Matos, 2017, p. 240). This can be mainly justified by the focus on the supply chain and the cluster that is created around it (Graça & Camarinha-Matos, 2017, p. 249). However, expansion on a global level is possible as well (Graça & Camarinha-Matos, 2017, p. 238). Complementary assets include mainly capabilities. Even though one of the goals in the interaction of actors is value co-creation, the focus in terms of value creation in the business ecosystem is not exclusively on value co-creation, but mainly on value capture (Awano & Tsujimoto, 2021, p. 1; Ben Letaifa, 2014, p. 279; Bogers et al., 2019, p. 13; Teece & Linden, 2017, p. 1).

Academic characteristics

Business ecosystems represent a central research construct especially in economics, information systems, strategic management, and organizational studies (Rong et al., 2018, p. 176; Zahra & Nambisan, 2012). The main research topics include classical management issues related to supply chain, stakeholder networks, and sustainability (Bsole et al., 2015; Camarinha-Matos & Afsarmanesh, 2006; Sharma & Henriques, 2005), as well as issues from the strategic management domain with research topics on general strategic issues (Zahra & Nambisan, 2012), competition issues (Li, 2009), and collaborations (Moore, 1997). Furthermore, innovation management forms another large grouping with topics on intellectual property (Zahra & Nambisan, 2012), open innovation (Chesbrough & Appleyard, 2007), innovation capabilities (Selander et al., 2013), and complementary assets (Adner & Kapoor, 2010). A final area of research forms the consideration of the business ecosystem construct in general (Graca and Camarinha-Matos, 2017) and collaborations (Galateanu Avram & Avasilcai, 2014). Leading researchers in business ecosystems include Basole et al. (2015), Li (2009), Moore (1993, 1996), Rong et al. (2015), and Teece (2016). Leading scholars include Basole et al. (2015), Li (2009), Moore (1993, 1996), Rong et al. (2015), Rothschild (1990), and Teece (2016), among others.

Industrial characteristics

The industry focus of business ecosystems in previous research includes automotive, high-tech, telecommunications, energy, tourism, biotechnology, steel, textile, 3D printing, and healthcare. The industry focus of business ecosystems is applicable to many industries due to their very general form, which is reflected in the heterogeneity of the industries.

Business ecosystem can be seen as an overarching concept for the other established ecosystem types (Aarikka-Stenroos & Ritala, 2017, p. 25). Thus, several researchers confirm that the respective ecosystem types, which are defined as established in this thesis, are derived from the concept of the business ecosystem and represent a subset of the business ecosystem.

1.2.2. Supply Chain Ecosystem

General description

Business ecosystems can also be existing companies with large external supply chains (Gupta et al., 2019, p. 101), but specifically focused on aspects of the supply chain. Supply chain ecosystems can therefore be defined as a subset of business ecosystems. Thus, a supply chain ecosystem consists of supply chain elements on the one hand, and actors that are directly or indirectly involved in the supply chain on the other. These include organizations that influence, for example, financial, information, and commodity flows based on management decisions, legal requirements, or the use of new technologies (Viswanadham & Samvedi, 2013, p. 6485). The particular risks of supply chains mainly include the supply chain network, government and social institutions, corporate resources (financial, human and industrial), and delivery service mechanisms (Viswanadham & Samvedi, 2013, p. 6486). Apart from the particular focus on supply chain management, these ecosystems also represent a community of interconnected firms that share as a common goal the assurance of the supply chain, and are interdependent (G. Liu et al., 2019, p. 1124). Thus, business and supply chain ecosystems have the same basic structure of ecosystem thinking, but vary in their target orientation (G. Liu et al., 2019, p. 1123). Supply chain ecosystem represent an emerging ecosystem type.

1.2.3. Digital Business Ecosystems

Fundamental characteristics

Digital business ecosystems are defined as "a socio-technical environment of individuals, organizations, and digital technologies with collaborative and competitive relationships to co-create value through shared digital platforms" (Senyo et al., 2019, p. 53). Digital business ecosystems are consequently a composition of digital and business ecosystems and represent an extension of business ecosystems (Senyo et al., 2019, p. 53; F. B. Tan et al., 2016, p. 3). The purpose of digital business is to establish a digital infrastructure, which improves efficiency in terms of faster processes and lower transactions costs. In digital business ecosystems, the core value lies mainly in the application and use of digital technologies such as hardware, software applications, and digital processes, and therefore represents the most important asset of the digital business ecosystem (Nachira et al., 2007, p. 9; Senyo et al., 2019, p. 53). Hence, the aim of digital business ecosystems is to integrate technological expertise and the ability to build an infrastructure based on digital technologies. The digital part of the ecosystem operates as a

technological infrastructure that connects digital services or creates new ones and distributes them (Senyo et al., 2019, p. 53). The business part of the ecosystem represents a community of individuals and organizations that operate outside their traditional industry boundaries (Senyo et al., 2019, p. 53). The use of digital technologies therefore enables the development, distribution, and monetization of products and services and facilitates the achievement of common interests through the networking of ecosystem actors (Selander et al., 2013, pp. 185-186).

Digital business ecosystems therefore focus on platforms in the sense of multi-sided markets that facilitate exchange between the ecosystem players and the end users. In this case, the platform provides interfaces, which enable the connection of economic actors around the platform such as, for example, content providers (Helfat & Raubitschek, 2018, p. 1392). A synonym for this kind of platform leader is "matchmaker," as they connect different parties around the platform (D. S. Evans & Schmalensee, 2016, pp. 1–4). For this reason, digital business ecosystems represent socio-technological systems (Senyo et al., 2019, p. 53; F. B. Tan et al., 2016, p. 2).

In the literature, the term digital ecosystem (Briscoe et al., 2011, p. 1153) or software ecosystem is also frequently used for digital business ecosystem (Nieuwenhuis et al., 2018, p. 308). All terms combine the same basic understanding of this ecosystem type. However, they differ in the focus of consideration. For example, digital and software ecosystems usually focus on technical functionality from the perspective of information system research, whereas digital business ecosystems focus on management-relevant issues. The present analysis therefore distances itself from the delimited definition of, for example, digital ecosystems that emerges from the study by Manikas and Hansen (2013, p. 1296).

Relational characteristics

The actors in the digital ecosystem are interdependent, co-evolving actors (Briscoe et al., 2011, pp. 1160-1161). Similar to the business ecosystem, the network of relationships is characterized by both cooperative and competitive structures (F. B. Tan et al., 2016, pp. 2-3). Due to the different skills that are exchanged in the digital business ecosystem, asymmetrical relationship structures also prevail here. Platform leaders usually orchestrate digital business ecosystems. In addition to the key actors in the business ecosystem, the actors also include advertisers, content and service providers, developers and vendors within digital business ecosystems (Gawer & Cusumano, 2014, p. 418).

Special characteristics

Key features can be seen primarily in the fact that actors can operate outside their own industry boundaries thanks to the digital infrastructure. At the same time, this digital infrastructure facilitates and enables small and medium-sized enterprises to be globally competitive (Briscoe et al., 2011, p. 1160; Herdon et al., 2012, p. 286). As a result, the digital business ecosystems link different stakeholders (B. Tan et al., 2015, p. 260). Furthermore, the digitization of products and services makes it possible to reduce costs, make processes faster and thus more efficient, and increase service quality (Senyo et al., 2019, p. 53). Digital business ecosystems lead to a break-up of the traditional value chain and to innovative and boundary-spanning solutions. The usage of digital technologies enables a change from the traditional pipeline model of the value chain to a "circular, iterative, feedback-driven process" of value creation (van Alstyne et al., 2016, p. 57). The degree of openness is dichotomous in digital business ecosystems: with regard to the technical infrastructure, it requires a degree of architectural openness; with regard to the actors, a certain degree of openness to collaborations is necessary (Senyo et al., 2019, p. 52). Complementary assets are seen in boundary resources such as application programming interfaces (API), integrated development environments (IDE), software development kits (SDK). Digital business ecosystems do not require immediate or even local proximity due to the digital infrastructure, so that the geographical proximity can be classified as "geographically dispersed" (Senyo et al., 2019, p. 53). In terms of the value chain, the focus of digital business ecosystems is primarily on value co-creation (Adner, 2006, p. 2; Senyo et al., 2019, p. 53). Digital business ecosystems primarily focus on value creation (Senyo et al., 2019, p. 53).

Academic characteristics

Digital business ecosystems represent central research concepts in engineering design, information systems, technology management, and organization literature (Briscoe et al., 2011, p. 1144; Nambisan et al., 2019, p. 1467). In this regard, the key research topics can be divided into four major research fields (Senyo et al., 2019, p. 55-58). The first research field is formed by business issues such as alliances, network analysis, value co-creation, governance structures and legal issues, knowledge management, social factors such as trust, risk, and security, and also management-related issues such as processes and strategies. Technical issues as the second research area include architecture, platform and service design, process management, system integration and interoperability, and the digital technologies used. The management, projects,

and further development of digital business ecosystems, as well as its genesis and properties, form the third research field: the conceptualization of digital business ecosystems. Frameworks, methodologies, models, and modeling languages belong to the fourth research area: artefacts. Leading scholars in these different research areas primarily include Hussain et al. (2007), Dong et al. (2007), Senyo et al. (2016), Senyo et al. (2018, 2019), and Tan et al. (2009; 2016).

Industrial characteristics

The industry focus in previous scientific studies is mainly in engineering (Gupta et al., 2019, p. 101) and computer science industries (Gupta et al., 2019, p. 101). Because digital business ecosystems can take the form of projects, technologies, or even of a concept, the examples of digital business ecosystems are diverse. In the project domain, one example is the EU's digital business ecosystem research project in 2003: Digital Business Ecosystem Integrated Project (DBE), which ran from November 2003 to January 2007 (Nachira et al., 2007, p. 6). An example of a technology in the sense of a platform is "Open Negotiation One" (ONE), an open-source platform, which agents can use for negotiating and services (Telesca et al., 2007, p. 186). Other examples of technologies include JDLink by John Deere, XBOX by Microsoft, and Playstation by Sony (Nambisan et al., 2019, p. 1467).

1.2.4. Platform Ecosystems

Fundamental characteristics

A platform ecosystem is defined as “a platform and its collection of complementary extensions. A platform refers to an extensible technological foundation and the interfaces used by extensions that interoperate with it. An extension - synonymous with add-ins, modules, and apps—is a complementary subsystem that augments a platform’s native functionality” (Tiwana, 2015, p. 267). Since the introduction of platform ecosystems into the literature, very different, sometimes contradictory definitions and concepts of this ecosystem type have become established (Cenamor & Frishammar, 2021, p. 1). For example, platform ecosystems are often equated with digital business ecosystems and software ecosystems (Hein et al., 2020, p. 92). At this point, it is important to mention that this thesis distances itself from this synonymous usage. Platform ecosystems consist of a technological platform in the sense of a system or architecture

that forms the infrastructure of the ecosystem and is the core of the ecosystem (Inoue & Tsujimoto, 2018, p. 235). This platform facilitates the exchange, primarily of services, between the platform operator and the end customers (Hein et al., 2020, p. 90). The purpose of platform ecosystem can be seen in facilitating the exchange between platform orchestrator and end-users as well as producing a consistent stock of external innovations through third party development. In this way, additional offers for end users can be provided. Moreover, ecosystem actors profit from ongoing solutions development (Tiwana, 2015, p. 269). The objectives of platform ecosystems, however, is that the further development of products and services is based on the principle of open innovation by third-party providers (Inoue & Tsujimoto, 2018, p. 235). The platform is thus the central starting point of the ecosystem and enables its emergence and the construction around the ecosystem (Hein et al., 2020, p. 89; Inoue & Tsujimoto, 2018), which is seen as the core value of the platform ecosystem (Riasanow et al., 2020, pp. 90-91). Guggenberger et al. (2020, p. 5) speak here of "digitally-enabled ecosystems such as app stores." Via these app stores, third-party developers can sell their own software, which users can operate from the associated mobile devices (Faber et al., 2019, p. 4). As a result, end customers benefit from additional offers and solutions in terms of products and services provided, while the ecosystem players (third-party providers) can also use these solutions for themselves (Faber et al., 2019, p. 4; Iansiti & Levien, 2004, p. 71). The app store provider in turn benefits from the expansion of the functionality of its end devices, which increases the value of the end device (Faber et al., 2019, p. 4). In dynamic platform ecosystems, third-party developers generate a constant, infinite expansion of the existing stock of digital external innovations (Cenamor & Frishammar, 2021, p. 1; Inoue & Tsujimoto, 2018, p. 235). Modular interfaces accordingly form the basis of platform ecosystems and enable the provision of products in the form of components or subsystems (complementarities) of different parties (Helfat & Raubitschek, 2018, p. 1392). The platform itself assumes the role of intermediary in transactions (Thomas et al., 2014, p. 204).

Complementary assets include the full range of skills and knowledge on digital aspects such as application programming interfaces (API), integrated development environments (IDE), and software development kits (SDK) (Hein et al., 2020, p. 88; Yoo et al., 2010, p. 729). In the case of platform-based ecosystems, these boundary resources are provided by third-party developers (Faber et al., 2019, p. 4; Guggenberger et al., 2020, p. 5). These resources are also referred to as boundary resources in the academic literature (Bianco et al., 2014, p. 11). Platform ecosystems are thus socio-technological systems (Hein et al., 2020, p. 89).

Relational characteristics

Platform ecosystem actors initially co-exist in an independent relationship with each other (Hein et al., 2020, p. 92), which can change over time to an interdependent, co-evolving relationship through consistent platform interaction (Cenamor & Frishammar, 2021, pp. 2, 4). The actors expand their capabilities through the permanent development of the app store ensuring a constant co-evolution (Riasanow et al., 2020, pp. 90-91). Due to the intertwined interests of the actors (Riasanow et al., 2020, p. 89), the relationships of the actors are designed for cooperation (Hein et al., 2020, p. 91), so that asymmetric relationships do not dominate the interaction between the actors (Parker et al., 2016, p. 263). The governance structure (orchestration) is determined solely by the platform leader (Cusumano & Gawer, 2002, p. 54; Teece, 2018, p. 1376). The actors in the platform ecosystem mainly include advertisers, asset providers (complementors), content providers (input suppliers), developers, end-users, platform owners, and vendors (Helfat & Raubitschek, 2018, p. 1392; Yoo et al., 2012, p. 1402).

Special characteristics

Key features of platform ecosystem are due to the fact that they are digital-enabled ecosystems that use a platform as a central technological infrastructure and create innovation through external third-party providers based on open innovation (Cusumano & Gawer, 2002, p. 56; Teece, 2018, p. 1376). This allows for both network effects (Helfat & Raubitschek, 2018, p. 1392) and economies of scale ((Hein et al., 2020, p. 92). The openness of platform ecosystems is expressed above all in the area of tension and thus raises the key question of open or closed innovation (Cenamor & Frishammar, 2021, p. 1). The dichotomy of maximum openness and at the same time safeguarding against a maximum loss of knowledge and thus a competitive advantage for all participating actors is also described as the "paradox of openness" (Benzell et al., 2019, p. 1). Similar to digital business ecosystems complementary assets are seen in boundary resources (Hein et al., 2019, p. 503). Due to the exclusive digital application and use of platform ecosystems, there is no need for geographic proximity, so ecosystem actors are geographically dispersed (Hein et al., 2020, p. 95). Platform ecosystems focus mainly on value creation (Hein et al., 2019, p. 503; Hein et al., 2020, p. 93).

Academic characteristics

Platform ecosystems are a key object of study especially in information systems. Research topics primarily include platform architecture, design, interfaces, governance, management, and modularity (Helfat & Raubitschek, 2018, p. 1391; Henderson & Clark, 1990, p. 9; Qiu et al., 2017, p. 225). Leading scholars include Gawer & Cusumano (2002), Ghazawneh & Henfridsson (2013), Thomas et al. (2014), Tiwana (2010; 2015), and Wareham et al. (2014).

Industrial characteristics

The industry considered in the case of platform ecosystems is the software/high-tech industry. Based on the understanding of platform ecosystems in this thesis, the examples of platform-based ecosystems are limited only to app stores such as Apple's App Store. Consequently, the difference between business and platform ecosystems is that in platform-based ecosystems the core value lies in the app store itself and not in the end devices, since the end devices would lose value without the permanent further development of third-party providers. Consequently, it is not the product or service itself that is the core of the platform ecosystem, as is the case with the business ecosystem, but the platform as the central technological infrastructure (Faber et al., 2019, p. 5).

1.2.5. Innovation Ecosystems

Fundamental characteristics

Walrave et al. (2018, p. 3) define an innovation ecosystem as "a network of interdependent actors who combine specialized yet complementary resources and/or capabilities in seeking to (a) co-create and deliver an overarching value proposition to end users, and (b) appropriate the gains received in the process." The purpose of innovation ecosystems is primarily to achieve competitive advantages. In order to achieve these competitive advantages, entities try to either build or establish an ecosystem or expand an existing ecosystem through cooperation with other actors. The cooperation of the actors is thereby primarily designed for the exchange of skills, technologies, and knowledge. Through this exchange and the interaction between the innovation ecosystem actors, new knowledge evolves (Oh et al., 2016, p. 5), which in turn can enable joint co-creation of innovation (core value) and thus to a joint creation of value (Gobble, 2014,

p. 55). Innovation or development therefore means proactive change. This is in contrast to adaptation or further development, which is triggered by external factors and thus describes a reactive behavior (Betta et al., 2010, p. 229). The goal of creating innovation is to create a new value for society. This newly created value can come from either radical innovation or the refinement of existing products, services, and technologies (Stam, 2014, p. 2). Here, actors share the risks and uncertainties of the innovation process (value creation) as well as its outcome (value capture), which ideally represent the core value of the innovation ecosystem (Aarikka-Stenroos & Ritala, 2017, p. 25; Dattée et al., 2018, p. 466). Innovation ecosystems are therefore socio-economic systems (Carayannis & Campbell, 2009, p. 224).

Relational characteristics

Actors are interdependent, co-evolving agents (Carayannis & Campbell, 2009, p. 206). The interaction of the actors is characterized by the simultaneous existence of collaborative and competitive structures (Granstrand & Holgersson, 2020, pp. 7–8; Nambisan & Baron, 2013, pp. 1071–1072). As a result, asymmetric relational relationships are present, which favor the exploitation of opportunistic behavior (Granstrand & Holgersson, 2020, p. 2). Innovation ecosystems incorporate an ecosystem leader in preference to a platform leader. Common actors in innovation ecosystems include additional innovators, customers, focal companies, governmental and non-governmental organizations, policymakers, private and public organizations, suppliers, and universities (Aarikka-Stenroos & Ritala, 2017, p. 25; Carayannis & Campbell, 2009, p. 206; Clarysse et al., 2014, p. 1165; Dedehayir et al., 2018, p. 18; Jackson, 2011, pp. 2, 11; Oh et al., 2016, p. 3).

Special characteristics

One key feature of innovation ecosystems is that they are more likely to be designed than evolving (Oh et al., 2016, p. 5). Moreover, coopetition can represent a powerful instrument to trigger innovation efforts (Bacon et al., 2020, p. 308). Special characteristics of innovation ecosystems include also an innovation spirit or spirit of inquiry (Madsen, 2020, p. 4), which is expressed in the fact that actors in the innovation ecosystem are very innovation-driven (Aarikka-Stenroos & Ritala, 2017, p. 25; Dattée et al., 2018, p. 466; Ritala & Hurmelinna-Laukkanen, 2013, p. 260). Innovations can be national, regional, or technological innovations (Dedehayir et al., 2018, pp. 19, 25; Jackson, 2011, p. 11). Innovation ecosystems differ from

business ecosystems in several aspects. While business ecosystems focus on the further development of existing products and services and thus on cost reductions, the exploitation of resources, and the satisfaction of existing customer needs, innovation ecosystems focus on the creation of innovation independently of existing products and services. This is associated with high costs in the form of investments and a high degree of uncertainty about the outcome of the innovation and its marketing, i.e., the satisfaction of customer needs, which do not yet exist until the innovation. The degree of openness in the innovation ecosystem also represents a dichotomy between maximum openness and the simultaneous risk of knowledge leakage at the collaborative level. The more the participants in the innovation ecosystem open up, the more knowledge is revealed and the more likely it is that competitive advantages based on this knowledge will be lost to the competitor through the coopetitive relationship structure (Wang & Bi, 2021, p. 201). Complementary assets consist of knowledge, skills, and technologies (Nambisan & Baron, 2013, pp. 1071-1072). The geographical proximity of innovation ecosystems is described as spatial proximity and the additional or exclusive presence of virtual spaces (Panetti et al., 2020, p. 1779). Innovation ecosystems focus primarily on value co-creation (Dedehayir et al., 2018, p. 18; Still et al., 2014, pp. 3-4).

Academic characteristics

Innovation ecosystem are a key research objective especially in strategic management, innovation management and entrepreneurship (Gomes et al., 2018, p. 30). Key research topics focus on collaboration, innovation capabilities, value co-creation, among others. Leading researchers in the field of innovation ecosystems include Adner (2006, 2017), Adner & Kapoor (2010, 2016), and Gomes et al. (2018).

Industrial characteristics

The industries addressed by innovation ecosystems are very heterogeneous: the mechanical engineering and computer industries (Adner & Feiler, 2019, p. 111), biotechnology (Bandera & Thomas, 2019, p. 544), the automotive industry (Feng et al., 2019, p. 85), the telecommunications, wireless, smartphone industries (Holgersson et al., 2018, pp. 306-311), the energy industry (Kolloch & Dellermann, 2018, p. 255), the food industry (Leten et al., 2013, p. 61), the pharmaceutical industry (Nambisan & Baron, 2013, p. 1077), 3D printing (Beltagui et al.,

2020), video games (Su et al., 2018, pp. 15-16), publishing (Suseno et al., 2018, p. 336), solar, and aircraft industries (Walrave et al., 2018, pp. 107-108).

1.2.6. Entrepreneurial Ecosystems

Fundamental characteristics

"Entrepreneurial ecosystems represent a diverse set of inter-dependent actors within a geographic region that influence the formation and eventual trajectory of the entire group of actors and potentially the economy as a whole. Entrepreneurial ecosystems evolve through a set of interdependent components which interact to generate new venture creation over time" (Cohen, 2006, p. 2). Thus, the entrepreneurial ecosystem consists of a set of entrepreneurial stakeholders (Bischoff, 2019, p. 2) whose purpose is to increase entrepreneurship. These interest groups represent different backgrounds, such as cultural, economic, political, or social (Spigel, 2017, p. 50). Entrepreneurship is understood as the creation and development of businesses (regional development) as well as economic growth (high-growth entrepreneurship) (Brown & Mason, 2017, p. 5; Spigel, 2017, p. 50; Stam & van de Ven, 2019, p. 6). Entrepreneurial thus refers to entrepreneurship (Stam, 2014, p. 2), under which is seen the discovery and exploitation of opportunities to create new products and services, including the risks of financing and founding (Shane & Venkataraman, 2000, pp. 223-224; Spigel, 2017, p. 50). In a broader sense, it is consequently about an innovation process (Stam, 2014, p. 2). The entrepreneurial ecosystem therefore emphasizes discovering, pursuing, scaling up, and scaling new ventures (Acs et al., 2017, p. 6). To achieve these entrepreneurial ecosystem goals, actors exchange resources with the aim of allocating resources. These include, for example, discovering and exploiting entrepreneurial opportunities (Qian, 2018, pp. 166-168). In the academic literature, the entrepreneurship ecosystem and the start-up ecosystem are also often used interchangeably (Faber et al., 2019, p. 6; Tripathi & Gupta, 2021, p. 65). In this thesis, these two terms are subsumed under that of entrepreneurial ecosystem, as all three terms share the same basic understanding of this ecosystem type. Resources include human resources, an infrastructure, an entrepreneurial culture, support systems, the market, demographics, and the entrepreneur or entrepreneurial team itself (Tripathi & Gupta, 2021, pp. 66-70). Entrepreneurial ecosystems are not necessarily platform-focused (Song, 2019, p. 569) and thus represent multi-sided markets. In the academic literature, platforms are not given a central role in any of the definitions analyzed. Thus, entrepreneurial ecosystems can be categorized as socio-economic systems (Acs et al., 2017, pp. 2, 4).

Relational characteristics

The actors in the entrepreneurial ecosystem are independent, co-existing actors at the beginning, which become dependent, co-evolving actors in the course of the entrepreneurial ecosystem (Pustovrh et al., 2020, p. 2). The interaction is based on the principle of cooperation, which is characterized by mutual trust and a common objective, so that there are largely symmetrical relationship structures among the actors (Audretsch & Belitski, 2017, p. 1035). This common objective is primarily rooted in joint entrepreneurial action (Pustovrh et al., 2020, p. 2). With regard to the main actor (entrepreneur or entrepreneurial team), there are hierarchical differences in the relationship structure, as there is a dependency relationship with other actors, such as the providers of capital. However, opportunistic behavior can be largely ruled out here, since the main actors have little leeway for pursuing their own interests due to the dependency relationship and the common objective. Nevertheless, the other actors exert a high degree of influence on the milestone setting and strategy alignment of the entrepreneurial ecosystem (Auschra et al., 2019, p. 60). Ecosystem leaders orchestrate the entrepreneurial ecosystem. In addition to (aspiring) entrepreneurs, the actors in the entrepreneurial ecosystem primarily include accelerators, banks, business angels, incubators, investors, investment funds, government agencies, venture capitalists, professional service providers, and universities (Auschra et al., 2019, p. 60; Kuratko et al., 2017, p. 121; Sako, 2018, p. 20; Tripathi & Gupta, 2021, p. 65). The circle of actors can thus be described as start-up related (Sako, 2018, p. 20). The role of government agencies is explicitly to promote and support entrepreneurship (Scaringella & Radziwon, 2018, p. 74).

Special characteristics

A key feature of entrepreneurial ecosystems is that the entrepreneur or entrepreneurial team has a central role in the ecosystem, as he or she is responsible for the construction and sustainability of it (Scaringella & Radziwon, 2018, p. 70). Thus, its position at this advanced stage should be considered as dependent on the other actors in the ecosystem (Alvedalen & Boschma, 2017, p. 891). Entrepreneurial ecosystems by definition inherit a collaborative openness. Without this openness to collaborate, the two-way exchange among actors would be absent, without which the entrepreneurial ecosystem could not emerge and exist (Qian, 2018, p. 166). The mutual discovery and exploitation of entrepreneurial opportunities defines the complementary asstes within entrepreneurial ecosystems (Audretsch et al., 2019, p. 321). The overwhelming

opinion in the entrepreneurial ecosystem literature is that this ecosystem type consists of mostly locally or regionally close entities (Bischoff, 2019, p. 2; Brown & Mason, 2017, p. 5; Spigel, 2017, p. 2; Tripathi & Gupta, 2021, pp. 62, 65, 68). Value co-creation is one of the main activities in the entrepreneurial ecosystem (Adner, 2017, p. 40; Ansari et al., 2016, p. 1841), as cooperation generates newly-shared value for each of the actors involved (Adner, 2006, p. 98).

Academic characteristics

The entrepreneurial ecosystem forms a central construct in entrepreneurship and innovation research (Song, 2019, p. 569). The main research topics include economic, technological, cultural, and societal dimensions (Song, 2019, p. 570). The entrepreneurial ecosystem literature is dominated by the studies of Acs et al. (2017), Audretsch and Belitski (2017), Berger and Kuckertz (2016), Bischoff (2019), Cohen (2006), Brown and Mason (2017), Pustovrh et al. (2020), Spigel (2017), Stam and van de Ven (2019), and van Rijnsoever (2020).

Industrial characteristics

Similar to innovation ecosystems, the industrial focus is broad and therefore cannot be attributed to a specific industry orientation (Song, 2019, p. 570). For example, industries considered in the academic literature to date include biotechnology (Basole et al., 2019), brewing (Bhawe & Zahra, 2019), oil and gas (Spigel, 2017), computing (Carayannis et al., 2016), high-tech (Chen et al., 2020), automotive (Colombelli et al., 2019), the banking industry (Colombo et al., 2019), food and denim industry (DiVito & Ingen-Housz, 2019), transportation (Elia et al., 2020), the aircraft engineering industry (Kapoor & Agarwal, 2017), and forestry (O'Shea et al., 2019). Entrepreneurial ecosystems are emerging at different scales measured by geographic radius. At the local level, previous examples from the literature include the University of Chicago (Miller & Acs, 2017) entrepreneurial ecosystem. The studies from consider the regional level. The national level includes examples such as the Dutch entrepreneurial ecosystem (Stam, 2014). Real-world examples include the Silicon Valley and Tel Aviv as the most prominent examples. However, some research articles also consider entrepreneurial ecosystems at the national level (case study South Africa and Italy), or do not refer to geographical proximity (Stam & van de Ven, 2019; van Rijnsoever, 2020).

1.2.7. Service Ecosystems

Fundamental characteristics

Service ecosystems are defined as "a relatively self-contained, self-adjusting system of resource-integrating actors connected by shared institutional arrangements and mutual value creation through service exchange" (Lusch et al., 2016, pp. 10-11). Service ecosystems fulfill the purpose of service exchange for the purpose of value co-creation. The core value lies in the information exchange that makes value co-creation possible. Accordingly, complementary assets mainly include information, resources, and knowledge (Ben Letaifa et al., 2016, p. 1933). Service ecosystems integrate a platform to exchange services (Alaimo et al., 2020, p. 26). Service at this point refers to the application of tangibles and intangibles for the benefit of end users (Lusch & Nambisan, 2015, p. 162). This platform is also referred to as a service platform (Lusch & Nambisan, 2015, p. 162). In general, service platforms are service and/or social oriented (Alaimo et al., 2020, p. 28). Service platforms serve the purpose of reciprocally creating socioeconomic value (Vargo & Lusch, 2004, p. 1, 2008, p. 2), whereas social platforms emphasize interactive human connectedness in the form of social value (Ben Letaifa et al., 2016, p. 1934). Service ecosystems therefore belong to the category of socio-technical systems, which ideally create socio-economic value (Norta et al., 2014, p. 242).

Relational characteristics

Service ecosystem actors have interdependent, co-evolving relationships with each other (Frow et al., 2014, p. 344; Vargo & Lusch, 2014, p. 245). The relationship level is described as coopetitive (Beirão et al., 2017, p. 237). The establishment of a governance structure (orchestration) is essential in the service ecosystem, as it guarantees coordinated value creation (Beirão et al., 2017, p. 244). In contrast to the other established ecosystem types, service ecosystems are even referred to as co-governance, i.e., the joint management and therefore orchestration of the ecosystem (Jonas et al., 2018, p. 414). The actors are composed of service providers, consumers, developers, etc. (Gölgeci et al., 2021; Guggenberger et al., 2020).

Special characteristics

The service ecosystem is characterized primarily by the exchange of services (Lusch & Nambisan, 2015, p. 161) and the creation of new services (Gölgeci et al., 2021; Guggenberger et

al., 2020, p. 5). This exchange is also referred to as service-for-service exchange (Ben Letaifa et al., 2016, p. 1933; Vargo & Lusch, 2010, p. 169). Service ecosystems require an open platform to ensure information exchange as well as resource integration between individual actors. These platforms subsequently represent dynamic resource allocations that enable value creation through information exchange (complementary asset) with other service systems (Maglio & Spohrer, 2008, pp. 18-19). This service system can also be an individual (Maglio & Spohrer, 2008, p. 18). Thus, as soon as actors of the service ecosystem interact with each other and exchange information and resources, they constitute service systems that generate socio-economic value (Ben Letaifa et al., 2016, p. 1933). Service ecosystems represent geographically dispersed entities. The focus of the service ecosystem is on value co-creation (Lusch & Nambisan, 2015, p. 157; Vargo & Lusch, 2008, p. 5).

Academic Characteristics

Service ecosystems define a central research construct especially in marketing and service management. Research topics primarily include actor engagement, crowdfunding, servitization and service innovation. Leading scholars in service ecosystems include Lusch and Nambisan (2015), Vargo et al. (2017), Alaimo et al. (2020), Beirão et al. (2017), Ben Letaifa et al. (2016), and Vargo and Lusch (2008). The industry focus in previous publications is mainly on the service industry (Sklyar et al., 2019) the consumer goods industry (Flint et al., 2014), the cork industry (Mele et al., 2018), the software industry (Jovanovic et al., 2019), and the IoT (Chandler et al., 2019) and the entertainment industry (Weidner et al., 2010).

Industrial Characteristics

Service ecosystems cover a broad range of industries such as consumer goods, IoT or software.

Table 1 classifies and summarizes the presented ecosystem types for a better overview.

	Business Ecosystems	Digital Business Ecosystems	Platform Ecosystems	Innovation Ecosystems	Entrepreneurial Ecosystems	Service Ecosystems
			Fundamental Characteristics			
Definition	• "In a business ecosystem, companies evolve capabilities around a new innovation: they work cooperatively and competitively to support products, satisfy customer needs, and eventually incorporate the next round of innovations. […] A business ecosystem […] gradually moves from a random collection of elements to a more structured community." *Moore (1993, p. 76)*	• Digital business ecosystems represent "a socio-technical environment of individuals, organizations and digital technologies with collaborative and competitive relationships to co-create value through shared digital platforms." *(Senyo et al., 2019, p. 53)*	• A platform ecosystem is defined as "a platform and its collection of complementary extensions. A platform refers to an extensible technological foundation and the interfaces used by extensions that interoperate with it). An extension—synonymous with add-ins, modules, and apps—is a complementary subsystem that augments a platform's native functionality." *Tiwana (2015, p. 267)*	• Innovation ecosystem are "a network of interdependent actors who combine specialized yet complementary resources and/ or capabilities in seeking to (a) co-create and deliver an overarching value proposition to end users, and (b) appropriate the gains received in the process." *Walrave et al. (2018, p. 3)*	• "Entrepreneurial ecosystems represent a diverse set of interdependent actors within a geographic region that influences the formation and eventual trajectory of the entire group of actors and potentially the economy as a whole. Entrepreneurial ecosystems evolve through a set of interdependent components which interact to generate new venture creation over time" *Cohen (2006, p. 2)*	• Service ecosystems represent "a relatively self-contained, self-adjusting system of resource-integrating actors connected by shared institutional arrangements and mutual value creation through service exchange." *Vargo & Lusch (2016, p. 10-11)*
Purpose of Existence	• Achieving competitive advantages • Creating and capturing value through innovation around existing products and services • Economies of scale • Exploiting resources for customer value • Harnessing of synergies • Satisfying customer needs	• Improving efficiency (faster processes, low cost, and high quality) • Providing capabilities for medium-sized enterprises (SMEs) to compete globally • Establishing a digital technology infrastructure • Seeking for synergies	• Facilitating exchange between platform orchestrator and end-users • Providing a consistent stock of external innovations through third party development • Providing additional offers for end users • Providing solutions which can be leveraged by other ecosystem actors	• Achieving competitive advantages • Economies of scale • Creating synergies • Sharing knowledge (skills and technologies) to jointly co-create innovative products and services • Sharing risks and uncertainties regarding the innovation's outcome	• Enabling the emergence and growth of new business areas • Focusing on economic wealth and generation of prosperity	• Creating new services within a collaboration • Focusing on service exchange and resources • Integral element of the servitization
Core Value	• Development of existing product or service	• Application of digital technologies	• Technological platform as ecosystem enabler	• Innovation outcome such as new products or services	• Start-up formation	• Service exchange
System Structure	• Socio-economic	• Socio-technical	• Socio-technical	• Socio-economic	• Socio-economic	• Socio-technical
			Relational Characteristics			
Relational Connectivity	• Interdependent, co-evolving actors	• Interdependent, co-evolving actors	• Independent, co-existing actors	• Interconnected actors, coevolving processes	• Independent, co-existing actors	• Interconnected actors, coevolving processes
Relationship Structure	• Coopetition	• Coopetition	• Collaboration	• Coopetition	• Collaboration	• Collaboration
Governance Structure	• Ecosystem Orchestrator	• Platform Orchestrator	• Platform Orchestrator	• Ecosystem Orchestrator	• Ecosystem Orchestrator	• Platform Orchestrator

Actors and Roles	• Competitors • Customers • Distributors • End-users • Financing institutions • Focal actors • Lead producers • Media Outlet • Outsourcing firms • Regulatory agencies • Suppliers • Technology providers	• Organizations • Individuals • Stakeholders • Technology providers	• Advertisers • Content providers • Developers • End-users • Vendors	• Customers • Focal companies • Focal companies • Governmental organizations • Innovators • Non-governmental organizations • Policymakers • Private organizations • Public organizations • Resource providers (funders) • Societal actors • Suppliers • Universities	• Accountants • Entrepreneurial teams • Established Firms • Family • Government • Individuals • Industries • Investors • Law firms • Peers • Supporting organizations • Universities • Venture capitalists	• Consumers • Developers • End-user • (Social) Service Providers
Special characteristics						
Complementary Assets	• Complementing mutual capabilities of each actor	• Complementing resources such as technologies and specialized services	• Complementing boundary resources such as application programming interfaces (API), integrated development environments (IDE), software development kits (SDK)	• Complementing resources such as knowledge and skills	• The mutual discovery and exploitation of entrepreneurial opportunities	• Exchanging services • Integrating resources
Key Features	• Customer centralization • Interacting organization • Shared value creation • Interdependence • Coopetition • Common business goal	• Leveraging resources (technologies, specialized services) across industries to fulfil customer needs • Platform consists of digital technologies such as hardware, software and networks • Platform means a collection of innovation, services and tools which other actors can use to improve their performance	• Digitally-enabled ecosystems (e.g. app-stores) • Network effects • Platform combines hardware, infrastructure and software as well as organizational and social rules which connect the platform ecosystem actors • External innovation by third party contributions • Platform as the technological infrastructure	• Enabled by information technology • Innovation-driven (national, regional innovation or technological innovation) • Uncertainties over value co-creation and value capture	• An entrepreneur acts or entrepreneurial teams act as the Centre of the business environment • Governments should support and sustain entrepreneurship • Located either in a particular geographic region or around a certain industry	• Service ecosystems have the ability to self-adjust to changes • Service ecosystems serve as the unit of analysis for value co-creation activities among actors • Service-oriented architecture • Technology serves as an operant resource for value creation in service ecosystems
Geographical Proximity	• Often close proximity or even inherently local	• Geographically dispersed entities	• Geographically dispersed entities	• Spatial proximity or/and virtual spaces	• Emerging and developing economies (country, region)	• Geographically dispersed entities
Value Proposition	• Primarily refer to value capture	• Primarily refer to value co-creation	• Primarily refer to value co-creation	• Primarily refer to value co-creation	• Primarily refer to value co-creation	• Primarily refer to value co-creation
Academic Characteristics						
Main Research Area	• Business Management • Information Systems • Innovation Management • Strategic Management • Organization Science	• Business Management • Information and Communications • Information Systems (IS) Technology (ICT)	• Information Systems	• Entrepreneurship • Innovation • Strategy	• Entrepreneurship	• Marketing • Service Management

Key Research Topics	• Co-evolution • Co-opetition • Global competition • Market selection • Synergies	• Artefacts • Business issues • Conceptualization •Technical issues	• Architecture • Generativity • Modularity • Network effects • Openness • Platform governance	• Collaboration • Value co-creation • Customer-facing solutions • Innovation capabilities • Innovation hubs • Knowledge hubs	• Clusters • Governance • Job and wealth creation • Locality • System attributes/ components	• Actor engagement • Crowdfunding • Product-service networks • Service innovation • Service-Dominant-Logic • Servitization • Value co-creation
Leading Scholars	• Basole et al. (2015) • Li (2009) • Moore (1993) • Moore (1996) • Peltoniemi (2006) • Rong et al. (2015) • Rothschild (1990) • Teece (1986) • Teece (2016)	• Darking et al. (2006) • Herdon et al. (2012) • Hussain et al. (2007) • Senyo et al. (2016) • Senyo et al. (2017) • Senyo et al. (2018) • Senyo et al. (2019) • Stanley & Briscoe (2010) • Sun et al. (2016) • Tan et al. (2009) • Tan et al. (2016)	• Gawer & Cusumano (2002) • Ghazawneh & Henfridsson (2013) • Ghazawneh & Mansour (2015) • Thomas et al. (2014) • Tiwana et al. (2010) • Tiwana (2015) • Wareham et al. (2014)	• Adner & Kapoor (2010) • Adner & Kapoor (2016) • Adner (2006) • Adner (2017) • Gomes et al. (2018) • Nambisan & Baron (2013) • Rong (2011) • Rong et al. (2010) • Rong et al. (2013) • Rong et al. (2015)	• Acs et al. (2017) • Berger & Kuckertz (2016) • Isenberg (2010) • Prahalad (2005) • Spigel (2017) • Zahra & Nambisan (2015)	• Banoun et al. (2016) • Kohtamäki & Rajala (2016) • Kshetri, 2014) • Lusch & Nambisan (2015) • Mason & Brown, 2014) • Stam (2015) • Taillard et al. (2016) • Vargo & Lusch (2010) • Vargo et al. (2015) • Zahra & Nambisan (2011) • Zahra & Nambisan, 2012)
Industrial Characteristics						
Industry Examples	• Automotive • Energy • Healthcare • High-Tech • Telecommunication • Tourist	• Computer science • Financial • Healthcare • Social media • Software • Tourism	• Hard- and software development • Online trade	• Automotive • Biotechnology • Computer • Energy • Mechanical engineering • Pharmaceutical	• Biotechnology • Brewing • Defense • High-Tech • Oil and Gas • Software	• Consumer goods • Cork industry • Entertainment • IoT • Service industry • Software
Real-World Examples	• Telecom Italia • China Mobile • Solar Service Ventures • Innofactor	• EU 2003 digital business ecosystem research programme	• Apple's App Store	• 3D printing • Chez Panisse • Leiden Bioscience Park • Lalejin ceramics and pottery	• Austin (USA) • London (UK) • Santiago de Chile (Chile) • Sao Paolo (Brazil) • Silicon Valley (USA) • Tel Aviv (Israel) • Zhongguancan (China)	• TripAdvisor • Eataly • KidZania

Table 1. Classification of Selected Ecosystem Types

2 Selected Aspects of Value Creation in Ecosystems

Value creation depends on the definition of the particular value to be created. Value basically represents a measurable unit for the achievement of the goal of a previously defined action. As a result, value is subjectively shaped (Lepak et al., 2007, p. 181). In strategic management, value in the sense of strategy-oriented value creation represents an increase in value that is created through value creation. This value creation, in turn, is triggered by the selection of a specific strategy. In process management, on the other hand, value is defined by the targeted deployment of resources as well as a targeted process design (Wunderer & Jaritz, 2007, p. 61). Value creation is therefore the factor that enables organizations to differentiate themselves from other competitors and create customer loyalty (Kandiah & Gossain, 1998, p. 29).

Traditional value creation according to Porter (2014, p. 61) defines the value chain of an organization in terms of strategically decisive activities that lead to cost and differentiation potentials, and thus competitive advantages, in the form of company divisions. Competitive advantages thus arise from a certain arrangement of activities within the organization, which in turn affects a certain arrangement or execution of these activities. The goal of the organization is to bundle these activities in such a way that added value is created for the customer, for which the customer is willing to pay a certain price (Porter, 1993, p. 62). The traditional value chain of an organization consists of a total of nine activities, which are divided into primary and supporting activities, as well as the profit margin (Porter, 2014, p. 66). Primary activities are inbound logistics, operations, outbound logistics, marketing, and sales and have a direct impact on value creation. Supporting activities include organizational infrastructure, human resource structure, technology development, and procurement. They are therefore called supporting because these factors mean the primary activities cannot be performed without the supporting activities. For this reason, supporting activities promote value creation (Porter, 1999, p. 85).

By establishing ecosystems, this traditional linear structure of value creation breaks down, as ecosystems create shared rather than separate value through the interactive networking of actors. This transformation is accompanied by a total of three changes: increasing customer and service centricity, the integration of digital technologies into the value creation process, and the networking of different players. The networking of the players is mostly taking place via platforms. All the players involved benefit from this networking, as the players would be exposed to higher communication and transaction costs on their own (Wirtz, 2019, p. 137). These actors can operate across industries in the ecosystem (Kapoor, 2018, p. 2). A crucial aspect of

this networking is the focus on one's own core competencies and the supplementation of one's own resource endowment with the resources of other players. In this way, not only is value created in the ecosystem, but value is also created for each actor (Teece & Linden, 2017, p. 9). Through interactive value creation, both dependencies and complementarities arise in terms of value creation (Kapoor, 2018, p. 5). The paradox about this joint form of value creation is that the value creation in the ecosystem is jointly created and thus based on a cooperative relationship, whereas organizations would like to protect the value capture for themselves, resulting in a competitive relationship (Khademi, 2020, p. 19).

Due to the fact that value capture differs depending on the type of ecosystem (Valkokari et al., 2017, p. 18), only a basic presentation of the most relevant factors is given here. These differences are rooted in the different characteristics of ecosystems, which were discussed in detail in the previous section. However, because the individual research articles considered different ecosystem types due to the cumulative nature of this thesis, and because value creation is not a central aspect of consideration in the context of this thesis, no further differentiation into the differences in value creation will be made here. Instead, the focus is directed to the factors that can have a significant influence on value creation in ecosystems and thus contribute to an increase and promotion of value-adding activities.

III. Derivation of Research Gaps and Research Questions

From this theoretical research framework, three research areas emerge that are distinct from each other, yet intertwined with respect to value creation in business ecosystems: “Dynamic Capabilities and the Role of Competitive Advantages” (research field one), “Innovation Capabilities and the Role of Knowledge Provision” (research field two) and “Social Capabilities and the Role of Trust Provision” (research field three). In each of these particular research fields, I outline a research goal (RG_n), which addresses a particular sub-aspect in this overarching research goal. In this endeavor, the individual research articles presented are based exclusively on qualitative research approaches, including both conceptual reflections (Research Articles #1, #4, #5, #8) and empirical investigations such as case studies (Research Article #9) and conducting interviews (Research Articles #2, #3, #6, #7). Conceptual approaches are particularly appropriate when examining new phenomena and thus deriving general research questions or research approaches Gartner (1985). For more in-depth investigations and analyses that build on fundamental, conceptual investigations, research tools which examine particular case studies or scenarios using case studies and interviews are particularly applicable (Yin, 2018).

1 Dynamic Capabilities and the Role of Competitive Advantages

Organizations are exposed to growing dynamic evolutions. These dynamics are primarily rooted in the advancement of digitization, which is manifested in faster technological development and the resulting innovations (Linde et al., 2021). Therefore, it is becoming increasingly challenging for organizations to adapt to these dynamic developments with their own resources and capabilities (Feng et al., 2019). In turn, connecting to an ecosystem or even setting up their own ecosystem offers companies the opportunity to tackle these dynamic conditions by having the various actors in the respective ecosystem complement each other's competencies and resources (Warner & Wäger, 2019). Through the role of the complementor, the individual actors in the ecosystem benefit from a joint resource base that enables these actors to adapt to different and, above all, dynamic developments within the ecosystems (Tavalaei & Cennamo, 2020). Therefore, ecosystems are considered resilient and robust due to their ability to dynamically adapt to changing living conditions (Ramezani & Camarinha-Matos, 2019). The question of how organizations succeed in remaining competitive is a pivotal question in strategic management. In this context, the resource-based view (RBV) answers the question of which existing

resources organizations can draw upon in order to remain competitive (Wernerfelt, 1984). Resources are therefore seen as a key factor in achieving higher business performance. The approach originates primarily from the research studies of Wernerfelt (1984), Prahalad and Hamel (1997) and Barney (1991). The authors argue that organizations should become aware of their resource endowment in order to achieve competitive advantages through the application of the organization's internal resources. Since knowledge is the most valuable resource from a strategic point of view, the knowledge-based view, a further development of the RBV, has become established in strategic management. The theory of KBV is based on the respective knowledge base of the company and its adaptation to changing environments (Grant, 1996).

Due to criticism of the static rather than dynamic approach of the RBV and KBV, the DBV was introduced in the early 1990s and has gained credibility since then (Weerawardena & Mavondo, 2011, p. 1220). With the introduction of the Dynamic Capabilities View (DBV), a separate consideration of resources and capabilities was made at the same time, which appeared to be necessary in order to be able to react to dynamic changes in the environment (Weerawardena & Mavondo, 2011, p. 1220). According to the DBV view, organizations need to reconfigure their capabilities in such a way that they are capable of dynamically responding to and adapting to rapidly changing conditions in order to maintain or even increase their competitive advantages (Weerawardena & Mavondo, 2011, p. 1220). Dynamic capabilities represent the ability of an organization to respond to rapidly changing environmental conditions by discovering, reconfiguring, and exploiting resources (Teece, 2017). While organization require dynamic capabilities in principle, the literature agrees that organizations need such capabilities in particular in dynamic environments (Weerawardena & Mavondo, 2011, p. 1222). Given that organizations are exposed to dynamic environments and face them dynamically by forming business ecosystems or connecting to business ecosystems through a complementary resource approach, the question arises as to what extent strategic capabilities can emerge in business ecosystems through the exchange of internal resources within the ecosystem and how these can be applied. Therefore, my overarching research goal in the first research field is:

RG_1: Conceptualizing dynamic capabilities against the background of strategic management approaches within business ecosystems

Dynamic capabilities represent a bundle of competencies that help organizations to adapt quickly to changing environments and meet new challenges and requirements. These dynamic capabilities can grow in organizations over time. However, the dynamics of ever-changing

market conditions are so rapid that organizations can no longer build and develop these dynamic capabilities alone. In addition, increasing digitization not only supports these dynamics, but also makes industry boundaries smaller or even disappear. This gives new players access to the market and thus the opportunity to position themselves successfully there. One consequence of the dynamic changes is that established organizations can no longer rely exclusively on their core competencies. Rather, digital, platform-based ecosystems are generating a change from traditional, linear value creation to non-linear value creation, which is reflected in the networking of various players and in shared value creation.

In strategic management, the theories of RBV, KBV, and DCV have become established for the study of resources and, in particular, dynamic capabilities. Since the literature on digital, platform-based ecosystems is still largely unsorted and studies of this type of ecosystem with regard to these strategic management theories are only sporadic, the goal of Research Article #1 is to sift through the literature landscape on the combination of these topics and, in a first effort, to classify it and to derive basic insights from the literature on increasing competitiveness and thus value creation. Therefore, the research question (RQ) of research article #1 is:

RQ_1: To what extent have the approaches of the RBV, KBV, and DCV been analyzed in the scientific management literature in the context of digital ecosystems?

Since the change in value creation through the establishment of platform-based ecosystems can be of existential concern to organizations, a fundamental understanding of the impact of dynamic capabilities against the backdrop of DCV is of outstanding importance. However, although the number of publications on platform-based ecosystems has increased tremendously in recent years, the linking and analysis of these topics remains largely absent from scholarly consideration. In this context, Jacobides et al. (2018, p. 2259) hold: “Only a handful of studies have explicitly tried to bridge existing perspectives [...] and ecosystems." To address this research gap, Research Article #2 sets a research agenda with the following research question:

RQ_2: What are essential areas organizations have to engage to achieve sustainable competitive advantages in platform-based ecosystems?

To address this research gap as a first approach, Research Article #3 builds on the findings of Research Article #1 and examines the dynamic capability of selective revealing. Selective revealing represents a strategic means of decision-making and coordinating open innovation that allows established organizations to continue to focus on their core competencies without losing the advancement of dynamic capabilities and thus the competitive edge. At the same time, it

can lead to cost savings, as longer and repetitive development cycles for building up bespoke, new dynamic capabilities can be avoided to a large extent. Although selective revealing is an emerging term in related research fields, a fundamental understanding of selective revealing as well as the development of boundary resources in platform-based ecosystems remains lacking so far. To address this research gap in a first approach, the research question of Research Article #3 is:

RQ_3: How can platform owners gain competitive advantages in platform-based ecosystems by strategically managing boundary resources?

With regard to the adaptation to dynamic living environments, more and more entrepreneurial ecosystems have been established in recent years. These entrepreneurial ecosystems differ in terms of the regions in which they are located and their specific regional conditions. What all entrepreneurial ecosystems have in common, however, is that they bring regional development and economic prosperity to the areas in which they are located. This is true for developed markets as well as for emerging markets. Therefore, a consideration of the promising components is obvious in order to derive success factors for the development of an entrepreneurial ecosystem. Despite the increased interest in entrepreneurial ecosystems in scientific studies, there is no research on the dimensions and characteristics of entrepreneurial ecosystems so far. Therefore, Research Article #4 explores the following research question:

RQ_4: Which dimensions and characteristics do entrepreneurial ecosystems have and to what extent do these dimensions and characteristics differ between developed and emerging markets?

2 Innovation Capabilities and the Role of Knowledge Transfer

An organization's ability to innovate has a major impact on the achievement of short-term and long-term organizational goals. The ability to create innovation depends primarily on how knowledge is managed. If knowledge resources are managed and used efficiently in an organization, they can trigger innovation effects and thus bring competitive advantages to the organization. Knowledge exchange is defined as the most important instrument to enable these innovation capabilities. Therefore, knowledge transfer in organizations must not only be very well organized, but also promoted. Innovation ecosystems are characterized by knowledge exchange. Thus, innovation ecosystems are designed to produce innovations through a complementary exchange of resources between different actors in the ecosystem. On the one hand, the

cooperative relationship between the actors increases this innovation, but on the other hand, the simultaneous existence of cooperative and competitive relationships impedes the key instrument, the exchange of knowledge exchange. Hence, my overarching research goal in the second research field is:

RG_2: Providing guidance to strategic decision-making for the integration of innovation capabilities within business ecosystems

One of the most valuable resources for innovation, i.e., the creation of new products and services, is knowledge. Consequently, knowledge is a key factor for value creation and the expansion of competitive advantages. Especially in innovation ecosystems, the exchange of knowledge is essential to rediscover and combine resources for value co-creation between the ecosystem actors. The process of knowledge exchange thus represents a fundamental process in innovation ecosystems. While the strategic management literature has long recognized the value of knowledge as a resource, and research on innovation ecosystems has increased rapidly in recent years, the research field of knowledge exchange between actors in ecosystems remains largely unexplored. To address this research gap, Research Article #5 explores the following research question:

RQ_5: How do organizations engage in knowledge exchange within innovation ecosystems?

Cognitive Computing Systems (CCS) are enjoying growing importance and investment in the public sector, as the use of CCSs can significantly optimize process flows, among other things. CCSs include a wide range of technologies such as Artificial Intelligence (AI), Big Data Analytics (BDA), Data Visualization (DV), Deep Learning (DL), Machine Learning (ML) and Natural Language Processing (NLP). The key value propositions of CCSs include improving operations through process optimization, generating big data to analyze and gain new insights into public sector data, improving service quality in terms of public sector services to citizens, and rethinking and restructuring the public sector through the implementation of an innovative mindset. Because the public sector differs greatly from the private sector, simply applying the lessons learned from the application of CCSs from the private to the public sector is not possible. For example, not only is the use of public taxpayers' money more restrictive in scope, but also in terms of compliance with regulations. Moreover, the spirit of innovation is more advanced in the private sector than in the public sector, which overall results in different underlying conditions for the implementation of CCSs in the public sector than in the private sector. Therefore, there is an imperative demand for research to investigate CCSs in terms of critical

components in order to draw conclusions on the maturity of CCSs as well as their further development in the public sector. Since the successful implementation and application of CCSs can provide a technological foundation for the emergence of innovation ecosystems, Research Article #6 explores the following research question:

RQ_6: Which critical factors can be derived based on a maturity model for the implementation of CCS in the public sector?

A good example of the dynamic changes illustrated in the opening of research goal one is the automotive industry. Whereas the production of cars and their technical improvement and optimization represented a traditional and very successful business model for decades, topics such as digitalization and the networking of cars present incumbents with major challenges. Business model innovations such as autonomous driving require not only a rethink, but also a special set of capabilities. Among other things, this also includes the winning mindset. The rethinking from traditional to non-traditional business models is difficult for incumbents. These non-traditional aspects of business model innovation include, above all, networking with players who may well be in a coopetitive relationship with the incumbent and who also operate across industries. This reflects the idea of a digital business ecosystem. Incumbents must therefore begin to build their own ecosystem around them, which includes players who complement the resource endowment of incumbents and thus generate dynamic capabilities within the ecosystem. Since business model innovations represent especially innovation capabilities, Research Article #7 explores the following research question:

RQ_7: How can asset-intensive organizations successfully pursue business model innovation?

3 Social Capabilities and the Role of Trust Provision

Ecosystems are in constant interaction with other actors, predominantly in coopetitive relationships, through the constant exchange of resources. For the exchange of resources, especially for the exchange of knowledge as a key resource, trusting relationships are an important foundation, as key resources such as knowledge can bring competitive advantages that organizations do not want to lose to competitors. In addition, trust in particular forms the basis for customer relationships. Trust is seen as an antecedent for customers' purchasing intentions, for example. Since ecosystems have to pay attention to trusting relationships when seeking for ecosystem actors and at the same time have to create trust by focusing on meeting customer

needs, social factors such as trust are an elementary component in the interactions of ecosystems with players and customers. Thus, my overarching research goal in the third research field is:

RG_3: Understanding trust as a strategic key resource to foster value creation within business ecosystems

Due to their interactive and networked nature, the relationships between ecosystem actors are shaped by social factors. Especially in supply chain ecosystems with a high degree of customer orientation, social factors have an intensive influence on the value creation of the ecosystem and its actors. This importance is further strengthened by the focus on meeting customer needs, which are changing ever more rapidly as a result of digitization and the drive for innovation. This means that supply chain ecosystems in particular are under constant pressure not only to perceive social factors, but also to address them in line with customer needs. Only by addressing these customer needs in the right way can value be created. Against this background, Research Article #8 poses the following research question:

RQ_8: Which social factors affect the value co-creation process within a supply chain ecosystem?

Trust is considered a core value among social factors. While business process management has traditionally focused primarily on fulfilling the triad of cost, quality, and time, social demand is becoming ever louder with regard to process optimization: the recognition of trust as a factor influencing value creation. Due to the increasing importance of platform-driven ecosystems, social factors, and among them trust in particular, are becoming more and more significant for process creation and execution. Trust is seen as a key factor in balancing out uncertainties with regard to the settlement process via platforms. Since platform-based ecosystems are socio-technical systems that are characterized not only by the use of the platform but also by a high degree of networking among a wide variety of actors, trust is a core value for value creation in platform-based ecosystems. Using GoFood as a case study, Research Article #9 therefore explores the following research question:

RQ_9: How does trust-aware process design materialize in practice?

IV. Publication History and Research Design

In total, this thesis consists of nine research articles, which contribute to the research gaps and related research goals addressed in Section III. The research articles follow in fourth place in the outline after the Introduction (Section I), the description of the underlying foundations regarding business ecosystems and value creation (Section II) and the presentation of the respective research gap, research question, and the research goal (Section III). The following section now describes the publication outline as well as the methods applied within the respective research articles. Furthermore, two supplementary research articles belong to this thesis, which are not assigned to a research goal (Section III) due to their additional character. However, for the sake of completeness, these articles are listed as well in table 2.

Due to the fact that all listed research articles are the product of a collaborative authoring process, I use the formulation *we* instead of *I* for the following description of the methodological approach. Thus, all research articles are the joint work with my co-authors. The attached author agreement "*Declaration of Co-Authorship and Individual Contribution to the Included Research Articles*" specifies the respective participation of the individual authors and author teams for each research article included in this thesis.

At the time of submission of this thesis, some of the articles have already been published, are currently in the review process, or have been submitted and are awaiting forwarding by the editor of the respective journal. This is due to the cumulative nature of this thesis. For each research goal, Table 2 lists the title of the research article, publication outlet, publication status, publication outlet ranking, and research method used. In the following, I will now briefly discuss the method used in the respective research article. For detailed descriptions I refer to the method section of the respective research article.

In Research Article #1, we conducted a structured literature review to provide an overview of the current status quo of literature on digital ecosystems in the context of strategic management theories. The primary goal was to build on the findings of Helfat and Raubitschek (2018) and Teece et al. (1997). In order to obtain targeted results for the theories of strategic management, the search string was explicitly designed for the most relevant theories. These include the resource based view, knowledge based view, dynamic capabilities view, core competencies, and gaining competitive advantage. To cover the ecosystem aspects, the focus in the search was placed on ecosystems, value creation, and coopetition. The search strings were deliberately kept comprehensive in order to obtain the broadest possible insights into the current state of

research. The Web of Science (WoS) database was used exclusively for the search. From the initial 977 articles, a final sample of 23 articles was filtered by analyzing the articles for title, abstract, keywords, duplicates, and content, and applying additional filters such as WoS categories like Business and Management. Furthermore, only journal articles were filtered. Based on a nine-field matrix, the total of 23 research articles in the final sample could be assigned by two axes to a specific ecosystem type as well as to one of the three relevant management theories (RBV, KBV, DCV). This made it possible to identify clear research foci as well as research gaps, which then led to a closer examination of the content.

Based on the literature review of the first research article, we created a conceptual model development in Research Article #2 to show a research agenda to further expand this research area and its relevance. For this, we create a three-layer model that explicitly refers to the levels: Resources, Dynamic Capabilities, and Knowledge Management in Digital Ecosystems. The goal of the research agenda is to investigate the research question of how sustainable competitive advantages can be built within a platform-based ecosystem. Thus, the research article represents a call for further research in the form of a research avenue considering the three underlying theoretical approaches, namely, RBV, KBV, and DCV.

Building on the findings of the first research article, a structured literature review was also conducted in Research Article #3 to provide more precise insights into the previous research and findings on selective revealing (Kitchenham et al., 2009). This literature review was conducted in both the WoS database and the Scopus database. Again, we used broad search strings to obtain the highest possible coverage of topics. Thus, the literature review focuses primarily on digital and platform-based ecosystems as well as the core topics of strategy, knowledge, dynamics, competition, and selective revealing. In addition, a temporal filter was set in this search starting with the year 1993 up to and including 2020. This covered the literature from the year the word *business ecosystem* was introduced into management science by (Moore, 1993) until the time this study was conducted. Additionally, quality criteria regarding journal rankings were conceded to ensure a high level of quality in the content. The ranking used here was Scimago (Q1 and Q2 only) with an H-index of 40 and above and an SJR value of above 1. The initial dataset of 3736 studies was reduced to a final set of 34 papers by applying inclusion and exclusion criteria. This dataset could be assigned to four different categories, which provide information about different strategic mechanisms. These four categories include: platform architecture, complementing characteristics (quantitative, qualitative), platform-based ecosystems as value-adding mechanisms, and platform governance.

In Research Article #4, we performed a taxonomy according to Nickerson et al. (2013) in order to determine and compare entrepreneurial ecosystems on the basis of fundamental dimensions and characteristics. For the data collection, we also conducted a structured literature review in a first step, for which we also defined a broad search string ("entrepre* ecosystem") in order not to exclude valuable studies at an early stage. By applying the filters articles (document types), journals (source), English (language) as well as the selection of certain keywords related to entrepreneurship, innovation, and ecosystems, a first dataset of 341 articles was obtained. This dataset was reduced to 226 articles by matching with specified keywords. The analysis of the abstracts as well as the application of further quality criteria such as ranking the journals according to VHB and Scimago led to a final dataset of 32 articles, of which 19 are classified as relevant and 13 as not relevant after a content analysis. The structured literature review thus formed a foundation for understanding entrepreneurial ecosystems in developed as well as emerging markets. The definition of the dimensions and their associated characteristics was based on the traditional structure of the taxonomy according to Nickerson et al. (2013). By applying the conceptual-to-empirical approach, we were able to explore seven different dimensions in an iterative process, each with between two and five different characteristics. Based on these dimensions, existing entrepreneurial ecosystems could be analyzed and compared against the background of different regions and specific environmental conditions. This examination ultimately leads to the derivation of success factors for the creation of entrepreneurial ecosystems.

In Research Article #5, based on a structured literature review according to Webster & Watson (2002), we were able to gain basic insights into knowledge sharing in innovation ecosystems. For this we used the Scopus database and the search string "Innovation Ecosystem AND Knowledge" and set the following filters: Business, Management and Accounting (subject area), article (document type), English (language), journal (source type) and innovation, ecosystems, knowledge management, ecosystem, knowledge, open innovation as keywords. In a first step, this search led to 203 research articles, which we classified in a further step using a four-level model. Here, the classification levels ranged from having no relation to the research focus (level 1) to investigating the core of our research question (level 4). The title, abstract, and keywords of the research articles were used as the basis for classification. This classification resulted in a dataset of 35 relevant research articles, which we reduced to 33 after content analysis (final sample). For content analysis, we used the datamining process, in which descriptive elements of the research topic under investigation are clustered to identify patterns

and relationships. In this case, the object of study was knowledge. The clustering of descriptive elements led to the STAR model, which depicts the four different process stages of knowledge sharing in innovation ecosystems. Thus, using the STAR model, it was possible not only to identify basic characteristics of each phase of the knowledge sharing process, but also to identify success factors and milestones for achieving competitive advantage.

In Research Article #6, based on the design science approach of Peffers et al. (2007) and Peffers et al. (2012), we conducted interviews with over 25 senior IT executives working in the public sector in order to understand challenges and possibilities of the deployment of CCS in the public sector. As a first step, we were able to identify problems with regard to challenges and opportunities in the application of CCSs in the public sector. These insights were further informed by an intensive literature review on existing maturity models for CCSs and the topics of digital transformation and e-government. By conducting twelve additional interviews, also with senior IT executives, key areas, varying degrees of maturity, key enablers, and barriers to implementing CCSs in the public sector were also discovered. The third part, design and deployment, was further developed in an iterative process. This allowed not only agility to be established through the use of prototypes, but also feedback to be gathered from practitioners in a three-week cycle. In addition, we used exaptation here by referring to existing maturity models in other areas. In total, four design and deployment runs were conducted. In each of these processes, the maturity model was further expanded and adapted until no further adjustments and changes were necessary and all maturity levels were taken up.

In Research Article #7, we adopted a multiple-case-study approach to gain deeper insights into key drivers, challenges, and opportunities for incumbents in the automotive industry seeking to advance the topic of business model innovation. This research approach is particularly suitable for answering questions of why and how. In the course of the study, we conducted a total of 14 interviews with recognized innovation experts in the German automotive industry (Eisenhardt & Graebner, 2007; Graebner et al., 2012). An inductive approach was chosen for the analysis, which is particularly suitable for topics that represent new fields of research (Eisenhardt, 1989). Data obtained from the interviews were coded and analyzed using MAXQDA software (Corbin & Strauss, 1990; Gioia et al., 2013). From this analysis, it was possible to develop categories that represent the current challenges to implementing business model innovations. In turn, recommendations for action could be derived from this insight.

In order to obtain a detailed overview of the current state of the literature on social factors and their influence on value creation in supply chain ecosystems, we have set up a literature review

in Research Article #8 using the WoS database. In order to get concrete insights into the most relevant social factors (trust, commitment, and mindset), we have already integrated them into the search strings. The final sample was reduced to a final sample of eleven articles by selecting the criteria management and business and using only research articles. Based on this sample, we were able to identify factors influencing social factors on value creation in supply chain eco-systems and to identify further research gaps with regard to the relevance of social factors in ecosystems.

In Research Article #9, we used a combined approach of literature review and case study to create a trust-aware process design based on the case study of GoFood. Based on the findings of vom Brocke et al. (2015), we used forward and backward searches to identify 57 research articles that contain relevant findings at the intersection of trust and digital technologies. Using the different process steps for conducting a case study according to Yin (2018), we also analyzed secondary data from academic as well as practitioner-oriented articles. To increase the search results, we also searched for relevant articles in Indonesian, considering Gojek's origin. This search resulted in 481 articles on Gojek that indicated a specific reference to GoFood. Out of these 481 articles, 51 articles could be used for further analysis. We grouped these selected articles into four different trust dimensions based on recurring patterns. Based on these four dimensions, different trust concerns could be derived from which a trust management framework was ultimately derived.

Research Goals	Title	Publication Outlet	Outlet Ranking	Publication Status	Research Method(s)
RG_1: Conceptualizing dynamic capabilities against the background of strategic management approaches within business ecosystems	**Research Article #1** Dynamic Capabilities as the Key Approach to Investigate Digital Ecosystems	**Conference Proceedings** Proceedings of 15th International Conference on Wirtschaftsinformatik (WI), 2020	VHB-JOURQUAL 3: C SJR: none	Published	• Structured literature review *(Durach et al., 2017)*
	Research Article #2 Gaining Competitive Advantages with Platform-based Ecosystems – Defining a Research Agenda	**Scientific Journal** IEEE Transactions on Engineering Management	VHB-JOURQUAL 3: B SJR: Q2	Revision in preparation	• Structured literature review *(Durach et al., 2017)* • Conceptual model development
	Research Article #3 Selective Revealing in Platform-based Ecosystems – How Platform Owners Leverage Boundary Resources for Strategic Advantage	**Conference Proceedings** Proceedings of the 55th Hawaii International Conference on System Sciences (HICSS), 2021	VHB-JOURQUAL 3: C SJR: none	Rejected	• Systematic literature review *(Kitchenham et al., 2009)*
	Research Article #4 Establishing Entrepreneurial Ecosystems: A Taxonomy of Developed and Emerging Markets	**Scientific Journal**	VHB-JOURQUAL 3: SJR:	In preparation for submission to a scientific journal	• Structured literature review *(Webster & Watson, 2002)* • Taxonomy *(Nickerson et al., 2013)*
RG_2: Providing guidance to strategic decision-making for the integration of innovation capabilities within business ecosystems	**Research Article #5** Reaching the STAR - Managing Knowledge in Innovation Ecosystems	**Scientific Journal**	VHB-JOURQUAL 3: SJR:	In preparation for submission to a scientific journal	• Structured literature review *(Webster & Watson, 2002)* • Datamining process *(Chen & Liu, 2005; Levy et al., 2006)*
	Research Article #6 Maturity Model for Cognitive Computing	**Conference Proceedings** Proceedings of the 54th	VHB-JOURQUAL 3: C SJR: none	Published	• Design science approach *(Peffers et al., 2007)*

Research Goals	Title	Publication Outlet	Outlet Ranking	Publication Status	Research Method(s)
	Systems in the Public Sector	Hawaii International Conference on System Sciences (HICSS), 2021			• Maturity Model *(Becker et al., 2009)*
	Research Article #7 Asset-intensive Firms and Business Model Innovation: Are Incumbents asleep at the Wheel?	**Scientific Journal**	VHB-JOURQUAL 3: SJR:	In preparation for submission to a scientific journal	• Multiple-case-study approach *(Eisenhardt & Graebner, 2007; Graebner et al., 2012)*
RG_3: Understanding trust as a strategic key resource to foster value creation within business ecosystems	**Research Article #8** Investigating Social Factors and their Impact on Value Co-creation in Supply Chain Ecosystems	**Scientific Journal** Journal of Global Operations and Strategic Sourcing	VHB-JOURQUAL 3: none SJR: Q3	Review (1st revision completed)	• Structured literature review *(Webster & Watson, 2002)*
	Research Article #9 Trust-Aware Process Design: The Case of GoFood	**Scientific Journal** Business Process Management Journal	VHB-JOURQUAL 3: C SJR: Q1	Review (1st revision completed)	• Case study approach *(Yin, 2014)* • Structured literature review *(vom Brocke et al., 2015)*
Other Publications					
Understanding the potentials of business ecosystems within different industries	Potentials of Digital Business Ecosystems in the Health Care Market	**Book Chapter** Handbook on Digital Business Ecosystems, 2022	VHB-JOURQUAL 3: none SJR: none	Submitted and accepted, publication in 2022	• Interview study
	Digital Business Ecosystems – A Comparison of Different Industries	**Book Chapter** Handbook on Digital Business Ecosystems, 2022	VHB-JOURQUAL 3: none SJR: none	Submitted and accepted, publication in 2022	• Interview study • Case study

Table 2. Publication history

V. Summary of Results

Due to the different research approaches and methods used, this thesis contributes on the one hand to a conceptual basic understanding and on the other hand to a practice-oriented understanding of action. Thus, each of the three research goals is first explored through a structured literature analysis, which elaborates relevant contents of the respective research area in a structured way. Subsequently, in-depth investigations in the form of further literature analyses, interviews, or case studies are used to gain in-depth knowledge and to derive recommendations for action based on models. As mentioned in Section IV, the following presentation of results represents the research gained not only by me, but also by my co-authors. For this reason, I use the plural *we* in this section.

1 Dynamic Capabilities as the Key Approach to Investigate Digital Ecosystems (Research Article #1)

The first research article examines digital ecosystems against the background of resource-based theoretical explanations of strategic management. As digital ecosystems are inherently characterized by the interplay of different external and internal actors, multi-layered forms of knowledge exchange, and complex value creation structures, classical explanatory approaches of strategic management lose their explanatory power. The article introduces the nature of digital ecosystems and examines the theories of the resource-based view, the knowledge-based view and the dynamic capability view on the basis of a structured literature review. After analyzing 977 research articles that relate the resource-based theories of strategic management to digital ecosystems, only 23 articles were identified that use the theories in relation to digital ecosystems to explain competitive advantage. The analysis of the relevant literature shows that the dynamic capability view is predominantly used to analyze digital ecosystems, while the resource-based view is only used for the fundamental analysis of companies in ecosystems and the knowledge-based view is strongly underrepresented.

The literature review of the first research article shows the overwhelming need for research in strategic management in the field of digital ecosystems. As the analysis of the identified literature shows, especially the dynamic advancements of the resource-based view, the dynamic capability view, and the knowledge-based view take into account the dynamic and knowledge-intensive environment of digital ecosystems. However, the article reveals the weaknesses of the

isolated application of the three resource-oriented theories and shows the need for further integrative development of the approaches. In order not to lose its significance and to be able to make a valuable contribution to explaining sustainable competitive advantages in digital ecosystems, far-reaching research efforts in the field of strategic management are required.

2 Gaining Competitive Advantages with Platform-based Ecosystems – Defining a Research Agenda (Research Article #2)

The second research article examines platform-based ecosystems and their value creation structures in detail. Platform-based ecosystems are a type of ecosystem that is becoming increasingly important in numerous industries as a result of digitization, product networking, the Internet of Things, and servitization. Platform-based ecosystems are a strategic path for sustainable competitive advantages, often underpinned by monopoly- or duopoly-like competitive structures across a variety of industries as entire new value creation mechanisms to formerly product-centered traditional industries are opening up. Thus, platform-based ecosystems offer incumbent organizations the opportunity to co-create value by complementing or sharing their resource base with partner organizations on a platform. The question of how companies, primarily platform leaders, can create sustainable competitive advantage through platform-based ecosystems is largely unanswered in the academic literature, despite the increasing relevance of the topic.

Building on the categorization of the literature in the first research article, the paper shows to what extent the resource-based theories of strategic management can explain the emergence of competitive advantages. Based on the particular design of platform-based ecosystems, the paper analyzes through which theoretical perspective competitive advantages can be explained and highlights the shortcomings of the individual explanatory approaches. On the basis of the conceptual consideration, the article derives an integrative three-layered research model for explaining competitive advantages in platform-based ecosystems. The research model combines the formerly static perspective of the resource-based view with the dynamic approaches of the dynamic capability view and the knowledge-based view. Within the research model, key research needs are raised and interactive relationships between the elements of the resource base (technical core, boundary objects, boundary resources), the dynamic capabilities (environ-mental scanning capabilities, integrative capabilities, innovation capabilities) and the knowledge management (selective revealing, absorptive capacity, organizational routines) of the platform leader are highlighted. The article provides a holistic avenue for future research.

3 Selective Revealing in Platform-based Ecosystems – How Platform Owners Leverage Boundary Resources for Strategic Advantage (Research Article #3)

Digital ecosystems are characterized by new forms of co-creation of value and enable open innovation approaches. Platform-based ecosystems enable a special form of collaboration as the platform refers to a technical core from which complementary products and services can be launched. Thus, the platform itself represents a set of core components that can be complemented by modules over time. Due to boundary resources, the platform enables complementary innovations by the integration of external actors. From the perspective of the strategic development of the platform-based ecosystem, the central question is how platform leaders can use this openness to increase the value of the platform. Research in the field of open source software and open innovation suggests the process of selective revealing. This article examines the forms that selective revealing can take in platform-based ecosystems.

A structured literature review is used to identify and analyze research that investigates platform openness and selective control of boundary resources in platform-based ecosystems. The analysis reveals that academic discourse on selective revealing contributes very few insights. While most of the identified studies name platform openness governance as a strategic lever, research on strategic governance of boundary resources in platform-based ecosystems is nonexistent. The third research article highlights this dramatic research gap, identifies a research agenda, and calls for far-reaching investigations in the research field of platform-based ecosystems.

4 Establishing Entrepreneurial Ecosystems: A Taxonomy of Developed and Emerging Markets (Research Article #4)

Research Article #4 answers the question of basic dimensions and characteristics that can be used to describe entrepreneurial ecosystems. Within the framework of the study, we were able to analyze a total of seven dimensions, each of which has between two and five forms of expression. The dimensions include boundaries, emergence, maturity, central focus, stakeholders, structural elements, and government involvement. While almost all studies agree that the geographic aspect is a crucial characteristic of entrepreneurial ecosystems, there are different opinions on how large the radius of geographic focus should be. Thus, entrepreneurial ecosystems differ in terms of local, regional, and national boundaries. The same applies to emergence. Here,

a distinction is made between strategically planned and naturally emerged. The maturity of an entrepreneurial ecosystem can be divided into four stages: emerging, growing, developing, and self-sustaining. The central focus of entrepreneurial ecosystems is either on high-growth entrepreneurship or on regional development. The central stakeholders in entrepreneurial ecosystems are potential entrepreneurs, government institutions, established companies, research institutions, and capital providers. Structural elements of entrepreneurial ecosystems include human resources, ecosystem infrastructure, entrepreneurial culture, and support systems. The involvement of the government is differentiated into low, moderate, and high.

This study thus provides initial insights into the characterization of entrepreneurial ecosystems. Since the establishment of entrepreneurial ecosystems is of particular importance for the regions in which these ecosystems are located, it is important to know which differences exist in already established entrepreneurial ecosystems and which forms this ecosystem type can take. Thus, the analysis contributes to a fundamental understanding of entrepreneurial ecosystems in the context of entrepreneurship literature and at the same time provides evidence for the establishment of entrepreneurial ecosystems in certain regions with specific characteristics such as developed and emerging markets.

5 Reaching the STAR - Managing Knowledge in Innovation Ecosystems (Research Article #5)

To address the research gap on the analysis of knowledge exchange processes within innovation ecosystems, Research Article #5 offers a STAR-Model that maps the individual phases of the knowledge exchange process in terms of, among other things, the milestones to be achieved and the resulting success factors. Hence, STAR is an acronym that represents the generic term for each phase: seeking, transfer, advancement, and retention. Thus, based on the results of this research article, we describe four distinct, separate phases that are critical to the interaction between the ecosystem orchestrator and the stakeholders. Each of these phases is described by certain categories that are characteristic for the course of this phase and accordingly influence the value creation. In addition, we derive milestones and success factors from the literature that can lead to the achievement of competitive advantages.

The STAR-Model thus provides both a basis for further academic research and a basis for deriving recommendations for practitioners. The research article contributes to a fundamental understanding of the knowledge sharing process and structures the individual phases based on relevant factors that are crucial for successful value creation. The findings thus contribute to a

better understanding of knowledge management in innovation ecosystems. At the same time, they include recommendations for action to support practitioners in either establishing their own innovation ecosystem or expanding an existing innovation ecosystem.

6 Maturity Model for Cognitive Computing Systems in the Public Sector (Research Article #6)

Research Article #6 fills the demand for a maturity model that maps the critical components for establishing CCSs in the public sector. Based on an iterative interview process, we were able to create a three-step maturity model that represents the relevant capabilities for implementing CCSs in the public sector. The three steps consist of problem identification, solution objects, and design and deployment using a prototype. Based on the findings of the maturity model, we were able to create two dimensions. The horizontal dimensions include all elements of CCSs that need to be critically assessed. The vertical dimension contains the individual maturity phases. We were able to discover two different domains to which these dimensions apply: the technical domain and the organizational domain.

The research article thus contains a roadmap for the public sector, with structured guidance on which factors in which dimension and phase of maturity are necessary for the application of CCSs, and what characteristically describes this phase. Thus, the research article not only fills the gap of missing maturity models in the public sector, but also contains best-practice recommendations from practitioners. It is also crucial that the study takes into account the framework conditions of the public sector. In addition, the interdependencies of the individual elements become clear. This study thus combines theoretical and practical knowledge.

7 Asset-intensive Firms and Business Model Innovation: Are Incumbents asleep at the Wheel? (Research Article #7)

Incumbent firms are exposed to massive environmental changes due to the emergence of ecosystems, the influence of increasing digitization, and the resulting changes in value creation processes. Asset-intensive organizations in particular face numerous obstacles to business model innovation due to their special structure. The seventh research article examines the background of business model innovations in the automotive industry through 14 in-depth interviews with industry experts from automotive OEMs and Tier 1 suppliers. The analysis of the

expert interviews enhances the understanding of incumbent firms towards business model innovation and identifies key factors that hinder business model innovation among incumbent firms. Although automotive incumbents are aware of the criticality of business model innovations, a calcification of existing business models prevails which drives inertia. In addition, the most significant hindering factors are the lack of structured tools and processes for business model innovation, the absence of ongoing applications of business model innovation activities, and the challenges of opening up to the ecosystem and collaborating with parties external to the company.

Based on the qualitative analysis of the expert interviews, the research work derives five recommendations for action for business model innovations by incumbent firms. Incumbent firms should make business model innovation one of their core competencies and develop company-wide capabilities and a corresponding corporate culture. To do this, incumbent firms must move away from their product centricity, open up to an ecosystem approach, and focus on the creation of consumer experiences. For this, incumbent firms, due to their asset-intensive base, must adopt a dual approach to organizational structure that promotes permeability to business model innovation of the core business.

8 Investigating Social Factors and their Impact on Value Co-creation in Supply Chain Ecosystems (Research Article #8)

Research Article #8 fills the research gap on what influence social factors can have on value creation in business ecosystems, especially supply chain ecosystems. In order to get a first overview of this research area, we have limited our study to the three most relevant social factors, namely: trust, commitment, and mindset. Thus, a low level of trust not only carries the risk of refusing to cooperate, but also reduces the motivation to perform even before that. In addition, relationships that are not based on trust harbor the danger of opportunistic behavior. In turn, open access to resources and information can make it easier to build a trusting relationship. This shared use or exchange of resources can be enhanced by relational capital. The exchange of resources also increases the development of strategic capabilities. Trust and commitment promote the formation of relational capital and thus influence value creation. Due to the interactive orientation and networking of business ecosystems, a common mindset is also important in order to mitigate risks in the joint collaboration and not to endanger the sustainability of the ecosystem.

By examining the three relevant social factors trust, commitment, and mindset, it is emphasized that even supposed soft factors such as social factors in ecosystems have an essential influence on the joint creation of value. In practice, this is often neglected because ecosystems are strongly output-driven. The fact that social factors have so far played only a minor role in the study of business ecosystems is also reflected in the small number of scientific studies in this research area. For this reason, this research article represents a call for further research in which social factors and their integration into business ecosystems should be examined in greater depth. For practical purposes, recommendations and examples are provided to facilitate the development and integration of social factors in business ecosystems.

9 Trust-aware Process Design – The Case of GoFood (Research Article #9)

Research Article #9 fills the research gap on how trust-aware process design materializes in practice. To investigate this research question, we analyzed trust dimensions that are relevant within GoFood's process management based on the review of published articles on the GoFood case study. Thus, in the research article, we show different trust concerns that have a decisive influence on value creation and value capture in the form of relevant moments of the ordering process. From the company's point of view, it is primarily a matter of removing uncertainties from the process or at least consciously controlling them. If these uncertainties are not balanced out, this can lead to so-called vulnerability, which in turn affects GoFood's value creation process.

Based on the trust analysis, we can derive various recommendations for action in practice. For example, we analyze different trust sources. Understanding different trust sources helps to develop mechanisms in the organization that support these trust sources. Thus, this research article provides initial insights into integrating trust into process design, contributing to a broader understanding of trust in process-intensive organizations or systems. Since platform-based ecosystems are highly process-driven, the research article includes initial insights at the intersection of the research areas of social factors and ecosystems.

VI. Discussion and Conclusion

In order to finally discuss my research findings, I write a summary of the theoretical foundation as well as the classification of the research articles into the research goals of this thesis (6.1). Furthermore, I show the implications for theory (6.2) as well as for practice (6.3). Finally, I describe the limitations of this thesis (6.4) and give an outlook for further approaches to scientific research (6.5).

1 Summary

At the interface of information systems (IS), innovation, and entrepreneurial management, as well as social psychology, this thesis examines business ecosystems against the background of strategic considerations. The overarching research question is organized around three research goals covering the areas of dynamic capabilities, innovation capabilities, and social capabilities. All three research goals will first be examined through conceptual considerations and then, based on this, through case and interview studies. The conceptual review serves as a structured literature review, which summarizes the basic findings from academic research on the respective research goal and thus prepares a basis for further considerations. Based on these considerations, the qualitative studies allow for an in-depth and at the same time practice-oriented gain of knowledge.

This structured and application-oriented understanding is based on a total of nine research articles. Research Articles #1, #2, #3, and #4 explore the first overarching research goal (RG_1), dynamic capabilities and the role of competitive advantage. Research Articles #1, #2, #3 examine dynamic capabilities against the backdrop of RBV, KBV, and DCV and their explanatory power. Research Article #4 builds on this by examining the use of characteristic features to create regional competitiveness in the context of entrepreneurial ecosystems. The second overarching research goal (RG_2), innovation capabilities and the role of knowledge transfer, analyzes the critical success factors for the process of knowledge exchange (Research Article #5), relevant dimensions and characteristics of CCSs in the public sector (Research Article #6), and challenges and opportunities of business model innovation (Research Article #7) in the context of existing and emerging ecosystems. The third overall research goal (RG_3), social capabilities and the role of trust provision, refers to the relevance of social factors in business ecosystems (Research Article #8) and their influence on the successful implementation of process management in platform-based ecosystems (Research Article #9).

2 Contributions to Theory

Due to the various interfaces with related research areas of ecosystems in general, this thesis contributes to a broad understanding of business ecosystems in several respects.

In relation to the first research goal, the thesis builds on basic theories of strategic management that have become prevalent and established in the literature since the 1990s. These basic theories include the RBV, KBV, and DCV. To fill the knowledge gaps at the intersection of the business ecosystem literature and strategic management topics on resource integration and extension of dynamic capabilities in the context of a business ecosystem, the thesis structures existing findings from the literature and extends them to consider emergent concepts such as that of selective revealing. In addition, the thesis considers relevant success factors for the development of ecosystems in entrepreneurship in order to be able to address dynamic developments also regionally.

With regard to the second research goal, the thesis substantiates the understanding of a central process against the background of strategic management: knowledge exchange. The structured description of the knowledge transfer process expands the existing literature at the interface of innovation management and ecosystems with essential insights for building competitive advantage. Based on this, the thesis uncovers a maturity model for establishing CCSs in the public sector and thus prepares the basis for establishing a digital ecosystem in the public sector. The thesis thus opens up a new interface to an area of research in connection with ecosystems that has received little attention to date: the public sector. In a third step, the challenges and opportunities of business model innovation are considered against the background of the establishment of an ecosystem of incumbents. By deriving recommendations for action, this study expands the interface between business model innovation and its direct connection to the establishment of ecosystems in asset-intensive industries such as the automotive sector.

The third research goal maps two interfaces to ecosystems: social factors and process management. Thus, the importance and influence of these factors on ecosystems is also investigated here in a first conceptual impact. Therefore, the study extends the knowledge of the influence of social factors as well as their importance with regard to value creation within business ecosystems. In a second step, this knowledge is used to take an in-depth look at the most important social factor, trust. This study consequently forms the interface to ecosystems and process management, an important research area against the background of platform-based business models.

3 Implications for Practice

In line with the three overall research goals, the following implications for practitioners can be derived. First, the conceptual considerations of this thesis in all three research goals contribute to a structured and fundamental understanding of the interactive nature and their relevance to the value creation of business ecosystems. As a result, ecosystem types can be distinguished from each other in practice by delineating characteristic features as well as different foundational purposes. This introduces a uniform understanding of different ecosystem types, which in practice leads to a targeted application of certain ecosystem types for certain targets. In addition, the different models can be used to define fields of action, which at the same time form the basis of decision models. Hence, these models reveal not only challenges but also opportunities that arise from the establishment of ecosystems in different industries and subject areas. Last but not least, the research results combine theoretical as well as practical recommendations for action, which is of great value for the use of ecosystem benefits due to the low level of consideration so far.

4 Limitations

This thesis provides a comprehensive insight into ecosystems in the economic environment and shows how organizations can use ecosystems to adapt to environmental changes, taking digitalization into account. Due to the broad approach of the still young research field on ecosystems, this dissertation tries to give an insight into the research field. Due to the focus and nature of the work, this dissertation is subject to different limitations.

The dissertation fundamentally illuminates the topic area of ecosystems and develops profound insights into the conceptual structure of different ecosystem types. Although the thesis takes a broad approach, the occurrence of ecosystem types and expressions in practice cannot be considered conclusively. The occurrence, the formation, and the design of ecosystems in practice depend on numerous different influencing factors that lead to individual ecosystem characteristics. This thesis abstracts different forms of ecosystems to superordinate ecosystem types and does not claim to be complete.

Due to the fundamental character of the dissertation, the work mainly takes a conceptual perspective on the topic of innovation in ecosystems. Since the thesis takes a purely conceptual perspective, especially in Research Articles #1, #2, #3, #4, #5 and #8, the insights gained can

neither be applied nor empirically tested. Due to the conceptual approach, the work lays fundamental foundations for both research and practice, but is not able to derive any context-specific or organization-dependent recommendations for action for achieving competitive advantages in ecosystems. Ecosystems in the context of economics are in the process of emergence, whereby a conceptual view contributes to theory development, but does not allow for empirical investigation and thus generalizability of the findings. The chosen methodological approaches in Research Articles #6, #7 and #9 break away from the conceptual perspective and apply qualitative research approaches with interviews and case studies. Although the results obtained show a very high level of detail in the insights into the companies and industries, statistical generalizability cannot be guaranteed.

5 Future Research

With regard to the three overarching research goals, the following further research needs arise. With regard to the first research goal, a closer look should be taken at dynamic capabilities and their different manifestations with regard to ecosystems. In particular, the selective revealing of boundary resources as a strategic tool for platform-based ecosystems is largely underrepresented in the current state of the research literature, even though it represents an extremely relevant dynamic capability. In this context, a networked view of the relevant strategic management theories should be taken.

With regard to the second research goal, further studies could look at the potential of ecosystems not only in the private sector but also in the public sector. Due to the increasing networking and generation of data volumes, the establishment of an ecosystem in the public sector lends itself to further study. In addition, it makes sense to clarify the question of the governance of the ecosystem at an early stage, especially in the case of asset-intensive ones. The question of who will play the role of orchestrator in the future, the incumbent or other players in the ecosystem, remains an exciting one. Further research studies could investigate governance mechanisms that are effective in protecting one's own core competencies while still achieving competitive advantages with other actors through coopetitive relationships.

The third research goal could bring enlightenment through further studies in relation to the interaction and relationships of actors in an ecosystem. For example, social factors have a significant impact on the motivation to interact. In line with the results from Research Article #5, these can be extended to include other social factors such as reputation and credibility. Furthermore, it is necessary to investigate trust as an essential influencing factor in existing ecosystems

in more detail in the form of case studies and interviews. So far, social factors as a whole remain a largely unexplored area in relation to ecosystems.

Regardless of the overall research goals, it is essential to ensure a consistent understanding of ecosystems in the literature. The diversity of different research backgrounds and perspectives leads to an increasing mixture of ecosystem types, which are used on an as-needed basis. This encourages inconsistencies in the use of terms. Despite attempts by several studies to create a unified understanding with respect to the expression *ecosystem*, the increasing research interest makes it difficult to delineate the various ecosystem terms.

VII. References

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VIII. Appendix

Index of Research Articles

Research Article #1: Dynamic Capabilities as the Key Approach to Investigate Digital Ecosystems

Götz, F., Hamann, C., Buck, C. Oesterle, S., Eymann, T. & Meckl, R. (2020). Published in *Proceedings of the 15th Conference on Wirtschaftsinformatik (8-11 March, 2020), Potsdam, Germany.*

(VHB-JOURQUAL 3: Category C; Scimago: none)

Research Article #2: Gaining Competitive Advantages with Platform-based Ecosystems – Defining a Research Agenda

Buck, C., Götz, F., Desouza, K., Hamann, C., & Meckl, R. (2021). Submitted to *IEEE Transactions on Engineering Management* (revision in preparation).

(VHB-JOURQUAL 3: Category B; Scimago: Q2)

Research Article #3: Selective Revealing in Platform-based Ecosystems – How Platform Owners Leverage Boundary Resources for Strategic Advantage

Buck, C., Axmann, G., Götz, F. & Desouza, K. (2021). Submitted to *55th Hawaii International Conference on System Sciences (4-7 January, 2022), Maui, Hawaii, United States of America* (rejected).

(VHB-JOURQUAL 3: Category C; Scimago: none)

Research Article #4: Establishing Entrepreneurial Ecosystems: A Taxonomy of Developed and Emerging Markets

Götz, F., Propp, M., Buck, C. & Meckl, R. (2021). In preparation for submission to a scientific journal.

(VHB-JOURQUAL 3: -; Scimago: -)

Research Article #5: Reaching the STAR - Managing Knowledge in Innovation Ecosystems

Götz, F., Thalenhorst, A., Horndasch, A., Buck, C. & Meckl, R. (2021). In preparation for submission to a scientific journal.

(VHB-JOURQUAL 3: -; Scimago: -)

Research Article #6: Maturity Models for Cognitive Computing Systems in the Public Sector

Desouza, K., Götz, F. & Dawson, G. S. (2021). Published in *Proceedings of the 54th Hawaii International Conference on System Sciences (5-8 January, 2021), Kauai, Hawaii, United States of America.*

(VHB-JOURQUAL 3: Category C; Scimago: none)

Research Article #7: Asset-intensive Firms and Business Model Innovation: Are Incumbents asleep at the Wheel?

Buck, C., Götz, F., Desouza, K., Schmitt, T. & Rosemann, M. (2021). In preparation for submission to a scientific journal.

(VHB-JOURQUAL 3: -; Scimago: -)

Research Article #8: Investigating Social Factors and their Impact on Value Co-creation in Supply Chain Ecosystems

Götz, F., Türkmen, I., Buck, C. & Meckl, R. (2021). Submitted to *Journal of Global Operations and Strategic Sourcing* (review; 1st revision completed).

(VHB-JOURQUAL 3: none; Scimago: Q3)

Research Article #9: Trust-aware Process Design: The Case of GoFood

Erawan, M., Funke, C., Götz, F. & Rosemann, M. (2021). Submitted (revise and resubmit) to *Business Process Management Journal* (review; 1st revision completed).

(VHB-JOURQUAL 3: C; Scimago: Q1)

Declaration of Co-Authorship and Individual Contribution to the Included Research Articles

This cumulative thesis consists of nine research articles that delineate the main body of this research work. In addition, two further research articles (Table 2) supplement the main body of this thesis. However, due to their additive nature, these two research articles are not considered further in the following presentation. Thus, the following section outlines respective project settings and in particular the individual contribution of each co-author to each of the main research projects. Moreover, the section details my individual contribution to each research article.

Research Article #1

Dynamic Capabilities as the Key Approach to Investigate Digital Ecosystems

Research Article #1 was developed with a team of six authors, all of them working at the same research institution (University of Bayreuth). Personally, I was responsible for leading the research project. Thus, I provided the initial research idea and co-developed the entire research project. Moreover, I managed the whole research process, engaged in the further development of the research idea, the textual elaboration, as well as the finalization of the research article's submission and later on its publication. Therefore, my contribution is reflected in the entire research project. Christian Hamann and Christoph Buck mainly contributed to the development of the research idea, participated in research discussions, and provided textual elaboration. Furthermore, Christoph Buck as well as Severin Oesterle contributed to the structure as well as the research design and helped in finalizing the research project for submission. Severin Oesterle also provided feedback and mentorship on the research content and its structure. Torsten Eymann and Reinhard Meckl supervised the research project and provided mentorship by participating in research discussions, and providing feedback on the paper's content and its structure. Overall, the research article benefitted significantly from the feedback of the experienced co-authors. Thus, the authorship of all co-authors is reflected in the entire research project. The research article was presented at the 15th International Conference on Wirtschaftsinformatik (March 8-11, 2020), Potsdam, Germany and later on published in the conference proceedings.

Research Article #2

Gaining Competitive Advantages with Digital Ecosystems

Research Article #2 was written with a team of five authors, two of whom work at other international research institutions (Kevin C. Desouza, Queensland University of Technology; Christoph Buck, Queensland University of Technology). After a former version of the paper (Research Article #1) had been presented at the 15th International Conference on Wirtschaftsinformatik (March 8-11, 2020), Potsdam, Germany, and published in the conference proceedings, one co-author (Severin Oesterle) left the team and another co-author (Kevin C. Desouza) joined in his stead. Being one of the leading authors, I had a main role in further developing the research idea and participating in discussions, providing feedback on the paper's content and its structure, and co-guiding the entire research process. In addition, I was mainly responsible for textual elaboration and finalizing the research paper for submission. Thus, my contribution is reflected in the entire research project. Christoph Buck served as the second leading author to this project by developing the research idea, participating in discussions, providing feedback on the paper's content and its structure, and co-leading the research process. Kevin C. Desouza supervised the research project, provided mentorship, gave feedback on the paper's content and its structure, and co-guided the entire research process. Christian Hamann helped develop the primary research idea and served as a great support in outlining the development of the research article. Reinhard Meckl supervised the research project, provided mentorship and feedback on the paper's content and its structure, and co-guided the entire research process. Overall, the research article benefitted significantly from the feedback of the experienced co-authors. Therefore, the authorship of all co-authors is reflected in the entire research project. The research article is in the revision process for the journal of IEEE Transactions on Engineering Management.

Research Article #3

Selective Revealing in Platform-based Ecosystems –

How Platform Owners Leverage Boundary Resources for Strategic Advantage

Research Article #3 was developed with a team of four authors, two of whom work at other international research institutions (Kevin C. Desouza, Queensland University of Technology; Christoph Buck, Queensland University of Technology). The research idea originated from the publication "Dynamic Capabilities as the Key Approach to Investigate Digital Ecosystems"

(Research Article #1). Christoph Buck and Gregory Axmann initiated the research project, managed the research process, provided mentorship, participated in discussions, developed the research idea and the whole research design. Moreover, Gregory Axmann conducted the structured literature review and data analysis elaborating content. I was mainly responsible for co-developing the research idea and project, providing expertise to the main parts of the research article, as well as elaborating and finalizing the research paper for submission. Although I had the role of a subordinate co-author, I was involved in each part of the research project. Therefore, I had a main role in the research article. Kevin C. Desouza supervised the research project, provided mentorship, gave feedback on the paper's content and its structure, and co-guided the entire research process. Overall, the research article benefitted significantly from the feedback of the experienced co-authors. Hence, the authorship of all co-authors is reflected in the entire research project. The research article was submitted to and rejected by the 55th Hawaii International Conference on System Sciences (January 4-7, 2022), Maui, Hawaii, United States of America.

Research Article #4

Taxonomy for Entrepreneurial Ecosystems –

A Comparison between Developed and Emerging Markets

Research Article #4 was written with a team of four co-authors, one of whom works at another international research institution (Christoph Buck, Queensland University of Technology). Personally, I was responsible for leading the research project. Thus, I provided the initial research idea and co-developed the entire research project. Moreover, I managed the whole research process, engaged in further development of the research idea, the textual elaboration, and contributed to data gathering and data analysis. Moreover, I finalized the research article for submission. Therefore, my contribution is reflected in the entire research project. Marie Propp co-developed the research idea, and contributed in data gathering and data analysis, as well as in providing textual elaboration. Christoph Buck contributed to the development of the research idea, the textual elaboration, and the structure and research design. Reinhard Meckl supervised the research project and provided mentorship by participating in research discussions, providing feedback on the paper's content and its structure. Overall, the research article benefitted significantly from the feedback of the experienced co-authors. Thus, the authorship of all co-authors is reflected in the entire research project. The research article is in preparation for submission to a scientific journal.

Research Article #5

Reaching the STAR - Managing Knowledge in Innovation Ecosystems

Research Article #5 was developed with a team of five co-authors, one of whom works at another international research institution (Christoph Buck, Queensland University of Technology). Personally, I was responsible for leading the research project. Therefore, I provided the initial research idea, co-developed the entire research project, and managed the whole research process. Moreover, I engaged in further development of the research idea, gathered data and conducted the data analysis, provided textual elaboration (especially for the Abstract and Sections 1, 2, 4, 5, 6), provided expertise on Sections 3 and 4, and contributed to data gathering as well as data analysis. Furthermore, I created the model of knowledge exchange within innovation ecosystems and the STAR-Model for knowledge management in innovation ecosystems. Finally, I revised Sections 1, 2, 4, and 5. In this way, I contributed significantly to the research progress, development of the research project, and the paper submission. Thus, my contribution is reflected in the entire research project. Annkathrin Thalenhorst contributed in co-developing the research idea, contributed to data gathering and data analysis, and in textual elaboration (especially Sections 3, 4, and 5). Moreover, she revised Sections 1 to 3 as well as Figure 1 and Tables 4 and 5. Finally, she participated in research discussions. Annabel Horndasch co-developed the research idea, contributed to data gathering and data analysis as well as to creating and formatting Tables 1 to 3 and 5. Moreover, she contributed to textual elaboration in Section 3 and participated in research discussions. Christoph Buck contributed to the development of the research idea, participated in research discussions, and provided feedback on the paper's content, its structure, and the textual elaboration. Reinhard Meckl supervised the entire research project and provided mentorship by participating in research discussions, providing feedback on the paper's content and its structure. All co-authors helped finalize the research paper for submission. Overall, the research article benefitted significantly from the feedback of the experienced co-authors. Thus, the authorship of all co-authors is reflected in the entire research project. The research article is in preparation for submission to a scientific journal.

Research Article #6

Maturity Models for Cognitive Computing Systems in the Public Sector

Research Article #6 was written with a team of three authors, two of whom work at other international research institutions (Kevin C. Desouza, Queensland University of Technology; Greg-

ory S. Dawson, Arizona State University) and one of whom was the leading author of the research article (Kevin C. Desouza). Kevin C. Desouza provided the initial research idea, co-developed the entire research project, led the whole research process, engaged in the further development of the research idea, gathered data, and conducted the data analysis. Furthermore, he provided textual elaboration. Personally, I contributed to the development of the research idea, engaged in the further development of the research idea, and had a key role in developing the maturity model for cognitive computing systems (Abstract, Sections 1, 2, 3, 4). Moreover, I was mainly responsible for providing textual elaboration and finalizing the research article for the submission to the conference. Thus, my co-authorship is reflected in the entire research project. Gregory S. Dawson contributed in data gathering and data analysis, co-supervised the research project, and provided mentorship by participating in research discussions, providing feedback on the paper's content and its structure. Overall, the research article benefitted significantly from the feedback of the experienced co-authors. Therefore, the authorship of all co-authors is reflected in the entire research project. The research article was published in the Proceedings of the 54th Hawaii International Conference on System Sciences (January 5-8, 2021), Kauai, Hawaii, United States of America.

Research Article #7

Towards the Business Model Innovation Paradox in the Automotive Industry

Research Article #7 was developed with a team of five co-authors, two of whom work at another international research institution (Kevin C. Desouza, Queensland University of Technology; Michael Rosemann, Queensland University of Technology). Christoph Buck provided the initial research idea, co-developed the entire research project, and provided textual elaboration. Moreover, Christoph Buck managed the whole research process, engaged in the further development of the research idea, and provided textual elaboration. I co-developed the research idea, participated in research discussions, and mainly provided textual elaboration. Moreover, I was involved in conceptualizing, developing, and reworking sections throughout the article and helped to finalize the research paper for submission. Hence, my contribution is reflected in the entire research project. Kevin C. Desouza co-developed the research idea, participated in discussions, and provided feedback on the research paper's content and its structure. Teresa Schmitt co-developed the entire research project, and provided textual elaboration. Michael Rosemann supervised the research project and provided mentorship. Further, he participated in research discussions and provided feedback on the paper's content and its structure. Overall, the research article benefitted significantly from the feedback of the experienced co-authors.

Thus, the authorship of all co-authors is reflected in the entire research project. The research article is in preparation for submission to a scientific journal.

Research Article #8

Investigating Social Factors and their Impact on Value Creation

Research Article #8 was written with a team of four authors, one of whom who works at another international research institution (Christoph Buck, Queensland University of Technology). Personally, I was responsible for leading the research project. Therefore, I provided the initial research idea and co-developed the entire research project. Moreover, I managed the whole research process, engaged in further development of the research idea, gathered data, contributed to the data analysis as well as the textual elaboration, and finalized the research paper for submission. Thus, my contribution is reflected in the entire research project. Ismail Türkmen co-developed the research idea, gathered data, conducted the data analysis, participated in research discussions, and provided textual elaboration. Christoph Buck mainly contributed to the development of the research idea and the research structure, as well as contributing to the textual elaboration. Furthermore, Christoph Buck participated in research discussions and provided mentorship as well as feedback on the research paper's content. Moreover, he helped to finalize the research paper for submission. Reinhard Meckl supervised the entire research project and provided mentorship by participating in research discussions, providing feedback on the paper's content and its structure. Overall, the research article benefitted significantly from the feedback of the experienced co-authors. Thus, the authorship of all co-authors is reflected in the entire research project. The research article is in the review process for the Journal of Global Operations and Strategic Sourcing (1st revision completed).

Research Article #9

Trust-aware Process Design – A Case of GoFood

Research Article #9 was developed with a team of four authors, three of whom work at other international research institutions (Mahendrawathi Erawan, Institut Teknologi Sepuluh Nopember; Carole Funke, Queensland University of Technology; Michael Rosemann, Queensland University of Technology) and one of whom was the leading author of the research project (Mahendrawathi Erawan). The initial lead-authorship (Carola Funke) was handed over to Mahendrawathi Erawan during the development of the research project. Mahendrawathi Erawan

provided the initial research idea and co-managed the entire research project. She was responsible for data gathering, data analysis, and provided feedback on the paper's structure as well as the research method. Moreover, she engaged in the further development of the research idea, provided textual elaboration, and finalized the paper for submission. Carola Funke co-developed the research idea, conducted the data analysis, and contributed to the development of the research idea as well as the textual elaboration. Personally, I had a key role in gathering data and conducting the data analysis as well as in participating in research discussions. Furthermore, I provided feedback on the paper's content and its structure, and provided textual elaboration. In sum, my authorship is reflected in the entire research project. Michael Rosemann supervised the research project and provided mentorship by participating in research discussions, providing feedback on the paper's content and its structure. Overall, the research article benefitted significantly from the feedback of the experienced co-authors. Therefore, the authorship of all co-authors is reflected in the entire research project. The research article is in the review process of the Business Process Management Journal (1st revision completed).

Research Article #1:

Dynamic Capabilities as the Key Approach to Investigate Digital Ecosystems

Authors: Götz, F., Hamann, C., Buck, C., Oesterle, S., Eymann, T. & Meckl, R.

Published in: Proceedings of 15th International Conference on Wirtschaftsinformatik, March 8-11, 2020, Potsdam, Germany

Abstract: As a result of technological change and increasing digitalization, corporate and industry structures are changing. Due to a growing dynamic in the competitive environment, companies are forced to reinvent themselves. Digital and platform-based ecosystems represent a promising direction for rapid progress in competition and cooperation at the same time. From a strategic perspective, however, the question of sustainable management must be posed. The classic approach of the Resource-Based View (RBV) appears too static in the dynamic digital environment and must be supplemented by the Knowledge-Based View (KBV) or the Dynamic Capabilities View (DCV). This paper structures and analyzes the existing literature on digital ecosystems against the background of existing management theories. Within the framework of a structured literature review, we identify and analyze 23 relevant management publications. The extant literature shows an existing research gap with regard to the KBV and DCV.

Keywords: Digital ecosystems, resource-based view, knowledge-based view, dynamic capabilities view, structured literature review

Research Article #2:
Gaining Competitive Advantages with Platform-based Ecosystems – Defining a Research Agenda

Authors: Götz, F., Buck, C., Desouza, K., Hamann, C., & Meckl, R.

Submitted to: IEEE Transactions on Engineering Management, 2021 (revision in preparation)

Extended Abstract

Platform-based ecosystems are becoming increasingly important. This is primarily due to the growing networking of products and services (Hein et al., 2020). This cross-linking is also changing the nature of value creation, which in turn is opening up completely new opportunities and potential for companies (Aarikka-Stenroos & Ritala, 2017; Adner, 2017; Dass & Kumar, 2014). For this reason, platform-based ecosystems are enjoying great popularity in both the economy and in science. While at the moment it is mainly corporations that are trying to establish platform-based ecosystems to avoid lagging behind and losing established competitive advantages, research is examining the phenomenon of platform-based ecosystems against the backdrop of different management issues and decisions (Hein et al., 2020; Järvi & Kortelainen, 2017; Kapoor et al., 2021; Scaringella & Radziwon, 2018; Senyo et al., 2019; Thomas et al., 2014).

Due to the changing nature of value creation, it is of great interest to academia to explore the dynamics of networked value creation (Adner & Kapoor, 2010; Hein et al., 2019; Kapoor, 2018; Meynhardt et al., 2016). This includes, in particular, resource integration and knowledge transfer with third-party providers to build and develop platforms and ultimately achieve competitive advantages.

Despite the great interest in platform-based ecosystems and their relevance for maintaining and expanding competitive advantage, there are surprisingly few studies to date that fill this research gap by linking established scientific theories with ecosystems (Jacobides et al., 2018). Based on the previously published paper by Götz et al. (2020), which examines the explanatory power of the resource-based view (RBV) with its extensions, the knowledge-based view (KBV) and the dynamic capabilities view (DCV), this research article therefore investigates the following research question:

What are essential areas organizations have to engage to achieve sustainable competitive advantages in platform-based ecosystems?

Against the background of strategic management, this research article thus combines RBV, KBV, as well as the DCV in the area of platform-based ecosystems and represents a call for further research.

To answer the research question, we first discuss different strategic considerations of platform-based ecosystems. These considerations include issues of digital technologies and digital content, the platform as a technical foundation that serves the launch of products and services (Thomas et al., 2014; Rajala et al., 2019; Rolland et al., 2018), and the platform leader and associated network (Jacobides et al., 2014; Kim & Altmann, 2020; McIntyre & Srinivasan, 2017; Tsujimoto et al., 2018). Moreover, we analyze strategic approaches linked to platform-based ecosystems.

Based on this research, we developed a three-layer research framework that considers different stratums to manage platform-based ecosystems and achieve competitive advantage. The research framework follows a systems thinking approach (Haines, 2000; Sunder & Ganseh, 2020). The starting point of the research is the platform leader. The inner core of the framework describes the RBV as the theoretical basis (Level I). This level is closely related to the DCV (Level II), as in the context of platform-based ecosystems, dynamic capabilities are mandatory to achieve competitive advantage due to the dynamic change of the environment (Helfat & Raubitschek, 2018). The outer level includes the sphere of knowledge management of the platform leader, since knowledge is considered the most strategically valuable resource for gaining competitive advantage (Level III).

This research contribution thus provides a foundation that, on the one hand, links classic approaches to strategic management and, on the other hand, opens up new research questions for further scientific investigations.

Keywords: Platform-based ecosystems; digital ecosystems, resource-based view; knowledge-based view; dynamic capability view; competitive advantage

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Research Article #3:

Selective Revealing in Platform-based Ecosystems – How Platform Owners Leverage Boundary Resources for Strategic Advantage

Authors: Buck, C., Axmann, G., Götz, F. & Desouza, K.

Submitted to: 55th Hawaii International Conference on System Sciences, 4 - 7 January, 2022, Maui, Hawaii, United States of America (rejected)

Extended Abstract

Digital platforms enable the networking of players across different industries, the networking of products and services, and break up the traditional linear value chain through value co-creation (Cennamo & Santalo, 2013; Eisenmann, 2013). As a result, digital platforms often achieve very high market shares, which in turn can lead to monopoly or duopoly-like structures. In this process, the platform leader provides the technical infrastructure and integrates third-party providers, who in turn create value for the platform-based ecosystem (Gawer, 2014; Gawer & Cusumano, 2014). The technical infrastructure provided includes application programming interfaces (APIs), software development kits (SDKs), and an extensible codebase (Hilbolling et al., 2020).

Now that large corporations in particular, such as Apple and Google, have used digital platforms for their sensor-oriented products (e.g., smartphones and tablets), more and more companies from different industries are integrating platforms into their business models. The automotive industry is playing a pioneering role here. For example, Volkswagen's We Experience platform and the Mercedes me platform represent very good examples where third-party providers offer the value proposition. This new value proposition is enabled at the accessible boundary resources through APIs and SDKs (Ghazawneh & Henfridsson, 2013; Hilbolling et al., 2020; Karhu et al., 2018).

However, to be successful as a platform leader (orchestrator) with a platform-based ecosystem (PBE), several factors must be met. In this context, different research questions arise, such as: How do platform leaders decide which interfaces and resources to make available to third-party providers (Brunswicker et al., 2019)? How will this openness later affect the value creation of the platform-based ecosystem and its complementors (Nambisan et al., 2018)? Moreover, how

do orchestrators apply the strategy of selective revealing? Since these are highly strategic questions that have a critical impact on maintaining and expanding competitive advantage, we explore the following research question in this research article:

How can platform owners gain competitive advantages in PBE by strategically managing boundary resources?

To further explore this research question, we conducted a structured literature review using the Web of Science (Manikas & Hansen, 2013) and JSTOR (Templier & Paré, 2015) databases. The final search string focused on the fields of platform ecosystems and strategic keywords. Moreover, we applied some filters such as years of publication, language, and journal ratings. In this way, we could reduce the final sample down to a total number of 34 research articles, which we analyzed according to our research question.

We identified four different categories on strategic mechanisms based on our literature analysis, which can be used to manage platform-based ecosystems. Therefore, this research article contributes to a fundamental understanding and outline of different strategic management approaches for platform-based ecosystems.

Keywords: Platform-based ecosystems; boundary resources; selective revealing; systematic literature review

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Research Article #4:

Establishing Entrepreneurial Ecosystems: A Taxonomy of Developed and Emerging Markets

Authors: Götz, F., Propp, M., Buck, C. & Meckl, R.

Preparation for: Submission to a scientific journal

Extended Abstract

Entrepreneurship is seen as a driver of innovation (Michael & Pearce, 2009). Consequently, entrepreneurship also becomes a driver of economic growth and regional prosperity through the creation of jobs and the advancement of technical developments in various industries (Cukier & Kon, 2018). Innovation, in turn, arises primarily through social interactions in networks (Liu et al., 2018). This social interaction is found in so-called entrepreneurial ecosystems, which enable the iterative process of creating innovations, creating new value, and establishing new business models within their network (Mason & Brown, 2014; Audretsch et al., 2019; Cavallo et al., 2019). Thus, entrepreneurial ecosystems act proactively and can adapt flexibly to dynamic changes in the environment (Manimala & Wasdani, 2015). More and more of these entrepreneurial ecosystems are establishing themselves around the world. Examples include Silicon Valley (USA) and Tel Aviv (Israel).

As a result, research interest in entrepreneurial ecosystems has also continued to grow (Acs et al., 2017; Cao & Shi, 2020; Spigel et al., 2020). What is striking about the studies published to date is that they focus predominantly on entrepreneurial ecosystems in developed markets (Hemmert et al., 2019; Uctu et al., 2020). In this context, several questions arise such as: What promising characteristics do established entrepreneurial ecosystems bring to the table? To what extent do these promising characteristics differ from those of entrepreneurial ecosystems that have been little studied so far, but which are now also established? To what extent can these characteristics be influenced and consciously developed? To find answers to this question, this research article examines the following research question:

Which dimensions and characteristics do entrepreneurial ecosystems have and to what extent do these dimensions and characteristics differ between developed and emerging markets?

To address this research gap, we conducted a taxonomy (Nickerson et al., 2013). In the first step, we conducted a structured literature review related to the analysis of entrepreneurial ecosystems. By setting different filters such as ranking of journals, as well as certain content parameters, we obtained a final sample of 19 research articles in total. For the identification of dimensions and characteristics, we used an iterative process following the guidelines of Nickerson et al. (2013).

Through this iterative process, we were able to identify a total of seven different dimensions that can be used to describe entrepreneurial ecosystems in both developed and emerging markets. Each dimension has a certain number of characteristics that describe the dimension in depth. This reveals considerable differences between entrepreneurial ecosystems in developed and emerging markets. These differences relate, for example, to the infrastructure, the level of development, and the maturity of the entrepreneurial ecosystem.

Keywords: Entrepreneurial ecosystem; taxonomy; developed markets; emerging markets

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Research Article #5:

Reaching the STAR - Managing Knowledge in Innovation Ecosystems

Authors: Götz, F., Thalenhorst, A., Horndasch, A., Buck, C. & Meckl, R.

Preparation for: Submission to a scientific journal

Extended Abstract

Innovation is seen as the key to achieving competitive advantage. The most important ingredient to create innovation is knowledge. Therefore, knowledge is also a key resource in strategic management (Sjödin, 2019; Spena et al., 2016; Spender, 1996; Wernerfelt, 1984). Innovation is seen as the key to achieving competitive advantage (Adner, 2006). The most important ingredient to create innovation is knowledge. Therefore, knowledge is also a key resource in strategic management. Moreover, knowledge exchange contributes directly to the value creation process within the innovation ecosystem (De Silva et al., 2018; Suseno et al., 2018; Teece, 1998). In terms of innovation, companies have to contend with ever shorter innovation cycles, which they can no longer manage on their own due to the short time spans involved (Tidd et al., 2005).

Against this background, interest in innovation ecosystems is growing steadily in business as well as in science (Dedehayir et al., 2018; Valkokari, 2015; Walrave et al., 2018). Thus, the number of publications on innovation ecosystems has increased rapidly in recent years (Granstrand & Holgersson, 2020 Su et al., 2018). However, despite the increasing number of publications on innovation ecosystems (Adner, 2006; Granstrand & Holgersson, 2020; Gupta et al., 2019; Lin, 2018; Nambisan & Baron, 2013), the research area around knowledge sharing in innovation ecosystems is largely unexplored. Given that knowledge and knowledge exchange play such a significant role in the strategic development of organizations and the achievement of competitive advantage (Gifford et al., 2020), we explore the following research question in this research article within the context of innovation ecosystems:

How do organizations engage in knowledge exchange within innovation ecosystems?

To shed light on this research gap, we conducted a structured literature review using the Scopus database (Denney & Tewksbury, 2013; Webster & Watson, 2002). The focus of the review relates to innovation ecosystems and the "knowledge" factor. To simplify the literature review, we also used filters and categorized the research articles by relevance. In this way, through an

iterative process, we were able to identify the relevant literature in the form of a final sample of 33 research articles.

The evaluation of this final sample shows that the topic of knowledge sharing has been studied only sporadically and in completely different journals. Moreover, it becomes clear that this research focus has only gained importance in the last five years.

Based on the content analysis, we were able to identify a total of four different phases that define knowledge sharing in innovation ecosystems. These four phases can be clearly distinguished from each other with regard to certain criteria, such as the purpose, the success factors of the respective phase, or even the tools to be used for knowledge exchange. The four phases are seen from the perspective of both the ecosystem orchestrator and the ecosystem complementors.

The research represents a conceptual investigation and thus contributes to an initial basic overview of the knowledge sharing process, while offering the potential for more in-depth investigations into each of the four phases through case studies or even long-term studies. Thus, as part of the research outlook, we identify specific research gaps for each of the four phases.

Keywords: Innovation ecosystems; open innovation; knowledge transfer; knowledge clusters; knowledge framework

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Research Article #6:

Maturity Model for Cognitive Computing Systems in the Public Sector

Authors: Desouza, K. C., Götz, F. & Dawson, G. S.

Published in: Proceedings of the 54th Hawaii International Conference on System Sciences, 2021

Abstract: Thanks to their enormous potential for creating more efficient processes and solving vexing problem, cognitive computing systems (CCSs) are increasingly prevalent in the public sector. However, their full deployment is stymied by all of the problems faced by private firms (e.g. organizational issues, people issues and technology issues) as well as problems that are unique to the public sector including stakeholder groups with conflicting goals and a demand for full transparency. In this study, we develop a public-sector centric maturity model approach to CCSs that acknowledges and addresses these problems while providing a path to evaluate, assess and guide CCS initiatives. By following this model, the public sector can reap the rewards of CCS deployment and provide better outcomes for its citizenry.

Keywords: Digital transformation and government; barriers to and enablers of change; cognitive computing systems; artificial intelligence; maturity models; public sector; public agencies

Research Article #7:

Asset-intensive Firms and Business Model Innovation: Are Incumbents asleep at the Wheel?

Authors: Buck, C., Götz, F., Desouza, K. C., Schmitt, T. & Rosemann, M.

Preparation for: Submission to a scientific journal

Extended Abstract

Asset-intensive companies often struggle when it comes to creating change. This is true for many incumbents across all industries (Braganza et al., 2009). While asset-intensive companies have the advantage of having an extensive customer base and thus numerous customer data, which create high barriers to market entry for other companies, these companies are also characterized by low agility and thus less flexibility to adapt to dynamic changes (Braganza et al., 2009; Sivapalan & Bowen, 2020; Vishnevskyi et al., 2017).

One of these industries is the automotive industry, which specializes primarily in product innovations and has high barriers to market entry (Mahut et al., 2015). However, with the advent of digitalization and the increasing networking of the car with its world, these market entry barriers are increasingly disappearing. The traditional value creation model can therefore no longer be maintained on its own (Grieger & Ludwig, 2019; Egfjord & Sund, 2020 Heider et al., 2020). For this reason, among others, incumbents in the automotive industry are facing ever-greater challenges and need to gain momentum in the area of business model innovation in order to keep and gain competitive advantages (Zott et al., 2011; Kim & Min, 2015; Warner & Wäger, 2019).

Despite the high relevance of the automotive industry for the German market, little is known about how incumbents conduct business model innovation. For this reason, we pose the following research question in this research article:

How can asset-intensive organizations successfully pursue business model innovation?

To answer this research question, we first look in detail at the challenges facing incumbents in the automotive industry. In a second step, we identify what we already know about business model innovation in the automotive industry and which questions are still unanswered.

To answer the research question, we chose a multiple-case study approach to gain deep insights into the field of business model innovation in the automotive sector. We conducted a total of 14 interviews with innovation experts from the German automotive sector and analyzed the data. From this analysis, we were able to identify five recommendations for action, which we discuss in detail in the research article.

This provides a fundamental scientific study on the implementation of business model innovation in the automotive sector using the example of German incumbents.

Keywords: Business model innovation; asset-intensive organizations; incumbent companies; automotive industry

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Research Article #8:

Investigating Social Factors and their Impact on Value Co-creation in Supply Chain Ecosystems

Authors: Götz, F., Türkmen, I., Buck, C. & Meckl, R.

Submitted to: Journal of Global Operations and Strategic Sourcing (review, 1st revision completed)

Extended Abstract

In economic terms, business ecosystems represent socioeconomic networks based on the interconnectedness of different actors across industries (Ben Letaifa, 2014; Ben Letaifa & Reynoso, 2015; Senyo et al., 2018). Supply chain ecosystems can be defined as business ecosystems (Liu et al., 2019; Valdez-de-Leon, 2019) and are characterized by close networking with distributors, suppliers, outsourcing companies, manufacturers, technology providers, customers, and competitors (Valdez-de-Leon, 2019). Within this interconnectedness of different actors in the supply chain ecosystem, knowledge and capabilities are shared to gain customer satisfaction, jointly create value, and achieve competitive advantage (Valkokari, 2017). As a result, traditional value creation is replaced by joint, dynamic value co-creation (Fierro Hernandez & Haddud, 2018). This changes the relationship between individual actors from a more competitive-oriented tie to cooperative interactions (Valdez-de-Leon, 2019). Within these interactions, resources are shared to drive innovation by complementing each other's different resources (Jacobides et al., 2018; Little, 2020). Therefore, actors belonging to a supply chain ecosystem share the same values and in this sense are interdependent (Liu et al., 2019).

Against this backdrop, social factors such as trust are particularly important, as relevant resources are exchanged in the course of interactions that can determine the attainment of competitive advantage. Despite the rapid increase in research interest in business ecosystems in general, social factors have been a largely unexplored area. For this reason, the research article examines the following research question:

Which social factors affect the value co-creation process within a supply chain ecosystem?

Given the low level of research interest so far, the primary objective of this research article is to provide a basic overview of the most important social factors in the context of supply chain ecosystems. For this purpose, we have conducted a structured literature review that identifies the most important social factors in a first step and analyzes them in the context of supply chain ecosystems in a second step. The structured literature review was conducted using the Web of Science database. The final sample of the SLR amounts to 37 research articles, of which 11 research articles contributed to the content of our research question. Trust is by far the most important social factor, followed by commitment and mindset. All three social factors influence the interaction of the actors in the supply chain ecosystem in different ways and thus also influence value creation. We discuss the three identified factors using different examples.

The study therefore contributes to a first overview of social factors against the background of business ecosystems.

Keywords: Supply chain ecosystems, social factors, value co-creation, literature review

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Research Article #9:

Trust-Aware Process Design: The Case of GoFood

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Extended Abstract

Traditionally, three factors determine business processes in management: costs, quality, and time. In recent years, however, various scandals in business have repeatedly made it clear how crucial social factors are with regard to business process management. One of the most important social factors is trust. Trust comes into play when uncertainties arise and is therefore a decisive variable for the successful completion of business processes (Zucker, 1986; Mohammadi & Heisel, 2016). In short, no matter how efficiently the business process is designed in terms of cost, quality, and time, if trust cannot be created or is not present, the customer will not be involved in the process.

In this context, the increasing use of digitization enables new opportunities and risks for companies (Choudhury & Karahanna, 2008). Platform-based business models benefit from the digital networking of products and services and maximize the three traditional influencing factors of cost, quality, and time. However, trust plays an increasingly important role in digitized processes in many respects (Angrian & Thakur, 2008; Agag & El-Masry, 2017). Starting with uncertainties about data protection, through uncertainties about the ordering and delivery process, to uncertainties about the person involved in the process (Gambetta, 1988; Taylor & Todd, 1995; Sirdeshmukh et al., 2002; Benlian et al., 2012; Fulmer & Gelfand, 2012). Trust is indispensable and is therefore a central factor in business process management.

Despite the increasing interest of trust in the research area of business process management (Kuntze et al., 2008; Müller et al., 2020a), there are a limited number of designs available so far that examine and demonstrate trust as a component of the business process in detail (Rosemann, 2019; Müller et al., 2020b). Therefore, this research article examines the following research question:

How does trust-aware process design materialize in practice?

To establish such a trust-based design of business processes, in this study we examine the case study of GoFood, the food delivery service of Gojek, one of the fastest growing ride-hailing companies in the world. GoFood is particularly well suited as a case study because its processes are highly trust-intensive and the company has had to adapt quickly to dynamically changing conditions. Specifically, we show what challenges Gojek faced and how the company addressed them with respect to the trust factor (Bart et al., 2005; Iskandar et al., 2017; Azzuhri et al., 2018).

Based on our research, we propose a trust management framework that serves to integrate trust into business process design. Thus, the research article answers the question as to what extent trust can materialize with regard to business process management and at the same time contains recommendations for practice.

Keywords: Business process design, trust-aware, trust management, framework

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