

**Managing Multi-Tiered Innovation Ecosystems: How Lead Firms Govern
Their Relationships With Multiple Heterogeneous Complementors**

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Table of Contents

Acknowledgements	I
Table of Contents	II
List of Tables	V
List of Figures.....	VI
List of Abbreviations	VII
Summary	VIII
Zusammenfassung.....	IX
 1 Introduction.....	 1
1.1 Research Objective and Research Question	2
1.2 Theoretical Contribution and Relevance.....	3
1.3 Practical Contribution and Relevance	6
1.4 Dissertation Outline	7
 2 Literature Background	 8
2.1 Extant Perspectives in the Strategy Literature	10
2.1.1 Resource Dependence Literature.....	12
2.1.2 Open Innovation Literature.....	19
2.2 Ecosystem Literature – Construct, Types, and Roles.....	31
2.2.1 Ecosystem Construct and History.....	31
2.2.2 Lead Firms' Creation of Innovation Ecosystems	38
2.2.3 Heterogeneous Complementors in Innovation Ecosystems	47
2.3 Ecosystem Governance	48

2.3.1 Dimensions of Ecosystem Governance	49
2.3.2 Governance Approaches and Challenges in Ecosystems	52
2.3.3 Understudied Aspects of Ecosystem Governance	59
3 Data and Methods	61
3.1 Research Setting	61
3.2 Research Design	62
3.3 Data Collection	65
3.4 Data Analysis	70
4 Empirical Case Evidence.....	72
4.1 Identifying Lead Firms' Ecosystem Strategy and Approach.....	72
4.1.1 Case Alpha.....	72
4.1.2 Case Beta	77
4.1.3 Case Gamma	79
4.1.4 Case Delta	83
4.1.5 Case Epsilon	87
4.2 Identifying Influencing Factors for Ecosystem Governance and Understanding Contrasting Governance Approaches	93
4.2.1 Comparing the Domains of Uncertainty Across Cases	97
4.2.2 Comparing Complementors' Role in Ecosystem Innovation Across Cases	99
4.2.3 Identifying Different Governance Approaches per Tier Group	101
4.3 A Model of a Multi-Tier Governance Process.....	107
5 Discussion and Implications.....	110
5.1 Implications for Research	111

5.1.1 Ecosystem Literature	111
5.1.2 Open Innovation Literature.....	118
5.1.3 Other Literature Streams.....	122
5.2 Limitations and Avenues for Future Research	128
5.3 Implications for Practice	131
5.3.1 Distinct Ecosystem Strategies and Their Implications	131
5.3.2 Governance Decisions in Innovation Ecosystems	146
5.3.3 Coordination Challenges and Capabilities Required by Lead Firms ...	150
6 Conclusion	157
Appendices	159
Appendix A	159
Appendix B	162
Bibliography	171
Curriculum Vitae	191

List of Tables

Table 1 50

Table 2 68

Table 3 91

Table 4 94

Table 5 134

Table A1..... 161

Table B1 162

Table B2..... 163

List of Figures

Figure 1	9
Figure 2	76
Figure 3	79
Figure 4	83
Figure 5	86
Figure 6	90
Figure 7	109
Figure 8	133
Figure 9	133
Figure A1	159
Figure A2	160

List of Abbreviations

BU	Business Unit
CCO	Chief Commercial Officer
CEO	Chief Executive Officer
COO	Chief Operating Officer
ED	Executive Director
e.g.	exempli gratia (for example)
et al.	et alia (and others)
etc.	et cetera (and so on)
FinTech	Financial Technology
i.e.	id est (that is)
MVP	Minimum Viable Product
OEM	Original Equipment Manufacturer
OI	Open Innovation
PSD2	Payment Services Directive 2
RDT	Resource Dependence Theory
Resp.	Respondent
Tech.	Technology
vs.	versus (against)

Summary

How do lead firms in innovation ecosystems govern their relationships with multiple heterogeneous complementors? While extant ecosystem literature has acknowledged that formal and informal governance mechanisms and the organizational form shape ecosystem governance, a nuanced perspective on how lead firms tailor their governance to manage the multiplicity of partners in innovation ecosystems does not yet exist. Developing a better understanding of inter-firm coordination and governance in ecosystems, however, seems more relevant than ever, as an increasing number of firms across industries work with more ecosystem- or platform-based models in which the firms develop value propositions through collaboration of multiple heterogeneous and independent partners.

This dissertation investigates lead firms' governance in innovation ecosystems to fill this gap in the literature by taking an inductive, multiple-case study approach. I provide empirical evidence illustrating that lead firms in these ecosystems, including heterogeneous complementors, form distinctly governed tiers of complementors. More specifically, my findings show that lead firms' decisions about the mix of formal and informal governance mechanisms and the choice of organizational form are determined by the domains of uncertainty underlying the ecosystem blueprint and complementors' role of either exploring or reinforcing elements of this blueprint.

Additionally, I find that lead firms from the same industry use different ecosystem strategies. Lead firms' strategies are either focused on developing a generative ecosystem around the established business or on building an integrative ecosystem focused on a specific customer-journey. I find that the chosen ecosystem strategy has important consequences for the uncertainty lead firms face, and for the suitability of governance decisions. I discuss the implications of my findings for ecosystem research and management practice, especially with regard to ecosystem governance and ecosystem strategies.

Keywords: incumbent, innovation ecosystem, governance, ecosystem strategy, ecosystem emergence, complementor, multiple-case study

Zusammenfassung

Wie regeln Firmen, die eine Führungsrolle in einem Innovations-Ökosystem innehaben (Ökosystem-Leader), die Governance in den Beziehungen mit mehreren heterogenen komplementären Partnern? Während die bestehende Ökosystem-Literatur die Verwendung von formellen und informellen Governance-Mechanismen und die Nutzung unterschiedlicher Organisationsformen bestätigt hat, fehlt es nach wie vor an einer differenzierten Betrachtung der Art und Weise, wie Ökosystem-Leader die Governance-Regeln an die Vielzahl an Beziehungen in Innovations-Ökosystemen anpassen. Ein besseres Verständnis für die zwischenbetriebliche Zusammenarbeit und die Governance in Ökosystemen scheint jedoch wichtiger denn je zuvor, da eine immer größere Zahl an Unternehmen aus unterschiedlichen Industrien in ökosystem- oder plattform-basierten Modellen agiert, in welchen Nutzenversprechen durch die Zusammenarbeit von mehreren heterogenen und unabhängigen Partnern erstellt werden.

In dieser Doktorarbeit versuche ich, die Forschungslücke in Bezug auf die Steuerung von Innovations-Ökosystemen durch Ökosystem-Leader anhand eines induktiven Forschungsansatzes und den Vergleich mehrerer Fallstudien zu analysieren. Ich präsentiere empirische Belege, die zeigen, dass Ökosystem-Leader in Innovations-Ökosystemen, bestehend aus heterogenen komplementären Partnern, verschiedene Gruppen an Partnern mit jeweils unterschiedlichen Governance-Regeln formen. Im Detail zeigen meine Ergebnisse, dass die Entscheidungen der Ökosystem-Leader im Hinblick auf die Verwendungen von formellen und informellen Governance-Mechanismen und die Wahl der Organisationsform von der Unsicherheit in Bezug auf den Entwurf des Ökosystems und von der explorativen oder festigenden Rolle der Partner bei der Umsetzung des Entwurfs abhängen.

Darüber hinaus stelle ich fest, dass Ökosystem-Leader innerhalb derselben Industrie unterschiedliche Ökosystem-Strategien anwenden. Die Strategie der Ökosystem-Leader fokussiert entweder auf die Entwicklung eines generativen Ökosystems, welches um das bestehende Geschäft aufgebaut wird, oder den Aufbau eines integrativen Ökosystems, welches auf ein ganz bestimmtes Nutzenversprechen fokussiert ist. Ich stelle fest, dass die gewählte Ökosystem-Strategie wichtige Auswirkungen auf die Unsicherheit der Ökosystem-Leader und die Anwendbarkeit von

Governance-Entscheidungen hat. Ich erörtere Implikationen dieser Erkenntnisse für die Ökosystem-Forschung und die unternehmerische Praxis, speziell in Hinblick auf die Themen Ökosystem-Governance und Ökosystem-Strategien.

Schlüsselwörter: Etablierte Unternehmen, Innovations-Ökosysteme, Governance, Ökosystem-Strategie, Ökosystem-Entstehung, komplementäre Partner, vergleichende Fallstudie

1 Introduction

Innovation ecosystems form a unique setting in which firms are highly dependent on each other in establishing a focal value proposition (Adner, 2017; Adner & Kapoor, 2010). The performance of the ecosystem is thus affected by how the independent ecosystem members are aligned to coordinate their activities without direct hierarchical controls (Adner & Kapoor, 2010; Iansiti & Levien, 2004). Consequently, firms' performance is increasingly dependent on resources that lie outside their direct control (Iansiti & Levien, 2004) and on activities of other firms in their environment (Adner & Kapoor, 2010). The co-creation of value within ecosystem partners requires firms to "open" their organizational boundaries to enable an exchange of resources (Zobel & Hagedoorn, 2020). However, as interorganizational ties are never without risks (Adner & Feiler, 2019), firms within ecosystems also need to consider how to govern these cooperative efforts in order to capture value and prevent unintended negative consequences of interorganizational ties, such as knowledge leakage or resource appropriation (Pisano & Teece, 2007; Somaya, 2012; Teece, 1986; Zobel & Hagedoorn, 2018).

Lead firms take on a central orchestrating role to drive the emergence of an ecosystem (Moore, 1993; Teece, 2007; Williamson & De Meyer, 2012). As part of this role, lead firms have to decide on the right governance approach regarding the organizational form along the market-hierarchy continuum (Kapoor & Lee, 2013) and the mix of formal and informal governance mechanisms (Kapoor, 2018). These governance decisions are crucial, as they will not only influence lead firms' ability to manage and control partners' activities (Dattée, Alexy, & Autio, 2018), but also affect the dynamics of value creation and capture between participating parties (Gulati, Puranam, & Tushman, 2012; Zobel & Hagedoorn, 2020). Undoubtedly, as ever more business and innovative activities move "towards more open and networked environments" (De Silva, Howells, & Meyer, 2018: 70) in which collective value creation and non-hierarchical interactions in ecosystems (Dyer & Singh, 1998; Jacobides, Cennamo, & Gawer, 2018) become more important, the question as to how firms govern their ecosystem's partners and their portfolio of external resources becomes increasingly relevant (Adner, 2017; Zobel and Hagedoorn, 2018).

1.1 Research Objective and Research Question

Despite the practical relevance of and the recent academic interest in the phenomenon, research is only beginning to understand the mechanisms and outcomes of governance-related decisions in ecosystems (Jacobides et al., 2018). In research we still lack a clear understanding of optimal ecosystem design strategies (McIntyre & Srinivasan, 2017) and related governance challenges, for example, "how 'open' such governance should be" (Bogers et al., 2017, p. 16). Further, apart from a few notable exceptions from the recent past (e.g., Dattée et al., 2018; Wareham, Fox, & Cano Giner, 2014), the literature on ecosystems has been relatively silent regarding the rules governing membership and relations (Jacobides et al., 2018). More specifically, research has not given adequate attention to the coordination and control strategies that firms can use to manage membership and relations effectively. Ecosystem governance has been studied in most detail in the domain of platform ecosystems, where platform leaders define governance mechanisms for a group of relatively homogeneous complementors (McIntyre & Srinivasan, 2017; McIntyre, Srinivasan, Afuah, Gawer, & Kretschmer, 2020; Rietveld, Ploog, & Nieborg, 2020). Another stream of work has analyzed the governance of innovation ecosystems, where lead firms choose different organizational forms (Kapoor & Lee, 2013) and apply a "combination of formal and relational governance mechanisms" (Kapoor, 2018, p. 9) tailored to complementors' specific position within the ecosystem (Kapoor, 2018).

In innovation ecosystems that strive to provide a complex, integrated value proposition, lead firms often have to deal with a large number of very heterogeneous complementors that operate in different industries and take on different activities and positions within the ecosystem (Adner, 2017). Creating alignment among such a diverse group of complementors can become a challenging task (Dattée et al., 2018), as examples of failed innovation ecosystems illustrate (Ozcan & Santos, 2015). Lead firms require a high level of ecosystem governance capability to successfully orchestrate a complex innovation ecosystem (Ansari, Garud, & Kumaraswamy, 2016; Helfat & Raubitschek, 2018). We know little about how lead firms approach this challenge and define governance mechanisms for innovation ecosystems containing multiple diverse complementors (Adner, 2017).

In this dissertation, I attempt to address this gap in the literature by asking:

"How do lead firms in innovation ecosystems govern their relationships with multiple heterogeneous complementors?"

Given our limited knowledge of ecosystem governance in the aforementioned situation (Jacobides et al., 2018), I conducted a multiple-case, inductive study (Eisenhardt, 1989) in the financial services industry. Successfully creating innovation ecosystems with heterogeneous complementors is especially important for established firms that set up more open business models as part of their broader digital transformation strategy (Nambisan, Wright, & Feldman, 2019; Yoo, Boland, Lyytinen, & Majchrzak, 2012). This makes the financial services industry a theoretically interesting setting for my study. Using multiple data sources, I investigated the governance decisions of five different financial services ecosystems created by large incumbent banks. In doing so I was able to conduct a robust comparison of the governance decisions and their underlying dynamics.

Drawing on evidence from my data, I propose a model of how lead firms can approach ecosystem governance when they collaborate with very diverse complementors. I find that lead firms addressed this heterogeneity by composing distinctly governed tiers of complementors. My central argument is that decisions about the mix of governance mechanisms (formal vs. informal) and the choice of organizational form (along the market-hierarchy continuum) used to manage ecosystem relationships were determined by the domains of uncertainty underlying the ecosystem blueprint and complementors' role to either reinforce or explore elements of this blueprint.

1.2 Theoretical Contribution and Relevance

This dissertation contributes to the ecosystem literature in several ways. My research's primary contribution is its development of a model explaining lead firms' governance decisions in innovation ecosystems that host numerous heterogeneous complementors. I extend the ecosystem literature by introducing the concept of complementor tiers, that is, groups of diverse complementors to which the lead firm applies a common governance approach. This concept helps to explain how lead firms

account for the challenge of managing diverse complementors and underlying interdependencies. I thus extend the focus of ecosystem governance beyond technological governance aspects and illustrate how a tailored mix of formal and informal governance mechanisms is applied to reach alignment with complementors (e.g., Adner, 2017; Adner & Kapoor, 2016; Tiwana, Konsynski, & Bush, 2010). Additionally, as Jacobides et al. (2018) recently highlighted, the strategies and tactics lead firms use to grow and manage innovation ecosystems warrant further investigation, particularly concerning the use of distributed decision-making as well as related ecosystem outcomes. My dissertation contributes to this line of research by shedding light on key factors that influence lead firms' governance decisions, namely the domains of uncertainty and the complementors' role in the ecosystem blueprint. A closer examination of how firms collaborate in ecosystems is necessary to advance our understanding of the phenomenon, as the rules of engagement influence firms' behavior in an ecosystem and eventually contribute to the ecosystem's overall success (Jacobides et al., 2018). My exploratory study also contributes to the literature on ecosystem creation (Dattée et al., 2018) by showing how incumbents in the same industry engage in two distinct ecosystem strategies, focusing either on turning the existing business into an ecosystem, or establishing an entirely new ecosystem value proposition. The study thus addresses recent calls to perform a (qualitative) comparative analysis of different ecosystem approaches or strategies (Dattée et al., 2018; Jacobides et al., 2018) to reveal how lead firms choose between alternative blueprints and "configurations of interdependencies" (Dattée et al., 2018, p. 493). Hence, this work makes an important contribution to the study of governance mechanisms, the strategic interplay between players, and the design and emergence of ecosystems.

Lastly, my dissertation also contributes new aspects to the open innovation (OI) literature. My work sheds new light on the importance of the role informal governance mechanisms play in lead firms' attempt to compose differently governed tiers of complementors, thereby heeding the call for a relational contracting perspective (Zobel & Hagedoorn, 2020). By exploring the heterogeneous roles of complementors in the ecosystem innovation process (Gesing, Antons, Piening, Rese, & Salge, 2015; Laursen & Salter, 2006) and how they affect lead firms' governance decisions, I also contribute to a better understanding of how firms organize in OI contexts (West & Bogers, 2014), where hierarchical control mechanisms are missing (West, 2003) and multiple actors are

engaged in decision-making (Bogers et al., 2017). To the best of my knowledge, the current study is the first to empirically explore the use of different organizational forms and formal and informal governance mechanisms in ecosystems from an open innovation (OI) perspective. Although several scholars in this field have pointed to the importance of governance-related questions in dynamic settings such as innovation ecosystems (e.g., Bogers et al., 2017; Tiwana et al., 2010), extant research has not yet addressed this matter. Also, by explicitly discussing implications for contract design, I contribute to an understanding of organizational boundary choices and the governance of contractual relations in ecosystems, thereby answering a further recent call in the literature (Zobel & Hagedoorn, 2020).

In addition, this dissertation seeks to make several theoretical contributions to the literature on resource dependence theory (RDT). First, I intend to advance the literature by examining how firms manage problems of uncertainty and dependence in the context of ecosystems where traditional mechanisms of formal control, such as control based on ownership and hierarchy, are less feasible (Zobel & Hagedoorn, 2020). The study thus addresses a call in the RD literature to explore alternative actions and strategies that firms can use to manage environmental dependence and uncertainty (Hillman, Withers, & Collins, 2009). Second, differentiating between different forms of environmental uncertainty and complexity (e.g., partner-related uncertainty, uncertainty related to an unknown complex value proposition) allows me to consider previously unexplored factors that underlie the formation of interorganizational ties. For instance, I shall investigate how different environmental conditions and prior strategic decisions affect lead firms' responses to dependence and uncertainty (Hillman et al., 2009; Wry, Cobb, & Aldrich, 2013). Third, by focusing on the use of governance mechanisms within a given relationship, I extend the application of the theory. Previous work primarily analyzed when a given formation is likely to occur (Gulati, 1998), but studies that explain the structure and nature of collaboration relationships are rare. Given that inter-firm collaboration and control of external organizations rests increasingly on informal mechanisms (see for instance, Thomas & Autio, 2020; Tiwana, 2015; Zobel & Hagedoorn, 2020) attention to the use of "soft power" instruments becomes increasingly important (Benlian, Hilkert, & Hess, 2015; Yoffie & Kwak, 2006). Fourth, I also discuss uncertainties and trade-offs related to interorganizational ties, which has been an understudied area of this theory (Katila et al., 2008). By directly addressing the

advantages and disadvantages of different options, for example the possible impact on the ecosystem's generativity and stability, I also answer a recent call in the literature to explore the problems that can occur through cooperation and information sharing from an RDT perspective (Hillman et al., 2009).

1.3 Practical Contribution and Relevance

Focusing on the lead firms' governance decisions in ecosystems, this dissertation provides a series of important new practical insights. First, from the perspective of managers charged with relationship management in ecosystems, ecosystem design, or ecosystem strategy, my argument is a clear call to modify the design of governance mechanisms between diverse complementor groups. Given that lead firms can choose from different organizational forms and governance mechanisms, it is important to know which one is the most appropriate in a particular setting (Furr & Shipilov, 2018). By studying the governance decisions of five different lead firms, I suggest how firms can decide between different organizational forms and explain why they should apply a mix of formal and informal governance mechanisms in order to manage a portfolio of complementors with varying roles and activities within the ecosystem. Second, the finding that lead firms followed two distinct ecosystem strategies, focusing on either the build-up of an entirely new ecosystem or on the build-up of an aggregative ecosystem around the established business, confirms that managers can choose between different approaches for the build-up of ecosystems (Dattée et al., 2018; Furr & Shipilov, 2018; Jacobides et al., 2018). Both strategies lead to the emergence of different sets of internal and external interdependencies (Dattée et al., 2018), which have important implications for the resulting coordination challenges (Kapoor, 2018). For instance, the lead firm's ability to leverage its established assets and capabilities in the new ecosystem endeavor is different in each of the two strategies. I thus explain why incumbent firms trying to respond to digitalization (Nambisan et al., 2019; Yoo et al., 2012) need to consider how they embed their ecosystem activities in the broader organizational structure and how this relates to the overarching ecosystem blueprint (Dattée et al., 2018). Finally, building on the challenges and conflicts the lead firms in my sample face, I discuss possible implications for the capabilities and skills needed to successfully orchestrate a diverse set of complementors (Helfat & Raubitschek, 2018).

1.4 Dissertation Outline

The remainder of this dissertation is organized as follows. In the next chapter (chapter 2), I provide an overview of selected literature streams related to my study, as well as of prior literature on ecosystems. Next, in chapter 3, I provide a description of the empirical context in which my study is grounded and illustrate the research data and methods chosen for this study, including a detailed discussion of the data collection and data analysis process used for the study. In chapter 4, I present the results of my analysis, starting with an overview and description of the individual firms used in the multiple-case study, and elaborating the individual governance decisions these firms made. Next, I present a conceptual model describing the mechanisms observed in my data. In the discussion section, in chapter 5, I detail how my results inform extant research on ecosystems and adjacent literature streams. Further, I acknowledge my study's key limitations and suggest avenues for future research. I also describe how managers can apply the dissertation's findings in practice. Finally, in chapter 6, I conclude by summarizing the key arguments of this dissertation and discussing its relevance.

2 Literature Background

In this chapter, I discuss the literature streams related to my dissertation's research agenda. I begin by reviewing established strategy literature to show how extant perspectives can usefully be applied to the study of ecosystems and to investigating and answering my research question in particular (2.1). In this respect, I find the following literature streams particularly helpful: resource dependence literature (2.1.1) and open innovation literature (2.1.2). I discuss these research streams, their relevant concepts and premises, and explain how they can inform our understanding of ecosystem-related phenomena.

Subsequently, I turn to the growing literature on ecosystems to provide a basic understanding of the research field (2.2). More specifically, I first explain the ecosystem construct, the different ecosystem types and the core concepts that the literature has identified (2.2.1). Then, I discuss the role of lead firms (2.2.2) and complementors in ecosystems (2.2.3) as their collaboration is central to this dissertation's research agenda.

Then, I review past literature on ecosystem governance and incorporate the aforementioned extant perspectives in the established strategy literature by elaborating their value for this dissertation's research agenda (2.3). Particularly, I discuss the key dimensions of ecosystem governance identified in prior literature and explain how they relate to the research question (2.3.1). Next, I elaborate on the governance approaches observed in different ecosystem contexts and the underlying challenges that prior literature has identified (2.3.2). Finally, based on a good understanding of the ecosystem literature, I mentioned understudied aspects of research on ecosystems governance, which leads to the main research question that motivated this study (2.3.3).

The outline of this chapter is shown in Figure 1.

Figure 1
Outline Chapter Two – Literature Background

2.1 Extant Perspectives in the Strategy Literature	
2.1.1 Resource Dependence Literature Review of concept of interdependence resulting from dependence on external resources and environmental uncertainty	2.1.2 Open Innovation Literature Review of different organizational forms used to structure innovative activities and implications for collaboration dynamics in settings where innovation is organized across permeable firm boundaries
2.2 Ecosystem Literature – Construct, Types, and Roles	
2.2.1 Ecosystem Construct and History Discussion of ecosystem construct, ecosystem types and various core concepts in the field of ecosystem research	2.2.2 Lead Firms' Creation of Innovation Ecosystems Discussion of lead firms' role in the creation of innovation ecosystems, including the central tasks and capabilities to succeed in this role
2.2.3 Heterogeneous Complementors in Innovation Ecosystems Discussion of complementors' role and what complementor heterogeneity means for the governance of ecosystems	
2.3 Ecosystem Governance	
2.3.1 Dimensions of Ecosystem Governance Discussion of the two dimensions of ecosystem governance, which collectively form the governance system within which partners collaborate	2.3.2 Governance Approaches and Challenges in Ecosystems Discussion of archetypical governance approaches and key governance challenges identified in prior literature
2.3.3 Understudied Aspects of Ecosystem Governance Review of central gaps in the literature on ecosystem governance, leading up to the dissertation's research question	

2.1 Extant Perspectives in the Strategy Literature

While ecosystems are a relatively new phenomenon and research on ecosystems is still a relatively young research endeavor, the ecosystem literature shows clear links to the extant strategy literature (Adner, 2017; Jacobides et al., 2018; Kapoor, 2018). Therefore, research on ecosystems should not develop in isolation, but instead should gain from and leverage the existing strategy research. To date, multiple, partly overlapping, partly unrelated, literature streams have contributed to our understanding of ecosystem-related phenomena (Adner, 2017; Jacobides et al., 2018; Kapoor, 2018); various ecosystems concepts and aspects have been studied in a broad range of established literature streams and from many different perspectives. For instance, research on networks (e.g., Ansari et al., 2016; West & Wood, 2013), alliance research (e.g., Hannah & Eisenhardt, 2018; Kapoor & Lee, 2013), research on industry architectures (e.g., Jacobides & Kudina, 2013), or modularity (e.g., Baldwin, 2015) have contributed to our understanding of ecosystems. Given that a broad review of all related research fields is beyond the scope of this dissertation, I shall focus on two selected literature streams that seem particularly relevant to analyzing ecosystem governance decisions, namely the resource dependence literature (2.1.1) and the open innovation literature (2.1.2). This choice is based on parallels between the perspectives' research foci and this dissertation's research agenda, as I shall explain in more detail in the paragraphs below.

Due to technology advances and ease with which tasks can be disaggregated and distributed among a large number of dispersed firms, we have seen a massive increase in inter-firm collaboration over the last decades (Baldwin & von Hippel, 2011; Gulati et al., 2012). As a result of this development, many of today's value propositions are based on the close collaboration between many independent firms (Jacobides, 2019). Ecosystems, in fact, are one manifestation of such inter-firm collaboration settings (Gulati et al., 2012), where multiple interdependent firms collaborate to work on a value proposition or innovation that would be difficult for a single firm to realize independently (Adner, 2017; Jacobides, 2019). Consequently, firms have to increasingly focus on and consider the interdependencies that exist with complementors (e.g., Adner, 2017; Kapoor, 2014, 2018; Kapoor & Lee, 2013). Both literature streams, resource

dependence and open innovation, focus on the interaction between firms and explore how various firms can navigate in environments where they are not completely self-sufficient but depend on external resources and/or innovations. For this reason I posit that the resource dependence literature (2.1.1) and the open innovation (OI) literature (2.1.2) can both be beneficially employed to advance our understanding for governance-related decisions in ecosystems.

More specifically, the analysis of firms' interdependence with other firms in their environment is at the very heart of resource dependence theory (2.1.1). Resource dependence scholars have analyzed both the factors that cause firms' dependence on others as well as the strategies that firms can use to manage their dependence and gain more control over critical exchange relationships (e.g., Pfeffer & Salancik, 1978). This theory thus provides a promising lens to study lead firms' effort to control independent partners in their ecosystem environment. As far as the open innovation literature (2.1.2) is concerned, scholars in this stream are determined to analyze sources of innovation and how innovative activities are organized and commercialized across firm boundaries (e.g., Chesbrough, 2003a, 2003b). Due to the increasingly distributed nature of innovation, OI scholars have also looked into the organizational design choices of innovating firms and studied how these choices relate to the firms' innovative capacity (e.g., Felin & Zenger, 2014). Similarly, research in this area has discussed how the use of inter-firm governance mechanisms changes in contexts where individual firm boundaries become increasingly permeable and open (e.g., Zobel & Hagedoorn, 2020). Given that my study focuses on innovation ecosystems, where multiple independent firms collaborate to mutually innovate, the OI literature provides a promising field to inform our understanding of how firms within innovation ecosystems manage their collaborations.

In the following sections I shall discuss the aforementioned literature streams in more detail to establish a basic understanding of their most important premises and their implications for this dissertation's research agenda.

2.1.1 Resource Dependence Literature

An array of studies in the field of organization theory have explored how firms' boundary choices can help them to reduce their dependence on external parties in their environment (e.g., Aldrich, 1979; Gulati et al., 2012; Santos & Eisenhardt, 2005; Thompson, 1967). Resource dependence theory (RDT), which is commonly considered "one of the most influential theories" in organization theory (Hillman et al., 2009, p. 1404), recognizes that firms are not closed systems but instead are subject to influences from their external environment (Hillman et al., 2009; Pfeffer & Salancik, 1978; Wry et al., 2013). Pfeffer and Salancik (1978), whose work contributed significantly to the popularity of this theory, argued that in order to understand the behavior of organizations, one necessarily has to study their environment.

RDT is thus centered around the premise that organizations are not fully self-contained, but depend on other organizations in their environment to provide critical resources (Drees & Heugens, 2013). Pfeffer and Salancik (1978, p. 40) describe this phenomenon as interdependence that "exists whenever one actor does not entirely control all of the conditions necessary for the achievement of an action or for obtaining the outcome desired from the action." Closely related to resource dependence is the concept of power, which refers to control over critical resources (Ulrich & Barney, 1984). Emerson (1962) and Blau (1964) described power as something that exists because of an actor A's dependence on another, actor B. That is, A depends on B because B controls a resource that A needs. A's dependence on B is further determined by the fact that A has no alternative way of accessing this resource (Pfeffer & Leong, 1977). Similarly, Pfeffer and Salancik (1978) summarized three key factors that determine an organization's dependence on a specific resource: (1) the resource's importance for the organization, which is defined by relative magnitude of exchange and criticality of the resource, (2) discretion over the resource, and (3) the number of available alternatives. Organizations try to reduce the power others' have over them, while increasing the power they have over others. They do this by modifying the power relations they have with other organizations (Hillman et al., 2009, Ulrich & Barney, 1984).

The second element central to studies on resource dependence, is uncertainty. The uncertainty stems from attempts to restructure exchange relationships, as when an organization has to find a new supplier for a critical resource (Pfeffer & Salancik, 1978).

Thus, interdependencies, "when coupled with uncertainty about what the actions will be of those with which the organization is interdependent, leads to a situation in which survival and continued success are uncertain" (Pfeffer, 1987, p. 26).

The theory predicts that organizations will make different interorganizational arrangements to overcome uncertainties and to solve interdependence problems (Drees & Heugens, 2013), as organizations seek to avoid dependencies and external control, and at the same time, "seek stability and certainty in their own resource exchanges" (Pfeffer & Salancik, 1978, p. 261). Consequently, RDT has been applied to explain the formation of interorganizational relationships such as mergers and acquisitions, joint ventures, alliances, and board interlocks (Hillman et al., 2009). From a conceptual point of view, interorganizational relationships that are established can be understood as attempts to reduce dependence and uncertainty through increased coordination with resource exchange partners (Heide, 1994), thereby creating more stable, or "negotiated," environments (Cyert & March, 1963; Pfeffer, 1972; Thompson, 1967).

The theory's principal ideas point to parallels and overlaps with research on ecosystems (Thomas & Autio, 2014). The first parallel lies in that scholars need to study a firm's external environment to fully understand organizational behavior, and the second refers to RDT's basic premise that firms will take certain actions to stabilize their environment and ensure a stable flow of essential resources (Pfeffer & Salancik, 1978). Permeable organizational boundaries allowing lead firms to access external resources, but at the same time allowing complementors to access parts of the lead firm's resource portfolio, thus present a promising area of studying the advantages and disadvantages of tie formation in ecosystems from a resource dependence perspective. More specifically, the RDT seems to offer a promising lens for exploring the possible implications of external resource dependence on lead firms' organizational boundary design and related governance decisions. Given these evident resemblances between the different research foci, Thomas and Autio (2014) encouraged ecosystem scholars to apply an RDT perspective to study the multiple intra- and inter-firm interdependencies that exist in ecosystems. Next, I shall discuss potential sources of dependence and uncertainty from the perspective of the lead firm in more detail, before I point out gaps in the RDT literature as well as indicating potential synergies that could contribute to our understanding of ecosystems.

Importance of external resources: One of the factors impacting the lead firm's dependence on external partners within the ecosystem is the importance of the complements these partners provide. In the RDT, the importance of a resource is based on (1) the criticality of the resource, (2) the relative magnitude of exchange between partners, and (3) the availability of possible alternatives (Pfeffer & Salancik, 1978). Regarding (1), Pfeffer and Salancik (1978) define a resource's criticality by organizations' ability to function in the absence of that resource. The argument is that a stable supply of a specific resource is especially important when the resource is crucial for the organization to operate. In the context of ecosystems, the more the ecosystem's emergence and smooth operation is subject to complementary resources provided by external partners, the more important are these complementors for the lead firm. Regarding (2), the relative magnitude of a resource exchange is determined by the proportion of the total input or output accounted for by the resource exchange. Thus, in the context of ecosystems, the more the lead firm relies on a particular complementor in terms of volume contributed to the ecosystem, the higher the lead firm's dependence. Regarding (3), lead firms' dependence on complementors varies according to the availability of alternatives. Pfeffer and Salancik's (1978) argument also resonates with Thompson's (1967) who noted that "an organization is dependent on some element of its task environment (1) in proportion to the organization's need for resources or performances which that element can provide, and (2) in inverse proportion to the ability of other elements to provide the same resource or performance" (Thompson, 1967, p. 31). Thus, when the ecosystem lead firm faces a large number of potential complements relative to its (or customers') demand, its dependence is reduced (Pfeffer, 1972; Pfeffer & Nowak, 1976; Pfeffer & Salancik, 1978). Many potential complementors lead to lower dependence because the lead firm can more easily switch to an alternative complement provider. Importantly, however, a large number of possible alternative complementors is only beneficial when the alternatives are of the same (or at least sufficiently similar) quality.

Considering this, the lead firm's decisions regarding the organizational boundaries thus have an important effect on its dependence (Gulati et al., 2012). While open access to the ecosystem and loose ties (i.e., more openness and less control) would expose the lead firm to risk due to complementors' relatively uncontrolled entry and exit (Gulati et al., 2012), stricter access control and closer ties would guarantee carefully

selected complementors' entry. Also, it is easier to establish a stable resource exchange and an orderly flow of resources if complementors have been carefully selected (Stearns, Hoffman, & Heide, 1987). Thus, the risk associated with important complementors can be reduced through stricter access (and exit) rules. Another argument in favor of closer ties is that establishing relational norms (Buchanan, 1992) and "credible commitments" (Williamson, 1983) with exchange partners is easier with carefully selected complementors. Based on such relational commitments, exchange partners benefit from "increased predictability and flexibility of the relationship and the assurance that power and influence will be used constructively" (Buchanan, 1992, p. 67). Further, careful selection of complementors gives the lead firm more control over complementors' quality and reliability, which is especially important when the complement is critical for the ecosystem value proposition, for instance, when the ecosystem cannot operate without this particular complement. Based on these arguments from the RDT perspective, formal governance mechanisms, such as stricter access and closer links to complementors, are means by which the lead firm can establish a more stable exchange relationship and increase control over the supply of critical ecosystem complements.

Similarly, while a large number of alternative complementors makes switching between complementors easier and increases the lead firm's bargaining power (Gulati et al., 2012; Jacobides et al., 2006), a small number of alternative complementors has the opposite effect on the lead firm's dependence. That is, due to limited alternatives, if the relationship with existing complementors were to fail, the lead firm faces higher levels of uncertainty regarding potential new complementors (Pfeffer & Salancik, 1978; Thompson, 1967). Also, lead firms would most likely face worse exchange conditions if they find alternative complementors, due to their weakened bargaining position (Piskorski & Casciaro, 2005). To reduce this uncertainty, RDT's proposed strategy for lead firms would be to increase coordination and links with complementors (Stearns et al., 1987; Pfeffer & Salancik, 1978). So, from an RDT perspective, we would expect that when lead firms face a small number of available alternative complementors, their incentive to "lock-in" complementors and secure stable long-term relationships is higher.

Uncertainty in lead firms' environment: The scholarly discussion of uncertainty has a long history across a number of fields (e.g., Aldrich, 1979; Dess &

Beard, 1984; Heide & John, 1990; Stearns et al., 1987; Thompson, 1967; Williamson, 1981), ranging from behavioral decision theory and organization theory, to marketing and strategic management (Sutcliffe & Zaheer, 1998). Pfeffer and Salancik (1978) were among the first to show that firms establish links with other organizations in an attempt to control uncertainty in their environment. While Pfeffer and Salancik's focus remained on the uncertainties a single firm faces, others (e.g., Beckman, Haunschild, & Phillips, 2004; Podolny, 1994; Stearns et al., 1987) expanded the analysis and included uncertainties that affected entire markets or industries.

One source of uncertainty in a firm's environment is competitive uncertainty, which is defined as uncertainty that stems from actions of competing firms (Beckman et al., 2004; Burgers, Hill, & Kim, 1993). According to Burgers et al. (1993, p. 421) this type of uncertainty is the highest in oligopolistic markets where "a limited number of evenly balanced competitors confront each other." In such markets, strategic actions by other firms can have a direct effect on focal firms' own market share and their need to respond competitively (Beckman et al., 2004). Especially in technology ecosystems, where often a small number of lead firms control the majority of the market (e.g., Apple and Android in the app ecosystem; or Microsoft and IBM in the software ecosystem), the uncertainty related to competitive interdependence can be substantial. Not surprisingly, these markets have commonly been the research setting of studies exploring how one player's competitive actions, such as certain platform design strategies, triggered other players' competitive responses (e.g., Cennamo & Santalo, 2013). That the cost of switching between platforms is fairly low for complementors in these ecosystems exacerbates the situation, at least from the lead firms' perspective (Bonaccorsi, Giannangeli, Rossi, & Giannangeli, 2006; Eisenmann, Parker, & Van Alstyne, 2006, 2011). In a situation where there are only a few complementors (in the most extreme case, only one) for a specific type of resource, i.e., when the complement is scarce and alternatives are limited, competitive uncertainty is higher. In such circumstances, lead firm A can fear that competing lead firm B will pre-empt difficulties and therefore try to "lock-in" the critical complementor. This would cause a high level of competitive uncertainty, posing a real threat to lead firm A's existence. To reduce risk related to competitive action and to secure the sourcing of critical complements, the two competing lead firms A and B have an incentive to increase their control over the critical complement, e.g., by creating closer interorganizational ties (Pfeffer & Salancik, 1978).

Environmental complexity is another potential source of uncertainty in organizations' environment. The study of environmental complexity and its effect on interorganizational links has a long tradition in the organizational literature (Aldrich, 1979; Stearns et al., 1987; Ulrich & Barney, 1984). An organization's environment is complex when it requires the organization to engage with heterogeneous actors and simultaneously manage multiple activities and collaborations with other organizations (Anderson & Tushman, 2001; Dess & Beard, 1984; Scott, 1992). Consequently, high environmental complexity requires firms to build more complex or more differentiated links with other organizations, while less complex environments allow firms to have more similarly structured links (Aldrich, 1979; Doz & Hamel, 1998; Stearns et al., 1987; Anderson & Tushman, 2001). In the context of ecosystems, a lead firm facing a complex market is thus required to establish and coordinate multiple complex complementor relationships, all at the same time (Aldrich, 1979; Doz & Hamel, 1998). As a plethora of close relationships with complementors would need to be managed and controlled elaborately, the resulting coordination requirements might be too high, so that the lead firm might prefer to voluntarily open up (see for instance, Alexy et al., 2013) and create looser, more flexible links to explore the unknown terrain (Furr & Shipilov, 2018). Flexibility to engage with multiple complementors will be especially valuable in an environment of high uncertainty (Schilling & Steensma, 2002), as exclusive ties would expose the lead firm to undesirable risk of path-dependence (Adner & Levinthal, 2004; Gruber, MacMillan, & Thompson, 2008; McGrath & MacMillan, 2000; Tiwana et al., 2010).

Overall, the above reasoning underlines that there is still much to learn from RDT experts, and that many of the theory's premises are currently still highly relevant (Wry et al., 2013). Yet, firms' engagement in dynamic ecosystem settings might require a fresh set of strategies and tactics to address problems of dependence and uncertainty (Hillman et al., 2009).

Potential synergies with research on ecosystems: Although RDT is renowned and well established in the organizational literature, there are multiple gaps and potential areas for advancing the theory (see Davis & Cobb, 2010; Hillman et al., 2009b; Wry et al., 2013). While the theory has contributed to our understanding of organizational behavior, the literature has not paid adequate attention to negative consequences and

trade-offs that can emerge as a result of interorganizational ties (Hallen, Katila, & Rosenberger, 2014; Katila et al., 2008). That is, whenever firms form interorganizational relationships, they face important tensions. For instance, when dependence on other firms' resources forces firms to enter into interorganizational relationships (Emerson, 1962; Pfeffer & Salancik, 1978), they face the risk of others misappropriating their resources (Ahuja, 2000; Gulati & Singh, 1998; Katila & Mang, 2003). Katila et al. (2008) noted this tension can become so severe that in some circumstances it "is likely to be a primary determinant of whether firms choose to form ties at all" (Katila et al., 2008, p. 295).

Especially in an innovation ecosystem, where knowledge and resources are exchanged openly across firm boundaries (Zobel & Hagedoorn, 2020), how lead firms can reduce dependence on external complementary resources, and at the same time contain misappropriation risks and other potentially negative consequences, becomes a pressing question that RD scholars have not addressed. For example, although traditional strategies, such as acquisitions of complementors (Pfeffer & Salancik, 1978), could help to secure a stable supply of complementary resources, they could also negatively impact the supply of other complements and thus affect the delicate balance between generativity and stability (Tiwana et al., 2010; Wareham et al., 2014; see 2.3.2). So, although stronger interorganizational ties are favorable from an RDT perspective, they are likely to have negative consequences if they discourage other complementors and hamper the ecosystem's overall generativity (Boudreau, 2010; Cusumano & Gawer, 2002).

Hence, in settings where the applicability of hierarchal control mechanisms proposed by the theory is limited, new actions that extend the theory's tool box are necessary (Hillman et al., 2009). Especially in ecosystems, where the plethora of relationships cannot be controlled exclusively via mechanisms based on ownership, alternative cooperative approaches become more important (Zobel & Hagedoorn, 2020). While other literature streams have long pointed to the importance of such "soft power" instruments and relational devices (e.g., inter-firm trust) to influence and control external partners (see for instance, Autio & Thomas, 2014; Benlian et al., 2015; Tiwana et al., 2010; Zobel & Hagedoorn, 2020), RDT has mainly focused on the use of the five traditional strategies originally proposed by Pfeffer and Salancik (1978). In this context,

Hillman et al. (2009, p. 1419) noticed that "consortia, co-ops, modular structures, trade associations, and other business groups may also be interorganizational forms that reduce dependency/uncertainty in the environment that warrant further examination." Therefore, exploring new actions and strategies that (lead) firms can use seems to be a worthy research endeavor (Hillman et al., 2009). This is particularly true in emerging ecosystems, where traditional strategies, such as links based on ownership, become less feasible due to a large number of required partners (Zobel & Hagedoorn, 2020) and where negative consequences of excessive control pose a fundamental governance challenge (Boudreau, 2010; Tiwana et al., 2010; Wareham et al., 2014).

2.1.2 Open Innovation Literature

The literature on open innovation (OI) focuses on how firms can access and profit from external sources of knowledge and innovation (Chesbrough, 2003b; West & Bogers, 2014). Research in this field is based on the logic that firms should commercialize other firms' ideas and innovations and consider how their own innovations can be marketed outside a given firm's current business (Chesbrough, 2003b, 2003a). In this light, OI scholars have analyzed how firms can balance both internal and external innovation and how they can manage the respective inflow and outflow of knowledge (Van de Vrande, Vanhaverbeke, & Gassmann, 2010).

While extant OI research has predominantly applied an organizational-level perspective (i.e., using the firm or business unit as unit of analysis), there is a growing body of research that applies other perspectives (Bogers et al., 2017), including an interorganizational level of analysis (e.g., Adner & Kapoor, 2010; Rohrbeck, Hölzle, & Gemünden, 2009). Such interorganizational perspectives seem increasingly important, given that the rapidly decreasing cost of communication and the growing decomposability of tasks have led to settings in which innovative activities are much more dispersed across firms than before (Baldwin & von Hippel, 2011; Gulati et al., 2012; Lakhani & Tushman, 2012). Or, as Bogers et al. (2017, p. 17) put it: "digitisation emerges as an important enabling factor of OI as it facilitates the entry and collaboration of various new actors." Thereby the rise of OI activities in ecosystem and platform settings is enabled. Relating to such new "network forms," these authors also noted that

"new frameworks for governing interactions between heterogeneous actors" are needed (Bogers et al., 2017, p. 22).

To account for the fact that "the locus of innovation" has moved beyond the traditional boundaries of individual firms (Lakhani & Tushman, 2012), research on open innovation has started to focus on governance-related decisions in such multi-firm collaboration contexts (e.g., Afuah & Tucci, 2012; Felin & Zenger, 2014; Gesing et al., 2015; Van de Vrande, Vanhaverbeke, & Duysters, 2009; Zobel & Hagedoorn, 2020). In so doing, OI scholars have also integrated insights from organizational design to investigate the advantages and disadvantages of different organizational forms that firms can use to manage their innovative activities with partners. In a similar vein, OI research has drawn on relational contracting literature to understand how the increasing permeability of firm boundaries affects the relationship between innovating firms. To understand how this prior work can contribute to our understanding of ecosystem governance, I shall next discuss work that has studied the relation between (1) innovation and organizational design, and work that has studied (2) implications for inter-firm governance mechanisms in collaborative innovation settings.

(1) Innovation and organizational design: The study of firms' organizational design, firms' boundaries and the implications for firms' innovative capacity and performance has been the focus of management scholars from various different fields, including innovation, strategy and organization theory (Lakhani & Tushman, 2012). Traditionally, research studying the management of innovation has focused on the innovation within the boundaries of an individual firm (Baldwin & von Hippel, 2011; Lakhani & Tushman, 2012; Van de Vrande et al., 2009). Building on the early work of scholars such as Schumpeter (1947) and Chandler (1962), this firm-focused perspective affirms innovation as the basis for firms' competitive advantage (Lakhani & Tushman, 2012).

Later, the seminal work of Lawrence & Lorsch (1967) and Thompson (1967) analyzed how organizational structures are affected by environmental factors. In studying the underlying pattern of interdependencies, they studied the organizational structures and controls required to solve critical tasks (Leiblein & Macher, 2009). Following this logic, organizational design scholars analyzed the relation between firm boundaries, organizational design choices, and firms' innovation capacity (Lakhani &

Tushman, 2012). In recent years, the topic of organizational design has received renewed scholarly attention, since research has tried to accommodate the complex design challenges that firms face in today's interconnected and globalized world (e.g., Gulati et al., 2012; Joseph & Gaba, 2020, Lakhani & Tushman, 2012).

In this light, OI scholars have integrated insights from organizational design to understand how increasingly dispersed innovation activities can best be organized across multiple firms (e.g., Baldwin & von Hippel, 2011; Boudreau, Lacetera, & Lakhani, 2011; Felin & Zenger, 2014; Gesing et al., 2015). In so doing, some scholars have changed their perspective from the focal firm as unit of analysis, to the innovation problem that the focal firm faces. Based on this perspective, they studied how the characteristics of different organizational forms relate to the characteristics of the innovation problem that needs be solved (e.g., Felin & Zenger, 2014; Leiblein & Macher, 2009; Nickerson & Zenger, 2004). I find this a compelling perspective, especially if the innovation problem is so multi-layered and complex that the solution search and the problem solving process cannot possibly happen within the boundaries of a single firm (see Lakhani & Tushman, 2012). The perspective's underlying logic is that innovation problems vary structurally (i.e., they have different underlying patterns of interdependence) and consequently require different organizational solutions or choices, to solve them (Simon, 1973; see Leiblein & Macher, 2009; Nickerson & Zenger, 2004).¹ Following this logic, open innovation scholars have studied how firms trying to solve specific innovation problems can best organize their search efforts when innovating with external partners (e.g., Felin & Zenger, 2014).

To understand how this perspective relates to this dissertation's research agenda, I shall first discuss the relevant characteristics of innovation problems and subsequently outline the advantages of each organizational form.²

¹ Leiblein and Macher (2009) argue that, from a theoretical point of view, this "problem-solving perspective" can be understood as a revitalized version of early organizational design studies (e.g., Lawrence & Lorsch, 1967; Thompson, 1967), as it combines a focus on interdependencies and firms' organizational choices with Kauffmann's (1993) seminal "NK model" to analyze the relation between a firm's environment, the organizational choices and (innovation) performance outcomes (see Leiblein & Macher, 2009; Nickerson & Zenger, 2004).

² Note that I treat the innovation problems as discrete types and the organizational forms as discrete choices, which is in line with Felin and Zenger (2014) and with other scholars in this field. I recognize that the problem types and organizational forms can overlap in reality and are likely to be continuous rather than completely discrete. Nevertheless, for ease of discussion and for the purpose of this

Different problem types: As outlined above, different innovation problems require different patterns of interaction and exchange between firms. Or, as Felin and Zenger (2014, p. 916) put it: "differing problems, in essence, demand differing approaches to solution search." Based on this premise, innovation scholars have categorized problems based on the problem characteristics, first and foremost the problem's complexity, by viewing the problem structures as complex systems (e.g., Felin & Zenger, 2014; Leiblein & Macher, 2009; Nickerson & Zenger, 2004). Depending on whether firms face complex problems rather than simple ones, different organizational forms will be more suitable than others in organizing the efforts toward searching a solution (Leiblein & Macher, 2009; Nickerson & Zenger, 2004).

Complex problems (or systems) are "made up of a large number of parts that interact in a nonsimple way" (Simon, 1962, p. 468). Such an innovation problem is difficult to decompose, so that tasks and decisions cannot easily be delegated to partners (Leiblein & Macher, 2009). Given that the many decisions, tasks, and knowledge sets that constitute the complex innovation problem are highly interdependent, the decisions need to be coordinated and organized to lead to a desired outcome (Felin & Zenger, 2014; Leiblein & Macher, 2009). The need to coordinate stems from the fact that small changes in one element of the system can lead to drastic shifts in other parts. Moving the entire system to a new optimum (Kauffmann, 1993) thus requires the lead firm to develop "some understanding (...) of the patterns of interaction among choices and relevant knowledge" (Felin & Zenger, 2014, p. 916).

Simple problems, in contrast, are easier to understand and solve (Leiblein & Macher, 2009). This is because the elements of the system are less interdependent, so that changes in one element have a small or no effect on other elements of the system (Kauffmann, 1993). These problems are more easily decomposable due to lower interdependence, so that individual tasks and decisions can be assigned to individual actors who can independently engage in the innovative efforts required to solve the innovation problem (Felin & Zenger, 2014; Leiblein & Macher, 2009). Consequently, in the context of innovation ecosystems, when facing simple innovation problems, lead

dissertation, I follow Felin and Zenger's (2014) approach and consider it to be sufficient for both academics and practitioners using a stylized and simplified approach for comparing organizational forms and problem types.

firms can assign the task and responsibility for a specific innovation problem (or a subset of problems) to external actors, without having to worry about negative consequences or interdependencies with their own work or the work of other actors in the ecosystem (Leiblein & Macher, 2009; Nickerson & Zenger, 2004). Assuming that external actors will independently search for an optimal solution to their innovation problem, their contribution will automatically lead to an ideal outcome for the ecosystem overall (Leiblein & Macher, 2009; Nickerson & Zenger, 2004).

Different organizational forms: Once the innovation problem has been identified and its characteristics have been understood, firms have to engage in the solution search and find the right organizational form to manage that search process (Nickerson & Zenger, 2004). Scholars exploring the relationship between organizational forms and innovation problems commonly distinguish between three broad categories of organizational forms, i.e., hierarchies, markets, and alliance-based relationships (e.g., Kapoor & Lee, 2013). The reason why these organizational forms differ in their capacity to facilitate problem solving and innovation while mediating between actors, is that they differ regarding their composition of communication channels, incentives, and associated property rights (Felin & Zenger, 2014). In what follows, I explain these differences and how they relate to the innovation problem in more detail.

(a) Hierarchies: Given that relationships in an ecosystem are by definition non-hierarchical in nature (Jacobides et al., 2018), I shall discuss this type only briefly. An important characteristic of hierarchies is that they provide weaker incentives for (innovative) actors' individual efforts than alliances and particularly markets do (Felin & Zenger, 2014; Leiblein & Macher, 2009; Teece, 1996; Williamson, 1991). The weaker incentives stem from the fact that property rights and rewards are usually assigned to the firm in which the solution originally emerged, and not to the individual or group of individuals who worked on it (Felin & Zenger, 2014). By entering into an employment relationship, both parties normally agree to assign all property rights and innovative output to the firm, rather than to the individual (Coase, 1937; Felin & Zenger, 2014). Further, compared to markets, hierarchies suffer from higher organizational costs (Kogut & Zander, 1996; Williamson, 1991) that stem from low-powered incentives (Williamson, 1985) and politicking (Milgrom & Roberts, 1988, 1990), which can result in unfavorable (i.e., inefficient) sourcing decisions (Kapoor & Lee, 2013). In addition,

another major drawback of this organizational form in solving innovation challenges is that lead firms cannot draw on external knowledge sources unless they identify and subsequently acquire these sources through hiring or purchasing (Felin & Zenger, 2014).

A key advantage of hierarchies, however, is that internal problem solving can draw on firm-specific language, established communication channels, and structures that incentivize knowledge sharing, communication and coordination across actors (Kogut & Zander, 1996; Leiblein & Macher, 2009). Compared to the markets and alliance-based organizational forms, hierarchies thus "promote [more] efficient teamwork, interaction and knowledge exchange" between actors (Felin & Zenger, 2014, p. 919). Given that complex problems require increased communication and coordination (Leiblein & Macher, 2009), scholars have found this organizational form to be advantageous for solving complex and ill-structured problems (Felin & Zenger, 2014; Kapoor & Adner, 2012; Leiblein & Macher, 2009; Macher & Boerner, 2012).

(b) Markets: Evaluating the characteristics of market-based relationships, we find they are characterized by discrete, formal contractual arrangements between firms (Gesing et al., 2015; Leiblein & Macher, 2009). The use of market-based contracts, however, rests on a number of preconditions. First, it requires the lead firm to clearly identify the problem at hand, and the firms with the relevant knowledge to solve it (Felin & Zenger, 2014). However, problem identification itself can be a challenging task, requiring specific capabilities (Helfat & Raubitschek, 2018). This is especially true in the context of emerging ecosystems, where the future is often difficult to envision (Dattée et al., 2018). Second, lead firms need to be able to clearly specify the tasks and responsibilities required to set up a legal contract (Nickerson & Zenger, 2004). If these preconditions are met, the lead firm can then search for "those thought to possess potential solutions or relevant knowledge to submit these for sale" (Felin & Zenger, 2014, p. 920). Nevertheless, identifying or inviting partners can be a difficult task if the lead firm is unfamiliar with the technology and/or the industry (Felin & Zenger, 2014). Especially in an ecosystem context, where cross-industry collaboration is a key characteristic and the lead firm has to identify or invite partners from industries completely unknown to the lead firm, identifying and inviting partners can pose a significant hurdle (Helfat & Raubitschek, 2018).

While markets provide the lead firm with a broader access to external knowledge than alliances and hierarchies (where the breadth of access is limited to the specific partner or the employees within the firm), they provide limited communication and collaborative knowledge exchange between partners (Felin & Zenger, 2014). A key advantage of markets, however, is their ability to incentivize actors (Hayek, 1945; see Leiblein & Macher, 2009). Compared to hierarchies (and to a lesser extent alliances), participants in markets are incentivized through prize-based mechanisms that motivate their search and development efforts (Leiblein & Macher, 2009; Nickerson & Zenger, 2004).

Given these characteristics, market-based relationships are "ideally suited to solving rather simple, well structured, and decomposable problems—problems that do not demand extensive knowledge sharing with the focal firm, but benefit greatly from high-powered incentives that motivate external actors' search" (Felin & Zenger, 2014, p. 920). Hence, when the innovation problem can be clearly specified and the required solution can be specified in the form of a formal contractual regime (i.e., a contract), markets are appropriate (Felin & Zenger, 2014; Nickerson & Zenger, 2004). However, when uncertainty and ambiguity increases, the cost of writing and reinforcing contracts increases substantially (Carson, Madhok, & Wu, 2006; de Figueiredo & Silverman, 2017; Gesing et al., 2015; Leiblein & Miller, 2003), which renders markets incongruous when firms face an uncertain environment. Consequently, markets are more advantageous for ecosystem lead firms when they face well-structured and simple innovation problems (Leiblein & Macher, 2009).

(c) Alliances: An alliance can be understood as a hybrid organizational form between markets and hierarchies (Borys & Jemison, 1989; Kapoor & Lee, 2013). As there are different forms of alliances between firms, we need to further differentiate between alliance types. For the purpose of this study, I distinguish between cash- and license-based arrangements, equity partnerships, and joint ventures. Cash- and license based alliance arrangements closely resemble market-based arrangements (Leiblein & Macher, 2009). Thus, similar to markets, they provide limited communication and collaborative knowledge exchange between partners. In fact, they normally provide rather infrequent contact between partners (Dyer & Singh, 1998; Felin & Zenger, 2014). Compared to the first alliance type, equity partnerships provide the lead firm with more

control and ability to monitor its partners than otherwise (Leiblein & Macher, 2009). However, coordination is normally limited to the management board level and exchanges at more operative, mid-level management levels are rare (Leiblein & Macher, 2009). In contrast to the aforementioned alliance types, joint ventures typically include substantial knowledge exchange between participating partners and coordination across all employee levels, ranging from top-management to operative levels (Leiblein & Macher, 2009). Further, compared to cash- and license-based arrangements, equity- and joint venture-based alliances provide more control and are thus more suitable to direct partners' explorative search efforts (Leiblein & Macher, 2009). Importantly, shared ownership in the joint venture not only helps to align incentives for participating partners, but also facilitates firms' monitoring and control tasks (Leiblein & Macher, 2009). The mutual coordination and communication between alliance partners can be further improved when the partners co-locate their personnel (Leiblein & Macher, 2009) as this facilitates regular interaction and an open exchange between employees.

In general, and in contrast to hierarchical organizational forms, alliance-based arrangements invite external partners to contribute their knowledge and to explore solutions in collaboration with the lead firm (Felin & Zenger, 2014). Compared to hierarchies, alliances also offer partners higher incentives in that they retain their independence and are rewarded for their innovative efforts (Kapoor & Lee, 2013; Teece, 1996; Williamson, 1991). In contrast to markets, alliance partnerships serve as vehicles that facilitate joint, active problem-solving and provides access to a broad portfolio of external knowledge (Dyer & Singh, 1998; Felin & Zenger, 2014; Kogut, 2000).

To work effectively, alliances require the lead firm (or its partners) to direct the search efforts. This especially the case if the alliance has been set up for the purpose of mutual innovation (which is unlikely to happen in cash- and license-based alliances) (Felin & Zenger, 2014). Strong communication between participating firms facilitates such mutual innovation (Felin & Zenger, 2014). The communication channels of alliances are an important factor in distinguishing alliance-based partnerships from markets as organizational form, where communication is rare and often simply not necessary (Felin & Zenger, 2014). In contrast to markets, the alliances typically do not fully detail tasks and responsibilities in specified contractual documents (Felin & Zenger, 2014). Instead, the contracts are usually kept somewhat open ended, specify the

efforts and resources each party will contribute, rather than articulating hardly predictable outputs (Felin & Zenger, 2014; Poppo & Zenger, 2002; Reuer & Arino, 2007). The alliance agreement, in fact, the entire relationship, is thus focused on collaboration and mutual exchange to work towards a common predetermined goal. Consequently, the underlying agreements focus on the resources each party will provide rather than on specific outputs or quality levels, which are often impossible or difficult to specify in advance (Felin & Zenger, 2014; Schilling & Steensma, 2002; Teece, 1986). Despite the alliances' evident advantages, they are not without drawbacks. Compared to markets, alliance-based arrangements in general provide less incentives for participating firms (Felin & Zenger, 2014; Leiblein & Macher, 2009; Nickerson & Zenger, 2004) because rewards for innovative (search) efforts have to be shared with partners. Further, alliance partners are exposed to a number of partner-related risks, such as the other's opportunistic behavior or being held up (e.g., Gulati & Singh, 1998; Kale, Singh, & Perlmutter, 2000).

Contrasting the different alliance arrangements shows that cash- and license-based agreements lack the communication and coordination channels for joint problem-solving and are thus not well suited to solve innovation challenges in ecosystems (Leiblein & Macher, 2009). In contrast, equity partnerships, provide more authoritative control to direct innovative search efforts, but nevertheless lack the communication and exchange channels needed to solve complex innovation challenges (Leiblein & Macher, 2009). Finally, compared to other alliance arrangements, joint ventures are the most suitable for nearly decomposable problems of intermediate complexity, but not ideal for highly complex and ambiguous innovation activities (Felin & Zenger, 2014; Kapoor & Lee, 2013; Leiblein & Macher, 2009; Nickerson & Zenger, 2004).

Potential synergies with research on ecosystems: So, from the aforementioned perspective, firms need to consider the underlying interdependencies that shape the innovation problem when they decide on the right organizational form for collaborating with partners. This logic conveys some interesting insights for ecosystem governance: Depending on the level of complexity inherent in an ecosystem innovation problem to which a lead firm can be exposed, successful collaboration with multiple heterogenous complementors in an innovation ecosystem will require not one, but various organizational forms. In other words, ecosystem lead firms, by taking the complexity

underlying the innovation problem into account, will need to establish differentiated complementor relationships to best facilitate joint innovative efforts with the respective partners. This reasoning resonates with Williamson and De Meyer's (2012) perspective on ecosystem governance. They state that "designing the right kinds of interfaces between partners in the ecosystem enables an understanding of the amount and nature of knowledge that must be exchanged and how this process of knowledge exchange can be made more efficient" (Williamson & De Meyer, 2012, p. 39). Further, it resonates with Brusoni and Prencipe (2013) view that innovation problems can imply different knowledge requirements, thus requiring different kinds of coupling of ecosystem partners.

(2) Implications for inter-firm governance mechanisms: Irrespective of the underlying organizational form chosen for the relationship with complementors, lead firms need to decide on the mix of governance mechanisms. In this regard, open innovation (OI) research that investigates the use and importance of contracts for multiple firms collaborating in innovative settings provides fertile insights. In conceptually analyzing collaboration behavior in OI settings, Zobel and Hagedoorn (2020, p. 409) found that "partly open-ended, flexible, and hence incomplete contracts are unavoidable" when ecosystem firms cooperate intensively and exchange knowledge in an attempt to mutually innovate. The basis for this argumentation is simple and convincing: close collaboration between multiple independent firms in innovation settings leads to a situation in which individual firm boundaries become more permeable (i.e., more open) (Zobel & Hagedoorn, 2020). The extensive knowledge exchange across firm boundaries and the development of new knowledge make it futile to try to foresee and define all potential contingencies before the relationship has started (e.g., Furr & Shipilov, 2018). The uncertainty makes it difficult or impossible to write a complete contract in advance (e.g., Milgrom & Roberts, 1992; Parkhe, 1993; Uzzi, 1996; Williamson, 1985, 1991; see de Figueiredo & Silverman, 2017).

From a neo-classical contracting perspective the best approach to counter such uncertainty would be to write even more extensive contracts (Carson et al., 2006), trying to specify contingencies, tasks and responsibilities of partners with respect to specific events. Writing overly detailed contracts, however, bears the risk of negatively influencing the interorganizational relationship (Vlaar, Van Den Bosch, & Volberda,

2007), for example, having detrimental effects on partners' creativity, innovation, and adaptability (Laursen & Salter, 2014; Mintzberg, 1994; Nooteboom, 1999; Wadhwa, Bodas Freitas, & Sarkar, 2017; see also Vlaar et al., 2007). Instead of using contracts as a solution, proponents of the relational contracting perspective emphasize the advantages of informal, i.e., relational, norms. Thus, they suggest that "the optimal response to uncertainty is less extensive formal contracting and a greater reliance on relational contracts to facilitate adaption" (Carson et al., 2006, p. 1060).

Given the increasing importance of such open innovation settings, Zobel and Hagedoorn (2020) argue that the formerly discrete contracts that helped partners to organize their exchange (Williamson, 1986) have by design become more long-term focused (de Figueiredo & Silverman, 2017; Hagedoorn & Heslen, 2007) and open-ended. With the increasing permeability of firm boundaries to facilitate mutual innovation, the behavior of contracting parties then relies more heavily on a broad set of (relational) norms (Macaulay, 1963; Macneil, 1978) rather than on the formal contractual agreement that has been set up by both parties (Zobel & Hagedoorn, 2020). In fact, some argue that the role of the actual written contract diminishes and changes to something like a "semi-formal framework" for the mutual cooperation between partners (Blomqvist, Hurmelinna, & Seppänen, 2005; Macneil, 1978; Zobel & Hagedoorn, 2020). The informal governance mechanisms, i.e., social norms based on inter-firm trust and transparency (Faems, Janssens, Madhok, & van Looy, 2008; Todeva & Knoke, 2005), however, become increasingly important in duly governing the relationship. With the diminishing role and importance of the actual written contract, social norms act as an important informal safeguard for both parties and as a critical element in assuring the stability and success of the collaboration (Blomqvist et al., 2005; Poppo & Zenger, 2002; Zaheer & Venkatraman, 1995; Zobel & Hagedoorn, 2020). This is because the informal elements can function as complementary governance mechanisms that "promote norms of flexibility, solidarity, and information exchange" (p. 710), which facilitate adaptability and joint problem-solving among partners (Poppo & Zenger, 2002).

Potential synergies with research on ecosystems: Considering the abovementioned arguments, innovation ecosystems, in which partners collaborate with the goal of mutually innovating and creating a new ecosystem value proposition, are therefore an ideal setting for exploring the role and use of contracts, relative to other

(less rigid, more informal) governance mechanisms (Zobel & Hagedoorn, 2020). Indeed, extant research discussing collaboration behavior of ecosystem participants clearly indicates the proposed importance of relational contracting in the governance of ecosystem relationships. Williamson and De Meyer, for example, noted in the context of ecosystems that "the interaction between the partners, therefore, needs to be designed so as to give adequate opportunities to learn from each other and experiment with joint activities (...). Given the dynamic nature of the ecosystem, many of the agreements governing partner interaction will need to be flexible to avoid imposing a straightjacket of excessive detail" (Williamson & De Meyer, 2012, p. 39). Similarly, multiple ecosystem studies pointed to the important role social (i.e., informal) governance mechanism play in the inter-firm collaboration (e.g., Thomas & Autio, 2014; Tiwana et al., 2010; Wareham et al., 2014). Various studies have shown that so-called "soft power" instruments are gaining importance (Benlian et al., 2015; Yoffie & Kwak, 2006).

Although several scholars have pointed to the importance of informal governance mechanisms, empirical studies exploring the informal governance mechanisms' relevance relative to formal governance mechanisms, are still scarce. Consequently, there are a number of interesting gaps in the literature that provide opportunities for ongoing research. For instance, extant empirical research has not yet sufficiently explored if and how the written contract's function changes as a consequence of more open, permeable firm boundaries (Zobel & Hagedoorn, 2020). Similarly, research has not yet explained how firms combine and use both formal governance mechanisms (such as the written contract as legal agreement stipulating rights and responsibilities) and informal governance mechanisms (such as inter-firm trust and social norms) at the same time (Zobel & Hagedoorn, 2020).

Further, as OI activities can occur in a number of different arrangements, including short as well long-term partnerships and collaborations, research in this area still needs to determine how the nature, length and intensity of a collaboration affects the use and importance of informal governance mechanisms (Poppo & Zenger, 2002; Vlaar et al., 2007; Zobel & Hagedoorn, 2020). Lastly, given that innovation ecosystems can consist of multiple diverse partners (Adner, 2017) producing complementary products and services, the numerous interdependencies among participants "can no longer be exclusively managed via ownership mechanisms but increasingly rely on

collaborative strategies" (Zobel & Hagedoorn, 2020, p. 408). This, in turn, opens up an array of interesting new research questions about the design of the mechanisms used to govern the innovative activities of multiple diverse independent, yet interdependent, firms collaborating in OI settings (Bogers et al., 2017).

So, the increasing importance of relational contracting for the governance of open innovation activities and the unresolved questions relating to the mix and use of formal and informal governance mechanisms underline the nexus of this dissertation's research agenda and indicate how I aim to contribute to this literature.

2.2 Ecosystem Literature – Construct, Types, and Roles

In this section, I present the growing body of literature on ecosystems to develop a basic understanding of the research field in which the dissertation is rooted. I start by explaining the ecosystem construct, the different types of ecosystems prior management research has discussed, and the theoretical concepts that are central to this research field (2.2.1). Then, I discuss the two key ecosystem roles, namely the roles of lead firms (2.2.2) and of complementors (2.2.3), and explain how both roles relate to the dissertation's research agenda.

2.2.1 Ecosystem Construct and History

The term "ecosystem" was first used in the management literature by Moore (1993), in a study of the actors that impacted a focal firm's performance. He noted that firms should be seen as members of a business ecosystem that spans across multiple industries (see Autio & Thomas, 2014; Kapoor, 2018). Starting in the 2000s, the concept of an ecosystem has become increasingly relevant in both research and practice (Adner, 2017; Dattée et al., 2018; Kapoor, 2018). A key determinant of this general surge in interest in ecosystems stems from the fact that business and innovative activity has moved toward more open, collaborative settings across multiple firms (De Silva et al., 2018). In such settings, even large firms can no longer operate independently, but instead depend on the collaboration with others (Jacobides, 2019). This is because individual firms usually "do not have the capabilities or resources to create complete

systems by making all the complements themselves" (Cusumano & Gawer, 2002, p. 53). Thus they need to collaborate with third-parties to source complementary innovations (Ceccagnoli, Forman, Huang, & Wu, 2012; Iansiti & Levien, 2004; Jacobides, 2019; Perrons, 2009).

So, while value creation activities have historically focused on activities within the firm, they are now increasingly spread across multiple, independent and diverse firms (Baldwin & Hippel, 2011; Gulati et al., 2012), often spanning several industries (Jacobides, 2019). These value creation activities are commonly organized around some core technology, product, or service provided by a focal firm (Dattée et al., 2018; Jacobides et al., 2018). The participating firms produce increasingly complex products and services by providing complementary elements and together creating a new "ecosystem value proposition" that benefits the customer (Adner & Kapoor, 2010; Chesbrough, 2003a; Dattée et al., 2018; Lusch & Nambisan, 2015; Tilson, Lyytinen, & Sørensen, 2010).

Ecosystem definition: The burgeoning research interest in this phenomenon has also led to more precise definitions of the ecosystem construct (Kapoor, 2018). Adner (2006, p. 98) first viewed ecosystems as "the collaborative arrangements through which firms combine their individual offerings into a coherent, customer-facing solution." In his more recent work he focused on the coordination necessary for co-creating value and defined ecosystems as "*the alignment structure of the multilateral set of partners that need to interact in order for a focal value proposition to materialize*" (Adner, 2017, p. 42). In contrast, Kapoor (2018, p. 2) defines an ecosystem as "*a set of actors that contribute to the focal offer's user value proposition.*" Focusing on mechanisms that result from the complementary relationship between actors, Jacobides et al. (2018, p. 2264) define ecosystems as "*a set of actors with varying degrees of multilateral, nongeneric complementarities that are not fully hierarchically controlled,*" pointing to the complementary nature of relationships within ecosystems. Jacobides et al.'s (2018) definition also refers to the important characteristic that individual partners are hierarchically independent, which raises interesting questions regarding coordinating or aligning partners and about controlling them (Adner, 2017; Jacobides et al., 2018; Thomas, Autio, & Gann, 2014). Building on key scholars' work in the field of ecosystem research (Adner, 2017; Jacobides et al., 2018; Kapoor, 2018), I define innovation

ecosystems as *the group of complementary actors required for a focal value proposition to materialize*.

While the new ecosystem value proposition is central in the aforementioned views of Adner (2006, 2017), Kapoor (2018), and Jacobides et al. (2018) as well as in my own definition articulated for the purpose of this dissertation, the term "ecosystem" has also been applied more broadly in the management literature. To avoid confusion and to clarify how my use of the term relates to other prevalent perspectives, I briefly review the most common ecosystem literature streams in management research.

Ecosystem types and literature streams: Following the typology of Jacobides et al. (2018), I differentiate between (1) business ecosystems (2) platform ecosystems; (3) innovation ecosystems:³

(1) Business ecosystem stream: here, the analysis is focused on a focal firm and the broader community of actors in its environment (Jacobides et al., 2018). The research emphasis is not on a specific ecosystem value proposition, but on all actors that can potentially influence the focal firm's fate and that thus need to be monitored and to which the focal firm needs to react (Teece, 2007). For Teece (2007) the ecosystem encompasses "the community of organizations, institutions, and individuals that impact the enterprise and the enterprise's customers and supplies. The relevant community therefore includes complementors, suppliers, regulatory authorities, standard-setting bodies, the judiciary, and educational and research institution" (Teece, 2007: 1325).

³ For the sake of completeness, I note that the term "ecosystem" has also been applied in other contexts to describe phenomena that are unrelated to those studied in this dissertation. For example, the term "entrepreneurial ecosystem" is generally used to describe (mostly regional) clusters of actors (i.e., entrepreneurs or ventures) who engage in knowledge exchange with regard to business model innovation (Thomas & Autio, 2020). Often the actors within such ecosystems also gain from or leverage a common set of assets or infrastructure elements, such as shared facilities or a network of venture capitalists. In contrast, the term "knowledge ecosystem" is commonly used to describe (also mostly regional) clusters of actors who engage with the primary aim of collectively creating new knowledge (Järvi et al., 2018; Thomas & Autio, 2020). The respective group of actors can include universities, public (research) institutions, and for-profit organizations that collaborate in a "pre-competitive setting" (Clarysse, Wright, Bruneel, & Mahajan, 2014; Järvi et al., 2018; Valkokari, 2015; van der Borgh, Cloodt, & Romme, 2012). Both these types, however, do not have a joint value proposition at the heart of their activities, which differentiates them from the ecosystems analyzed in this dissertation (for a more detailed discussion comparing these different types, see Thomas & Autio, 2020).

(2) Platform ecosystem stream: here, the analysis is focused on a specific type of ecosystem, where the ecosystem's core is formed by a central actor providing a technological platform for others on which they connect to the ecosystem (Jacobides et al., 2018). The platform thus forms the technological foundation through which complementors can get access to the ecosystem (Ceccagnoli et al., 2012; Cusumano, Yoffie, & Gawer, 2019; Gawer & Cusumano, 2008). The research emphasis is on the (technological) interdependence that exists between the platform owner (i.e., the central actor) and the complementors that connect to the platform (McIntyre & Srinivasan, 2017; Tiwana et al., 2010; Wareham et al., 2014). Cusumano, Yoffie, and Gawer (2019) further distinguish between two basic types of platforms, depending on the activity the platform performs. First, they identify an "innovation platform," which refers to platforms that serve as facilitator of complementary innovation (e.g., app-developer platforms). Second, they identify a "transaction platform," which refers to platforms that act as intermediary for transactions between two or more sides (e.g., e-commerce market places/platforms) (Cusumano et al., 2019). They also note that in practice hybrid forms exist, such as Apple, Google, or Facebook, which facilitate both complementary innovation as well as transactions on the platform.

(3) Innovation ecosystem stream: This is the literature stream in which my dissertation's research agenda is rooted. Here, the analysis focuses on the new innovation or joint value proposition that lies at the heart of participating firms' mutual efforts. Scholars in this field study the collaborative arrangements that connect the (lead firm's) ecosystem core product, the individual components, and the various complementary partner offerings located upstream and downstream, which collectively form the ecosystem value proposition (Adner, 2017; Jacobides et al., 2018). Research in this stream aims to develop an understanding of how "interdependent players interact to create and commercialize innovations that benefit the end customer" (Jacobides et al., 2018, p. 2257), which is exactly where this dissertation hopes to contribute.

What makes an innovation ecosystem appealing and at the same time complex is that usually participating actors are formally independent, and yet they are interdependent in assuring that the focal ecosystem value proposition will materialize (Adner, 2017; Jacobides et al., 2018). Adding to this complexity is the fact that participating firms can have a range of different backgrounds and take on different

(sometimes even conflicting) roles and activities in the ecosystem (Adner, 2017; Kapoor, 2018). These latter arguments point to the challenges concerning firms' governance-related decisions in innovation ecosystems and hint at the relevance of this dissertation's research agenda for this research field, which I detail in the next section (see 2.3.3).

Before moving to the discussion on the theoretical premises, please note that the aforementioned ecosystem types depict different research foci and should not be understood as strictly separated from one another. In fact these ecosystems types can overlap in practice (Jacobides et al., 2018).

Theoretical underpinnings: From a theoretical perspective, the connection between ecosystem partners is enabled by the modular nature of their individual contributions (Jacobides et al., 2018), while the relationship between them is characterized by both complementarity and interdependence (Kapoor, 2018). To understand what makes ecosystems so special and different to other types of organizing related economic actors, I shall review each of these theoretical underpinnings – i.e., modularity, complementarity, and interdependence – in more detail.

First, **modularity** is a necessary condition for an ecosystem to emerge (Jacobides et al., 2018). Simply put, a modular system is one in which the individual elements that make up the system can be dissembled, thus allowing us to break up the system into smaller parts, called modules (Baldwin & von Hippel, 2011). In the context of ecosystems, the modular nature of the ecosystem value proposition enables splitting the focal product or service into smaller components which can then be provided by separate independent actors (Baldwin & Clark, 2000; Jacobides et al., 2018). The decomposability of tasks and advances in communication technologies enabled by digitization means the participating actors can be widely dispersed and still collaborate effectively and efficiently (Baldwin & von Hippel, 2011; Bogers et al., 2017; Lakhani & Tushman, 2012). Although the ecosystem value proposition does not need to be entirely modular, a certain degree of modularity is essential for the collaboration between independent ecosystem participants to take place without them needing a hierarchical fiat (Jacobides et al., 2018).

Second, **complementarity** describes how the individual components (or complements) of the focal ecosystem value proposition (i.e., the ecosystem product or

service) are connected. The complementary relationship stems from the additional value that participating firms' individual offers create for the focal ecosystem value proposition (Kapoor, 2018; Thomas & Autio, 2020). Below, I highlight the different types of complementarities that are central to our understanding of ecosystem dynamics.⁴ While there are different ways of structuring complementarity types, I find it most useful to distinguish between "strict" (or "strong") vs. "supermodular" complementarity on the one hand (Hart & Moore, 1990; Milgrom & Roberts, 1990), and "specialized" (or "specific") vs. "generic" complementarity on the other (Teece, 1986; see Kapoor, 2018). Regarding the first dimension, the strict complementarity type describes a relationship in which A (a product/service/asset/etc.) requires the presence of B to be of value (Hart & Moore, 1990; see Jacobides et al., 2018; Kapoor, 2018). The supermodular complementarity type describes a relationship in which the value of A (a product/service/asset/etc.) increases with the presence of B (Milgrom & Roberts, 1990; see Jacobides et al., 2018; Kapoor, 2018). Regarding the second dimension, specialized complementarity relates to a situation where A needs a specialized, i.e., customized, version of B to function. In contrast, generic complementarity relates to a situation in which a generic, i.e., standardized, version of B suffices for A to function (Teece, 1986). This is an important aspect because, as Jacobides et al. (2018) noted, it requires a non-generic complementary relationship between actors for the ecosystem construct to add any value. This is because, in our example, if B were a generic input, actor A could source it from any actor able to provide B. In other words, there is no need for a special co-alignment or coordination between the two actors for A to get what it needs. Only if the relationship between A and B is of a non-generic nature, is "the creation of a specific structure of relationships and alignment" (Jacobides et al., 2018; p. 2263) between actors within the ecosystem notion needed.

Third, **interdependence** stems from firms being co-dependent through a structural relationship linking firms and their respective offers that collectively contribute to the ecosystem value proposition (Jacobides et al., 2018; Kapoor, 2018). Kapoor (2018, p. 3) noted that "while complementarities represent an economic relationship between offers in terms of the potential for value creation,

⁴ Note that there are various ways of organizing our thinking around the different complementarity types; however, I chose to follow Kapoor's (2018) organizational logic because I found this approach most intuitive and best suited to the purpose of this dissertation.

interdependencies represent a structural relationship between offers in terms of how they are connected for the value to be created and how a change in one offer may affect the contribution of other offers towards value creation." In that sense, it is the structure of interdependencies that determines how inputs and outputs are organized in the ecosystem, which ultimately influences individual actors' role in the ecosystem (Kapoor, 2018).

To illustrate how these theoretical underpinnings manifest in practice, I turn to real world examples of ecosystems, which we can find in various industries and in numerous shapes and sizes. Apple's and Android's app stores, for instance, prominently exemplify the building blocks and functionalities of ecosystems. In these cases, the mobile phone itself builds only the technical foundation or "platform" for which independent partners, i.e., developers, can build (modular) complementary applications. While the isolated apps alone are of absolutely no value without a technological device, the third-party applications significantly increase the mobile phone's value by increasing the device's functionality. The technological connection between hardware (i.e., the mobile phone) and software products (i.e., the mobile apps) creates a structural interdependence between firms. The value generated through the joint use of both elements thus creates what literature has called "supermodular" complementarity (Milgrom & Roberts, 1990), where more of the same (i.e., more apps) create more or additional value for the customer. In contrast, the mobile phone and the operating system that enables its use, illustrate a strict complementary relationship (Hart & Moore, 1990), as the two elements are of no value unless used together (Kapoor, 2018). Further, the relationship between the mobile phone and the operating system as well as the relationship between the operating system and the mobile apps is non-generic in nature, as a certain degree of specialization is necessary for the elements to perform together effectively. In contrast, the relationship between the mobile phone and the cellular network is generic in nature, provided that the mobile phone can function without problems on any cellular network (the same is true for the operating system).

Another practical example that has gained increasing importance in recent years, and will likely continue to do so, is the development of electric cars (Kapoor, 2018). It is a particularly interesting example as it helps to illustrate the complex interdependencies that exist between a broad range of diverse actors and their respective

contributions to the focal ecosystem value proposition. Although the interdependence of the battery, electric car, and charging infrastructure is critical to the future success of electric cars, less obvious interdependencies need to be considered as well (Kapoor, 2018). More specifically, the interdependencies between the battery, the charging infrastructure, and the power grid are also critical for the successful interplay between individual complementary components. This is because limitations in the power grid could hinder value creation through innovations aimed at achieving, e.g., a more efficient charging station or better batteries (Kapoor, 2018). What adds to this complexity is the fact that electric car manufacturers, power grid operators, and charging infrastructure providers are all hierarchically independent actors, with diverging agendas and incentives (Adner, 2017).

So far, ecosystem research's primary interest has been to study firms' positions and roles as well their strategic choices within the ecosystem regarding collaboration and alignment (Adner, 2017; Kapoor, 2018). Scholars investigating such choices have studied firms' decisions about the overarching ecosystem business model or "blueprint" (Dattée et al., 2018), organizational boundaries and links between partners (e.g., Gawer & Henderson, 2007; Hannah & Eisenhardt, 2018; Kapoor & Lee, 2013). They have researched how firms design the rules for collaboration and governance (e.g., Tiwana et al., 2010; Wareham et al., 2014), how firms design technological aspects of the ecosystem core (e.g., Saadatmand, Lindgren, & Schultze, 2019; Tiwana, 2014), how firms balance cooperative and competitive tensions (e.g., Ansari et al., 2016; Casadesus-Masanell & Yoffie, 2007), how firms purposefully create or resolve (strategic) bottlenecks within the ecosystem (e.g., Adner & Kapoor, 2010; Kapoor & Furr, 2015), and how firms take on and keep the leading role in an ecosystem (e.g., Cusumano & Gawer, 2002; Gawer & Cusumano, 2008). Given that creating alignment among partners is an important prerequisite for the ecosystem's success and a critical challenge for lead firms, I explore lead firms' role in more detail in the next subsection.

2.2.2 Lead Firms' Creation of Innovation Ecosystems

The successful emergence of ecosystems commonly depends on deliberate actions of lead firms (Jacobides et al., 2018), i.e., firms which act as "architect, catalyst, and guide in order to promote the development of an ecosystem" (Williamson and De

Meyer, 2012, p. 44).⁵ Lead firms thus need to consider how to align ecosystem partners' complementary activities that contribute to the focal ecosystem value proposition (Adner & Kapoor, 2010). These lead firms often have a powerful position within the broader network of firms, which helps them to coordinate the ecosystem partners' activities (Gawer & Cusumano, 2002; Pierce, 2009; Thomas & Autio, 2014).

In such a role, lead firms try to attract additional participants to the ecosystem (Shipilov & Gawer, 2020; Thomas & Autio, 2014), to facilitate the interaction between participants (Evans, Hagi, & Schmalensee, 2006), and to improve the ecosystem's overall performance and "health" (Iansiti & Levien, 2004; Pierce, 2009). They do this through deliberate actions that steer complementary innovation (Cusumano & Gawer, 2002; Thomas & Autio, 2014), improve the collective value creation (Cusumano & Gawer, 2002), and guide the growth of the ecosystem (Shipilov & Gawer, 2020; Wareham et al., 2014). Lead firms usually also define the interfaces that connect participants and the rules for collaboration between firms (Gulati et al., 2012; Parker, Van Alstyne, & Jiang, 2017; Teece, 2014; Wareham et al., 2014).

Given that lead firms are typically in a very favorable position (Iansiti & Levien, 2004), firms commonly strive to take the lead in emerging ecosystems, although they are not necessarily well positioned to do so (Jacobides, 2019). According to Gawer and Cusumano (2008), firms need to satisfy two conditions to be able to take on the role of the lead firm: "(1) It should perform at least one essential function within what can be described as a 'system of use' or solve an essential technological problem within an industry, and (2) it should be easy to connect to or to build upon to expand the system of use as well as to allow new and even unintended end-uses" (Gawer & Cusumano, 2008, p. 29). In a similar vein, Jacobides (2019, p. 133) argues that lead firms need to have "a superior product or service that is hard to replicate." Hence, it is generally agreed that lead firms have some foundation that enables them to attain a strong leadership position and subsequently to gain power over other firms in the ecosystem. Lead firms' power, which is normally not based on formal authority over ecosystem partners, can

⁵ While I follow Williamson & De Meyer (2012) in selecting and using the term "lead firm", other scholars have referred to this type of firm using the terms "hub firm" (Dhanaraj & Parkhe, 2006), "platform leader" (Gawer & Cusumano, 2002), "keystone firm" (Iansiti & Levien, 2004), and "ecosystem captain" (Teece, 2014) in the same context.

stem from gatekeeping rights (Gulati et al., 2012), a critical installed customer base, a strong and trusted brand (Jacobides, 2019; Pierce, 2009), or control over another critical ecosystem resource or technology (Blau, 1964; Gawer & Cusumano, 2008; Gawer & Cusumano, 2002; Jacobides, Knudsen, & Augier, 2006).

Although the leadership role typically implicates a favorable profitable position within the ecosystem (Iansiti & Levien, 2004), the role also entails a whole array of leadership tasks for which a certain set of capabilities is required. For this reason, the following paragraphs discuss these (1) leadership tasks and the related (2) leadership capabilities in more detail.

(1) Leadership tasks in ecosystems: The leadership tasks described in this section relate to the critical activities necessary to build and maintain a successful ecosystem. Consequently, the following paragraphs discuss lead firms' task to (a) design and realize an ecosystem blueprint as well as their task to (b) stabilize their leadership position and the ecosystem as a whole.

(a) Design and realization of the ecosystem blueprint: As mentioned, lead firms' prime responsibility is to facilitate the successful emergence of the ecosystem (Williamson & De Meyer, 2012). To align participating firms, the lead firm usually develops an ecosystem blueprint, defined as a "vision that clearly defines the ecosystem value proposition (i.e., what value is created, how, and for whom) and associated structures of governance and interaction (i.e., who does what, who controls what, and how everyone will benefit)" (Dattée et al., 2018, p. 467). The lead firm's blueprint provides an important orientation for other actors on which the lead firm depends to realize its envisioned value proposition (Adner, 2017; Ansari et al., 2016). The ecosystem blueprint's design will also contain decisions about which elements of or complements to the ecosystem the lead firm wants to produce internally, and which ones it will delegate to external partners (Cusumano & Gawer, 2002). Designing an ecosystem blueprint is an essential task as "the design of the ecosystem in terms of the technological architecture and in terms of the input-output flows have [sic] a significant impact on how value gets created in an ecosystem, the roles played by the different actors, and the interdependencies between them" (Kapoor, 2018, p. 12).

The ecosystem literature has long assumed that ecosystems are created following such predefined blueprints; however, scholars have recently recognized that lead firms' envisioned blueprints are often far from definite or complete (Dattée et al., 2018; Furr & Shipilov, 2018). In fact, blueprints can contain domains of high uncertainty, either regarding the ecosystem value proposition or the necessary alignment with partners needed to realize the value proposition (Adner, 2017; Dattée et al., 2018): Regarding the **ecosystem value proposition**, designing the future ecosystem blueprint is relatively easy if the lead firm faces a simple and stable environment, where customer needs and expectations are well known or can easily be envisioned (Dattée et al., 2018). However, if the ecosystems is built on new technologies that allow for endless possibilities of use cases and applications, such envisioning becomes much more difficult (Dattée et al., 2018). Similarly, when lead firms face an ecosystem environment where the problems (i.e., customer needs) and the right solution (i.e., the design and delivery of the ecosystem value proposition) have not been fully resolved, imaging the most favorable set-up and selecting the right partners for this endeavor can become a challenging task (Furr & Shipilov, 2018). Ambiguity regarding the ecosystem value proposition can thus create substantial uncertainty for lead firms. Dattée et al. (2018) noted that when (target) customer groups are still unknown and a similar ecosystem value proposition does not exist on the market yet, determining the details of the preferred blueprint can be difficult, if not impossible. This envisioning task becomes even more challenging when industry boundaries shift (Furr & Shipilov, 2018) or when changing ecosystem structures lead to bottleneck shifts that change where and how value is captured and distributed in the ecosystem (Hannah & Eisenhardt, 2018). In other words, in an emerging ecosystem, lead firms' desired position and role within the ecosystem can change over time, once the future ecosystem value proposition becomes apparent and the most favorable positions assume a definite shape.

The other potential source of uncertainty relates to the **alignment with partners**. Given that lead firms depend on complementary offerings, reaching alignment with ecosystem partners is crucial. Thus, the lead firm's ecosystem blueprint needs to include a plan for how to align all participating actors in conducting the overall activities and processes required to create and deliver the ecosystem value proposition to customers (Thomas & Autio, 2014; Williamson & De Meyer, 2012). However, given that there is no authoritative, hierarchical control over partners (Gulati et al., 2012; Jacobides et al.,

2018), uncertainty can arise from disagreements between partners about activities, roles and positions within the ecosystem (Adner, 2017; Yoffie & Kwak, 2006). Also, due to the ecosystem endeavor's unpredictable nature, lead firms might have difficulties in finding sufficient support from complementors (Dattée et al., 2018; Ozcan & Santos, 2015). Even if the lead firm manages to successfully realize its envisioned blueprint, new domains of uncertainty can arise. For example, changes in the ecosystem structure (Hannah & Eisenhardt, 2018), competitors' reactions or responses of the lead firm's own complementors might threaten the lead firm's position in the ecosystem (Dattée et al., 2018; Gawer, 2014; Helfat & Raubitschek, 2018). This would require the lead firm to take corrective action and reconstruct the alignment with partners. I will discuss the topic of complementor alignment in more detail in the ecosystem governance section (see 2.3.). However, here already, it is important to note how extensive and challenging this leadership task is. Most importantly, the associated governance includes rules on members' participation (regarding who is allowed to participate) as well as their respective tasks and responsibilities (regarding what their role and position within the ecosystem is) (Helfat & Raubitschek, 2018; Jacobides et al., 2018; Kapoor, 2018; Wareham et al., 2014). In addition, the governance determines the rules of interaction between players, including how decision and control rights are distributed between partners. Particular aspects, e.g., of incentives to complementors or users' pricing structures, are also woven into the governance decisions, as the decisions on value distribution will affect complementors' incentive to participate and contribute to the ecosystem (Helfat & Raubitschek, 2018). Hence, in the context of multi-sided ecosystems, where users as well as diverse complementors need to be attracted to the ecosystem, all governance decisions need to be made in view of both sides' incentives and motives, i.e., considering both users and complementors (Boudreau, 2010; Hagiu, 2014; Helfat & Raubitschek, 2018; Parker, Van Alstyne, & Choudary, 2016). This further adds to the complexity of this task.

Thus, whereas designing a compelling value proposition is far from easy even in traditional contexts (i.e., where firms focus on their own value chain and apply an "intra-firm focus"), it becomes even more challenging if the value proposition encompasses multiple and diverse external players whose incentives and motives need to be incorporated (Adner, 2017; Dattée et al., 2018; Helfat & Raubitschek, 2018). Taken together, ambiguity about customer needs, the best value proposition (Dattée et al.,

2018; Furr & Shipilov, 2018), and challenges related to the (lasting) alignment with partners (Adner, 2017; Dattée et al., 2018) can result in substantial uncertainty, making the realization and successful commercialization of a new ecosystem a difficult endeavor.

(b) Stabilizing leadership position: Given that most ecosystems are still at an early stage of development, there is "significant opportunity for innovation" (Helfat & Raubitschek, 2018, p. 1393). The opportunities for innovation are especially salient when it comes to innovation across multiple ecosystem products and services, e.g., through merged functionalities (Iansiti & Levien, 2004). While the vast innovation potential represents great value creation potential, it also implies that lead firms (and their respective ecosystems) are constantly exposed to competitive threats (Helfat & Raubitschek, 2018). So, even once a viable ecosystem blueprint has been established, lead firms need to consider competitive dynamics and reactions of competitors and competing ecosystems (Helfat & Raubitschek, 2018). From this vantage point, several scholars noted that the traditional rivalry between individual firms could prospectively turn into a rivalry between ecosystems (Iansiti & Levien, 2004; Jacobides et al., 2018). However, competitive threats can even arise from within the lead firm's own ecosystem. In addition to direct competition of competitors and competing ecosystems, lead firms also need to consider strategic moves from their own complementors (Gawer, 2014). Complementors could try to occupy valuable positions within the ecosystem (i.e., "bottlenecks"), or create innovations that could adversely alter the structure and value creation dynamics within the ecosystem. Helfat and Raubitschek (2018) argue that, in order to counter such competitive threats, lead firms need to "continually scan their environments for emerging competitive innovative threats" (p. 1393).

Hence, drafting a well-designed blueprint for the ecosystem is most likely not sufficient for long. Instead, lead firms need to constantly revisit and assess the blueprint to consider where adjustments are needed (Cusumano & Gawer, 2002). The need for innovation concerns all sub-elements of the ecosystem blueprint, including the lead firms' own technology, core product and service provided to the ecosystem (Cusumano & Gawer, 2002; Helfat & Raubitschek, 2018). Developing and innovating lead firms' own product or service is especially important when it serves as the basis (i.e., as foundational element or platform) for the ecosystem, in which case the technological

compatibility with complementary offerings is essential (Cusumano & Gawer, 2002). The development, maintenance and further development of this "ecosystem core product" then becomes an integral part of the lead firms' responsibilities, in addition to the orchestration activities (Helfat & Raubitschek, 2018).

Importantly, however, providing and operating the ecosystem's functional foundations can become an extensive task, often requiring the lead firm to acquire completely new technological capabilities (Cennamo, 2018; Ozalp, Cennamo, & Gawer, 2018), for example in areas related to software development and maintenance (Lee & Berente, 2012).⁶ Besides these technological capabilities needed to ensure the ecosystem's stability and operational performance, the leadership role calls for more general leadership capabilities as well. For this reason, I next turn to the leadership capabilities most important to managing a portfolio of heterogeneous complementors.

(2) Leadership capabilities in ecosystems: To succeed in their role as leaders and fulfill the aforementioned leadership tasks, lead firms will require a certain set of capabilities. While research on dynamic capabilities has traditionally applied an intra-firm lens, the focus on setting up and commercializing a firm's internal resource base has recently been extended to cover the broader resource portfolio (Zobel & Hagedoorn, 2020) that exists within the ecosystem. Helfat and Raubitschek (2018), for example, have explored the dynamic capabilities of lead firms required in multi-sided platform markets, namely the innovation capabilities, scanning and sensing capabilities, and integrative capabilities, which I will now discuss more detail.

Innovation capabilities: As indicated, to maintain their leadership position and ward off competitive threats, lead firms need continuously to invest in innovation (Cusumano & Gawer, 2002). Constantly innovating the ecosystem's core product (or service) is crucial, as this builds the basis for complementors' products and services (Helfat & Raubitschek, 2018). What makes this particularly challenging in ecosystems is the fact that the ecosystem's core product and the complementors' offering are strongly interdependent (Helfat & Raubitschek, 2018). Consequently, when engaging in innovative efforts within the ecosystem, the lead firm needs to consider possible implications and repercussions for complementary products and services, since

⁶ Notably, the importance of technological capabilities will vary depending on the particular ecosystem.

innovations need to be consistent with other products and services within the ecosystem (Cusumano & Gawer, 2002; Helfat & Raubitschek, 2018). In other words, if the lead firm provides the technological platform for complementary products and services (for example, on a mobile device platform), it needs to ensure that its own innovations do not adversely impact the performance and quality of complementing applications (for example, a software update for the mobile device should not impair the performance of the applications installed on it). To be able to constantly innovate and direct innovative efforts across multiple firms (despite the strong interdependencies that exist within ecosystem), lead firms thus need to develop strong innovation capabilities (Helfat & Raubitschek, 2018) that expand beyond those of regular complementors.

Scanning and sensing capabilities: Building on the work of Teece (2018), Helfat and Raubitschek (2018) note that lead firms need sensing capabilities to detect emerging opportunities and threats related to the ecosystem. This requires lead firms to "continually scan their external environments to spot new or untapped technologies, unexploited market needs and changes in customer preferences, as well as the threat of innovative entry by new and existing platforms" (Helfat & Raubitschek, 2018, p. 1395). Additionally, lead firms require sufficient knowledge to correctly interpret the information they obtain through scanning and sensing activities (Helfat & Raubitschek, 2018). Hence, lead firms' areas of expertise have to expand beyond their own contribution to the ecosystem, to also encompass that of partners' contribution, at least to a certain extent. The requirement for such an extended area of expertise stems from lead firms' task to evaluate the likely success of complementary products and services in order to decide which complementary offering to add or remove from the ecosystem (Helfat & Raubitschek, 2018). Knowledge of complementary offerings will also be beneficial to lead firms' task in directing or even engaging in complementary innovation (Cusumano & Gawer, 2002).

Integrative capabilities: Although the interdependencies between individual ecosystem components are a central characteristic of ecosystems, they can also create substantial complexity (Cusumano & Gawer, 2002), which is why integrative capabilities are essential for lead firms as well. Simply put, integrative capabilities help lead firms to manage interdependencies between complementary products and their own ecosystem (core) product, but also interdependencies between various complementary

products. For example, lead firms need such capabilities for alignment with and among partners on aspects such as the joint activities, resources, and capabilities provided, investments made, and mutual ecosystem objectives (Helfat & Campo-Rembado, 2016; Helfat & Raubitschek, 2018). Unsurprisingly, in this respect scholars studying lead firms' capabilities (e.g., Helfat & Raubitschek, 2018; Lee & Berente, 2012) have noted that lead firms would benefit from "know[ing] more than they need for what they make" (Brusoni, Prencipe, & Pavitt, 2001, p. 620). While integrative capabilities are elementary for effectively coordinating activities and aligning with lead firms' ecosystem partners, they are also useful for internal alignment, i.e., between different teams and units within the lead firm (Chen, Qian, & Narayan, 2017; Cusumano & Gawer, 2002; Helfat & Raubitschek, 2018). Integrative capabilities thus enable the lead firm to manage both interorganizational as well as intra-organizational interdependencies more effectively (Kapoor, 2014, 2018).

Helfat and Raubitschek's (2018) aforementioned arguments also resonate well with the system integration perspective, according to which firms providing complex products (i.e., ones requiring the integration of both internally and externally produced components) need to have capabilities that expand beyond their individual component (Brusoni et al., 2001; Lee & Berente, 2012). Based on an analysis of how OEMs integrate new innovative complementary components, Lee and Berente (2012) noted that although modular product systems and interfaces between elements are intended to reduce the overall system complexity and knowledge the OEM requires, focal (lead) firms still require knowledge about important components and integrative capabilities. In a similar vein, building on earlier work in the domain of dynamic capabilities (Pisano & Teece, 2007; Teece, Pisano, & Shuen, 1997), Baldwin (2015, p. 2) noted that "architectural capabilities are an important subset of dynamic capabilities that provide managers with the ability to see a complex technical system in an abstract way and change the system's structure by rearranging its components."

Hence, in order to manage complex systems, lead firms need an understanding of the (technological) architecture and how components of the system interact and contribute to the ecosystem's overall performance (Arthur, 2009; Baldwin, 2015). Iansiti and Levien (2004) have similarly noted the importance of understanding and managing interdependencies, stating "a firm that takes an action without understanding the impact

on the ecosystem as a whole is ignoring the reality of the networked environment in which it operates" (p. 78). Interestingly, Lee and Berente (2012) found that the required knowledge of complements depends on an "organization's position in the supply chain and the point in the evolution of the relevant product structures" (Lee & Berente, 2012, p. 1443). In other words, depending on how and by whom components are integrated, the required knowledge of complements positioned upstream and downstream will differ.

2.2.3 Heterogeneous Complementors in Innovation Ecosystems

For the purpose of this dissertation, I define ecosystem complementors as the actors that, from the lead firm's viewpoint, contribute complementary activities (Gawer & Henderson, 2007; Kapoor & Lee, 2013; Shipilov & Gawer, 2020) and in doing so help to realize the ecosystem's value proposition (Adner & Kapoor, 2010). In platform ecosystems that bring market participants together around a stable technological core (Jacobides et al., 2018), complementors are usually a relatively homogeneous group of firms with a predefined role, for example, as app developers (Jacobides et al., 2018; McIntyre et al., 2020). Innovation ecosystems, however, are organized around a focal value proposition (Adner, 2017) and characterized by a broad range of heterogeneous complementors (Adner & Kapoor, 2016; Thomas & Autio, 2020). This heterogeneity stems from the different activities and positions in the "flow of activities" that contribute the ecosystem's focal value proposition (Adner, 2017). In their most basic form, these positions are differentiated as upstream and downstream complementors (Ganco, Kapoor, & Lee, 2020), but much more complicated ecosystem structures arise around complex, integrated value propositions (Adner, 2017; Kapoor, 2018). In many of today's innovation ecosystems, complementors come from multiple completely different industries and sectors (Autio & Thomas, 2018; Jacobides et al., 2018; Moore, 1993). The heterogeneity is amplified by the fact that innovation ecosystems can comprise different types of organizations, such as non-governmental organizations, regulatory agencies, or universities (Thomas & Autio, 2020).

I came across a related discussion and delineation of collaboration partners based on their individual characteristics (e.g., their resource endowment and ability to contribute to the innovation process) in the open innovation literature (Gesing et al.,

2015; Masucci, Brusoni, & Cennamo, 2020). In particular, the literature distinguishes between partners based on the specific knowledge each contributes to the innovation process. Thus scholars differentiate between market or technology focused partners (e.g., Bogers, Afuah, & Bastian, 2010; Spanjol, Qualls, & Rosa, 2011), and according to the range of organizations contributing to the innovation process, including, for example, customers, competitors, universities, consultants and other organizations (e.g., Laursen & Salter, 2014).

In general, complementors fulfill two contrasting kinds of roles in the innovation ecosystem. On the one hand, they act as independent innovators, contributing complementary innovations to the ecosystem (Jacobides et al., 2018). It is this generative capacity (Nambisan et al., 2019; Yoo et al., 2012), which can be described as an "ecosystem's capacity to foster complementary innovation from autonomous, heterogeneous firms" (Cennamo & Santaló, 2019, p. 617), that makes ecosystems a particularly attractive means for organizing economic activities. On the other hand, complementors also perform well-defined tasks and activities and thus contribute to the convergence of all ecosystem activities into a coherent and integrated value proposition. If the ecosystem does not demonstrate a certain level of stability, complementors as well as other relevant stakeholders (i.e., customers, regulatory bodies, etc.) might hold back necessary investments (Wareham et al., 2014; Williamson & De Meyer, 2012) and question the ecosystem's potential for value creation and capture (Thomas & Autio, 2020). Hence, although lead firms need to foster the generativity of complementors, it is also necessary to reign in complementors' innovativeness to ensure a consistent value proposition (Yoo et al., 2012) and avoid coordination difficulties among the participating firms. The tension between these two kinds of complementor roles has long been acknowledged in ecosystem research (Cennamo & Santaló, 2019; Nambisan & Sawhney, 2011; Wareham et al., 2014) and will be discussed in more detail later in this chapter (see 2.3.2).

2.3 Ecosystem Governance

Despite the increasing interest in ecosystems and a growing body of research on various aspects of ecosystems, the research field still lacks a solid understanding of the

governance of innovation ecosystems. This dissertation aims to provide new insights and guidance for lead firms in innovation ecosystems. Therefore, it is important to gain a thorough understanding of governance-related concepts and explore insights reported in prior literature in more detail, which is the aim of this subsection. First, I discuss the two dimensions of ecosystem governance, which together form the governance-system that guides the collaboration between partners (2.3.1). Second, I explain how ecosystem governance approaches differ in the context of different ecosystem types, and I review the key challenges associated with ecosystem governance as discussed in prior literature (2.3.2). Finally, based on this knowledge, I critically analyze remaining gaps in the literature and outline the research question that motivated this study (2.3.3).

2.3.1 Dimensions of Ecosystem Governance

Building on prior literature, I define the term ecosystem governance as the collective set of decisions affecting the relationship between participating firms (Rietveld et al., 2020; Wareham et al., 2014). Generally, the governance of activities that link ecosystem partners is central for efficient value creation (Thomas & Autio, 2014; Williamson & De Meyer, 2012). Hence, irrespective of the ecosystem type and setting, all ecosystems require a certain set of rules (Thomas & Autio, 2014) that govern the interaction between participants (Adner, 2017; Cusumano & Gawer, 2002; Jacobides et al., 2018) and that contribute to the ecosystem's stability, robustness, and coherence (Nambisan & Sawhney, 2011; Thomas & Autio, 2012; Wareham et al., 2014).

To discuss the different aspects of ecosystem governance, I follow prior literature on interorganizational governance (Zaheer & Venkatraman, 1995) and distinguish between two distinct but interrelated dimensions of governance. The first dimension refers to the organizational form (1), that is, the legal structure of the relationship between partners (Zaheer & Venkatraman, 1995).⁷ The second dimension refers to the mix of formal and informal governance mechanisms (2), reflecting how activities between partners are coordinated (within a given legal structure). Table 1 gives an

⁷ Note that Zaheer and Venkatraman (1995) called this the "structure of the relationship" (emphasis removed).

overview of the two ecosystem governance dimensions and the characteristics of each dimension.

Table 1

Overview of Ecosystem Governance Dimensions

Governance dimensions	Explanation	Manifestation
Organizational form	Describes the legal structure of the relationship between partners (Zaheer & Venkatraman, 1995)	- Hierarchical - Alliance-based - Market-based
Governance mechanisms	Describes how activities between ecosystem partners are coordinated (within a given legal-structure)	- Formal governance mechanisms (e.g., formal rules and contracts) - Informal governance mechanisms (e.g., inter-firm trust, open dialogue)

I take the viewpoint that analyzing ecosystem governance in terms of both organizational form and use of formal and informal governance mechanisms allows a more accurate description of how the relationships between ecosystem participants are managed. This view is supported by prior ecosystem research, which found that firms collaborating in dynamic collaborative relationships, such as innovation ecosystems, tend to rely more heavily on non-contractual (i.e., informal) governance mechanisms (e.g., Gulati et al., 2012; Thomas & Autio, 2020; Zobel & Hagedoorn, 2020; Gesing et al., 2015; Agerfalk & Fitzgerald, 2008; Iansiti & Levien, 2004) that complement, or even replace, the traditional organizational form used as a basis for the exchange. In what follows, I discuss each dimension in more detail.

(1) Organizational form: Even though the ongoing collaboration between ecosystem partners will manifest itself in the form of specific rules and relational norms, i.e., a mix of formal and informal governance mechanisms, it is important to expand the analysis to incorporate the underlying organizational form. The organizational form builds the "structure of the relationship" (Zaheer & Venkatraman, 1995), the "legal frame," and thus forms the basis on which the relationship between partners is built and developed. The literature commonly distinguishes between three broad categories of

legal structures used for bilateral interorganizational relationships: market-based, hierarchical, and alliance-based linkage as hybrid between market-based and hierarchical structures (Kapoor & Lee, 2013). Within each of these different structures the partners can then deploy a certain mix of governance mechanisms along the continuum ranging from very formal (i.e., discrete, contractual) to informal (i.e., relational) mechanisms. However, as discussed earlier in the section on open innovation (2.1.2), the organizational forms differ significantly in terms of their adaptability (Kapoor & Lee, 2013) and the degree to which they support communication and collaborative knowledge exchange between partners (Felin & Zenger, 2014). These differences point to the interrelation between the two governance dimensions (Zaheer & Venkatraman, 1995). For example, markets commonly provide rather limited communication and collaborative knowledge exchange between partners (Dyer & Singh, 1998; Felin & Zenger, 2014), so that informal (relational) mechanisms usually play only a non-essential or subordinate role. In contrast, a certain level of trust and willingness to mutually collaborate is a prerequisite to successful joint ventures (as alliance-type). Regular, open interaction between joint venture partners and long-term focus of the relationship implies that informal (relational) contracting elements can emerge more naturally and become more important over time (Zaheer & Venkatraman, 1995; Zobel & Hagedoorn, 2020). For this reason, I posit that it is important to understand how the organizational form supports or contradicts the mix of governance mechanisms used to coordinate activities.

(2) Governance mechanisms: An ecosystem's governance mechanisms reflect how the activities between various ecosystem partners are coordinated within a given structure (i.e., organizational form). For the purpose of this dissertation, and building on prior work on interorganizational governance (e.g., Dyer & Singh, 1998; Järvi, Almpnanopoulou, & Ritala, 2018; Poppo & Zenger, 2002; Wareham et al., 2014; Zobel & Hagedoorn, 2020), I distinguish between formal governance mechanisms, when governance is based on explicit contracts and codified rules stipulating participants rights and duties, and informal mechanisms, when governance is based on cooperative social norms, such as trust, transparency, and open dialogue. Importantly, in this respect lead firms can simultaneously employ both formal and informal governance mechanisms to control ecosystem partners (Autio & Thomas, 2014; Tiwana et al., 2010). Governance based on informal mechanisms, such as relational trust between partners, is

particularly useful when traditional, more formal, governance mechanisms are not feasible or sufficient (Gesing et al., 2015; Zobel & Hagedoorn, 2020). Especially in dynamic settings such as emerging innovation ecosystems, the definition of formal agreements that specify all possible contingencies and partners' tasks and responsibilities is often not feasible or very costly (de Figueiredo & Silverman, 2017; Parkhe, 1993; Teece, 1986; Zobel & Hagedoorn, 2020). In such cases more open, flexible contracts (Furr & Shipilov, 2018; Schilling, 2002) and other relational contracting elements (Zobel & Hagedoorn, 2020) are more suitable.

Hence, the ecosystem partners are connected by an underlying organizational form (i.e., the legal frame) and a system consisting of formal governance mechanisms (e.g., formal rules stipulating tasks), as well as informal governance mechanisms (e.g., mutual goals and shared values), which together form the basis for their mutual value creation in the ecosystem (Anderson, Hakansson, & Johanson, 1994; Mouzas & Ford, 2009; Thomas & Autio, 2012). Depending on how these dimensions of governance (i.e., the organizational form and the mix of formal and informal mechanisms) are structured, ecosystem governance can range from rather hierarchical, formal control structures to reciprocal and informal coordination based on open communication and social rules of behavior (Gawer & Phillips, 2013; Gulati et al., 2012; Järvi et al., 2018; Thomas & Autio, 2020).

2.3.2 Governance Approaches and Challenges in Ecosystems

Prior research has observed how lead firms take different approaches to find the right balance along the aforementioned governance continuum. To understand how this dissertation can contribute to this field, it is important to review literature that has discussed (1) governance approaches in different ecosystem contexts and (2) common governance challenges in ecosystems, which is the goal of this subsection.

(1) Governance approaches in the context of different ecosystem types: Studying lead firms' approaches to ecosystem governance, the literature commonly distinguishes between governance in the context of platform ecosystems and governance in the context of innovation ecosystems (e.g., Cusumano et al., 2019; Jacobides et al., 2018; Kapoor, 2018). This distinction stems from the different interdependencies that

exist in these separate ecosystems types, which have important implications for lead firms' governance choices (Kapoor, 2018), as I shall explain in more detail in the following paragraphs.

Standardized governance in platform ecosystem types: In platform ecosystems, i.e., ecosystems where a central technological platform builds the ecosystem's core (see 2.2.1), the "hub-and-spoke" interdependencies between lead firm and complementors are commonly managed through a standardized, formal, market-based governance approach (Kapoor, 2018). As describe above (see 2.2.1), lead firms have a very central position in these ecosystems by providing the technological platform that serves as the "coordinating artifact" for lead firms' governance activities (Autio & Thomas, 2014). If they own the technological architecture that serves as a basis for the ecosystem, lead firms can embed the rules for participation and coordination directly into the platform (Bakos & Katsamakas, 2008; Thomas & Autio, 2014). In defining the modularity of the system and the design of interfaces needed to connect to the platform (Cusumano & Gawer, 2002; Gawer & Cusumano, 2008), lead firms of platform ecosystems can exercise control over the ecosystem and its development (Baldwin & Woodard, 2009; Tiwana et al., 2010). For example, the lead firm can determine who is allowed to connect on a particular interface and participate in the ecosystem, and under which conditions this is allowed. Hence, in such settings, the lead firm's control and coordination is normally based on and embedded in the technological architecture of the platform or ecosystem (Autio & Thomas, 2014; Thomas & Autio, 2014). A defining characteristic of platforms is a clear hierarchical gap between the lead firm and its complementors, which typically all have to comply with the same set of governance rules (see for example, Cutolo & Kenney, 2020, or Rietveld et al., 2020; or empirical studies of Wen & Zhu, 2019, or Zhu & Liu, 2018). However, when complementors are very heterogeneous, especially regarding their structural position and activities in the ecosystem (Adner, 2017), such a standardized governance approach might fail to take the complementor specificities into account, thereby leading to suboptimal outcomes.

Tailored governance in innovation ecosystem types: As described above (see 2.2.1) literature on innovation ecosystems attends to settings in which participants organize around a focal value proposition (Adner, 2017) rather than around a central platform (see Ganco et al., 2020; Hannah & Eisenhardt, 2018). Given that innovation

ecosystems are focused on a new innovation or value proposition that requires multiple diverse actors' participation, such systems' primary interest is to understand how participating firms collaborate and link their individual products or services to create and sell the ecosystem value proposition (Jacobides et al., 2018). In such settings, the individual actors' contributions can be connected and combined in a variety of ways, and actors can use different collaborative arrangements, i.e., organizational forms and governance mechanisms, as basis for their activities (Adner, 2017; Jacobides et al., 2018; Kapoor & Lee, 2013). Hence, lead firms' interdependence with individual complementors can be managed by a tailored mix of formal and informal governance mechanisms that accounts for complementors' position in the ecosystem structure (Kapoor, 2018). However, this requires a high level of integrative capability (Helfat & Raubitschek, 2018) in the lead firm, which has to balance numerous tensions that can arise between differently positioned firms within the ecosystem (Nambisan & Sawhney, 2011; Wareham et al., 2014). Given that the broad range of heterogenous complementors (Adner & Kapoor, 2016) can result in partners presenting contradicting strategies and visions among participants (Adner, 2017), aligning a large number of ecosystem participants can become a challenging task (Dattée et al., 2018) that might stretch the lead firm's leadership capabilities (Helfat & Raubitschek, 2018). Hence, in contrast to platform ecosystems, where the standardized governance approach can be put to practice (Kapoor, 2018), governance-related challenges are especially salient in innovation ecosystems, where creating alignment with partners requires tailored approaches. Consequently, questions revolving around the alignment and coordination of ecosystem participants are of primary interest to this literature stream (Jacobides et al., 2018).

(2) Governance challenges in ecosystems: Irrespective of the specific ecosystem type and corresponding governance approach (standardized governance vs. tailored governance), lead firms face a series of critical governance challenges. The following paragraphs focus on two related governance challenges that are prominent in research on ecosystem governance. These challenges relate to the question on how to balance openness and control, and how to account for various external factors that influence the effectiveness of lead firms' governance decisions.

Openness as governance challenge: Recent technological advances have led to a unprecedented surge in task modularization and disaggregation of value chains (Gulati et al., 2012). This development has led to a situation in which value generating innovative activities (which have traditionally been located within the boundaries of a single firm) are increasingly spread across a broad array of firms (Baldwin & Hippel, 2011). However, while the world of practice is shifting towards more "open business models" and models of multi-firm collaboration and coordination across firms (Jacobides, 2019; Nambisan et al., 2019), the literature has been slow to react to this development and is still mainly focused on intra-firm settings and mechanisms that do not sufficiently explain how firms take decisions when resources portfolios span across multiple firms (Gulati et al., 2012).

To do justice to this development, the study of firms' boundary choices and of the links between multiple diverse firms that contribute complementary resources to a focal ecosystem value proposition has received increasing scholarly attention (see, Adner & Kapoor, 2010; Ghazawneh & Henfridsson, 2013; Gulati et al., 2012; Kapoor & Lee, 2013). When innovative activities are spread across multiple firms, a better understanding of firms' boundary choices is critical because the design of firm boundaries will have important implications for participants' ability to create and capture value from their activities (Zenger, Felin, & Bigelow, 2011; Zobel & Hagedoorn, 2020). Consequently, a fundamental governance decision in this respect concerns the decision about the ecosystem's "openness."

Generally, the term openness relates to the permeability of firm boundaries and describes the degree to which the firm's value chain is disaggregated and external suppliers and complementors are involved in value chain activities (Jacobides et al., 2006; Thomas et al., 2014). However, the term's definition is not entirely clear-cut and the term has been used differently across literature streams. In the platform literature, the term is commonly used to describe the openness of technological interfaces, as technological connection point between lead firm and complementors (Baldwin, 2015). For example, Gawer (2014) defines an open interface as one that allows complementors to access information required in building complementary products and services. Depending on the extent to which this information is shared with others, Gawer (2014) distinguishes between closed interfaces (when information is not shared at all), semi-

closed (when information is shared exclusively), and open interfaces (when information is shared openly with all complementors). Similarly, Boudreau (2010, p. 1851) states that "openness relates to the easing of restrictions on the use, development, and commercialization of a technology."

In the ecosystem literature, according to Jacobides et al. (2018) the rules related to membership participation and the governance related to rule-setting factors determine how open ecosystems are. The latter definition is very similar to the distinction between access and control, which is a common distinction in the platform literature (e.g., Baldwin & Woodard, 2007; Boudreau, 2010). So, comparing the various definitions of "openness" in the different literature streams, the term generally describes outsiders' ease of participation, i.e., the ease with which they can "plug-in" and participate (see also Baldwin & Woodard, 2007). Defining the rules related to membership (i.e., access) and control (i.e., decision-rights portioning) thus forms a critical aspects of the formal governance mechanisms, and is a key tool with which lead firms can control complementors' access and behavior (e.g., Boudreau, 2010; Jacobides et al., 2018; Wareham et al., 2014).

Technology firms such as Microsoft, Intel and Apple, although just a few, probably represent the most famous examples of firms that turned their core offerings into powerful platforms and built large ecosystems around their core businesses. With such an open set-up, allowing other firms to build on and leverage lead firms' platforms and resources, the lead firms can benefit from access to a broad range of new ideas from outside firms (Chesbrough, 2003a; Quinn & Hilmer, 1994; Rigby & Zook, 2002). As Nambisan et al. (2019, p. 2) noted: "Openness of the ecosystem or community implies that collectives (of individuals or organizations) can pursue innovation/entrepreneurship collaboratively." Following from this, lead firms can build value propositions that are far more comprehensive than they could provide on their own (Jacobides, 2019). So, while open boundaries have apparent advantages, collaborating with complementors does also induce a series of important trade-offs and challenges related to governing the relationship to complementors (Wareham et al., 2014) and the management of resources beyond firm boundaries (Tanskanen, Ahola, Amino, Bragge, & Kaipia, 2017).

First and foremost, although an open ecosystem facilitates greater generativity, increasing an ecosystem's generativity does not necessarily lead to positive results only

(Foerderer, Kude, Schuetz, & Heinzl, 2014). The ecosystem needs to be sufficiently open to encourage third party participation (Chesbrough, 2003a), but at the same time should be sufficiently closed to avoid possible negative consequences that can result from loss of control (Boudreau, 2010). The challenge of finding the right degree of openness is based on an elementary trade-off, also known as "diversity vs. control" (Boudreau, 2010, 2012; Tiwana et al., 2010; Yoo et al., 2012). More specifically, whenever lead firms open the ecosystem to invite complementary solutions and increase the innovative output (Tiwana, 2014), they risk greater fragmentation, inefficiencies, inferior user experience, and overcrowding (Wareham et al., 2014), which can result in quality issues (Jacobides, 2019). This is because with the ecosystem's increasing openness, it becomes harder to coordinate resources (Benlian et al., 2015) and cultivate the ecosystem (De Reuver, Sørensen, & Basole, 2018). These problems can result from the higher number of players and interests involved (Almirall & Casadesus-Masanell, 2010), as well as from the diminishing control over the ecosystem's integrity and strategic direction (Boudreau, 2012). The independent complementors might develop offers that do not coincide with the strategic intent of the lead firm (Benlian et al., 2015; Boudreau, 2012). If, as a consequence of this, the ecosystem offering becomes overly diverse and inconsistent, it also becomes less useful, which ultimately reduces the customers' and complementors' incentive to participate (Boudreau, 2012; Cusumano & Gawer, 2002; Foerderer et al., 2014; Katz & Shapiro, 1994).

Rather than taking a passive role and allowing uncontrolled generativity to unfold and develop, lead firms have to impose some control mechanisms (Tiwana et al., 2010; Wareham et al., 2014) to coordinate complementary activities and ensure that partners collectively work toward the envisioned ecosystem value proposition (Dattée et al., 2018). While a number of formal and informal control mechanisms can be helpful in this regard (Tiwana et al., 2010), excessively strict control measures can discourage complementors (Boudreau, 2010, 2012). Due to this crucial trade-off, finding the right balance between "diversity vs. control" has been an important topic in ecosystem- and platform-related research ever since (Boudreau, 2010, 2012; Tiwana et al., 2010; Yoo, Henfridsson, & Lyytinen, 2010).

External factors as governance challenge: While finding the right balance between openness and control is critical, lead firms' governance challenges do not end

there. To secure the ecosystem's longevity, lead firms also need to consider how external factors, such as changing customer preferences, advances and changes in technology, or actions of competing ecosystems, could affect the ecosystem's health and performance. In this light, another prominent governance challenge that applies to all ecosystems, irrespective of the type, is that lead firms' governance decisions need to be consistent with the exogenous environment in which ecosystem activities are embedded (Tiwana et al., 2010). The lead firm, as in fact the entire ecosystem, does not exist in an isolated space; both are thus subject to environmental dynamics that can affect the appropriability of lead firms' decisions regarding the ecosystem blueprint and related governance decisions (Tiwana et al., 2010). Tiwana et al. (2010, p. 682) noted that "architectural and governance choices that are appropriate for one environmental context might be inappropriate for another." Inappropriate governance decisions can therefore negatively impact an ecosystem's ability to recognize and act upon new developments in its environment (Dattée et al., 2018; Tiwana et al., 2010). For example, if shifting customer preferences render certain components of the ecosystem value proposition redundant, or if the technological trajectory shifts dramatically, unfavorable governance decisions might negatively influence a lead firm's ability to adjust the mix of partners and correct the course of joint explorative search activities accordingly. Especially in an environment characterized by high uncertainty and rapid changes in the underlying technology (Dattée et al., 2018; Tiwana et al., 2010), the ability to flexibly adjust the course of action can be critical to the ecosystem's success.

However, prior research has observed seemingly divergent ways of addressing this challenge: In their study of how lead firms' reduced the range of possible alternative paths and aligned complementors around the preferred blueprint, Dattée et al. (2018) observed that ecosystem creation was a dynamic process characterized by "collaborations to explore plausible service-level applications, interactions to define requirements of the deep-layer enabling technology, early developments with a few selected partners, and increasing commitments to an emerging blueprint" (p. 485). Such close collaborations with selected partners can facilitate lead firms' effort to orchestrate the kind of coordinated response required to commercially exploit a new technology (Adner & Kapoor, 2010; Kapoor & Lee, 2013). In contrast, other scholars noted that open, modular interfaces and collaborations with multiple different partners can create a form of flexibility for lead firms that is necessary when the future trajectory is

uncertain (Baldwin & Clark, 2000; Gamba & Fusari, 2009). From the latter perspective, cultivating multiple strategic and operational alternatives, or "real options," is considered to be a valuable strategy, helping (lead) firms to counter uncertainty in their environment (Adner & Levinthal, 2004; Gruber et al., 2008; McGrath & MacMillan, 2000; Tiwana et al., 2010). Hence, while environmental conditions influence the appropriability of ecosystem blueprints and governance decisions (Dattée et al., 2018; Tiwana et al., 2010), different strategies seem to exist. So far, research exploring the fit between ecosystem design, ecosystem (governance) strategies and the environmental dynamics has been relatively scant. To shed more light on these aspects, scholars have encouraged research that explores how lead firms' decisions aid effective responses to environmental dynamics (McIntyre & Srinivasan, 2017; Tiwana et al., 2010).

So, as outlined above, lead firms not only need to find the right level of control, but should also consider how their governance decisions fit into the broader, potentially (partly) uncertain environment. Finding appropriate answers to these questions is important, however, if lead firms – together with their existing or new partners – want to be able to react in accordance with changes in their environment (e.g., technological shifts or changes in customer preferences). The aforementioned challenges are thus closely linked to this dissertation's research agenda, as lead firms' governance decisions determine both the level of control and the space to maneuver in an uncertain environment.

2.3.3 Understudied Aspects of Ecosystem Governance

Lead firms have to deal with multiple heterogenous complementors in innovation ecosystems and coordinate their activities to provide a consistent ecosystem value proposition. As discussed above, this will include the critical decisions regarding how to balance openness (i.e., to encourage third-party contribution and provide access to the ecosystem) and control (i.e., to protect lead firms' own technology, product, or service, and to keep control of the overall ecosystem development) (e.g., Tiwana et al., 2010; Wareham et al., 2014). The fact that lead firms face different kinds of uncertainty (e.g., regarding the blueprint, the technology, the customers' preferences, the partners' behavior) (Adner & Kapoor, 2010; Dattée et al., 2018) makes these decisions even more complex. How the lead firm defines each complementor's role in designing the

ecosystem blueprint is thus a critical task (Jacobides et al., 2018) that underlines the lead firm's role as an "architect" of the emerging ecosystem (Williamson & De Meyer, 2012). Although extant research has provided valuable insight regarding the lead firm's role, it is important to examine decisions and choices related to the lead firm's boundaries (Bogers et al., 2017; Saadatmand et al., 2019) as well as the rules related to membership and collaboration in ecosystems (Jacobides et al., 2018), in more detail.

More specifically, the literature shows that ecosystem governance is particularly challenging when numerous and heterogeneous complementors have to align to provide a complex, integrated value proposition. However, to date, only a few empirical studies have investigated governance mechanisms in innovation ecosystems (see Jacobides et al., 2018; McIntyre & Srinivasan, 2017), while even fewer studies have explored different "ecosystem governance modes" (Thomas & Autio, 2020) applied within the context of a single ecosystem. Consequently, our knowledge of how the use of formal and informal governance mechanisms varies between heterogeneous groups of complementors and how they are combined with traditional organizational forms (Zobel & Hagedoorn, 2020), remains limited. In this dissertation, I aim to contribute to these gaps by developing a more nuanced understanding of how lead firms define the organizational form and the mix of formal and informal governance mechanism in innovation ecosystems with heterogeneous complementors.

3 Data and Methods

In this chapter, I discuss my methodological choices. I describe the research setting (3.1), the research design (3.2), the data on which the analysis is built (3.3), and the approach to analyzing the data (3.4). I also clarify the measures taken to ensure the trustworthiness, reliability, and validity of my research findings.

3.1 Research Setting

My research setting is the European banking industry, which has experienced a surge in "open banking" and ecosystem-based business models, making it a particularly attractive setting for my research. The banking industry, which has traditionally been characterized by a high degree of vertical integration, has experienced dramatic changes (see Gianiodis, Ettlie, & Urbina, 2014; Lynn, Rosati, & Cummins, 2020). For many centuries, banks were vertically integrated, offering a broad variety of financial products and services to their customers, essentially building a link between customers and the financial market (i.e., other financial institutions or firms providing infrastructure services, e.g., for making payments). However, while banks used to "own" the entire customer value chain, ranging from "front-office" services such as sales to "back-office" services such as payments and operations, in the recent past a number of factors have changed the industry's landscape (Gianiodis et al., 2014; Junghanns & Niebudek, 2019; Lynn et al., 2020).

First, regulatory changes, such as the European Union's Payment Service Directive (PSD2), initiated a push toward more open business models in banking (Zachariadis & Ozcan, 2017). The directive has given third parties mandatory access to customers' payment accounts with the customers' consent, and thus has accelerated the disaggregation of the industry value chain (Diamond et al., 2019). As expected, the directive triggered a large initiative toward ecosystem-based approaches in banking, reaching far beyond payment accounts originally covered by the directive (Farrow, 2020b, 2020a; Moysan & Rudnicki, 2019).

Second, technological disruptions have also affected how banks organize their operations. The emergence of specialized firms along the industry value chain gradually eroded the advantages of vertically integrated models, increasingly encouraging established banks to enroll FinTechs to provide state-of-the-art technology services and products. The trend to collaborate with FinTechs has been particularly salient with regard to activities located upstream in the industry value chain – for example, the infrastructure- and technology-related processes that improve the core offering of the bank. This is where specialized firms began to pioneer solutions based on new technology such as AI-empowered fraud detection, robot advisory for investments and so forth.

Third, large technology firms (such as Google, Facebook, and Amazon), have intensified their efforts to enter attractive segments of the financial services industry. One example is the payment segment, which is the segment with the highest level of customer interaction and the most touchpoints. Initiatives such as Google Pay, Apple Pay, Facebook's Libra, WeChat's payment function, and Amazon's partnership efforts with banks are all strong indicators of heightened competition in the financial services industry and pose a real threat to established banks.

Over the last decade, these trends, together with customers' expectations of compelling digital value propositions, have sparked growing numbers of new partnership models and initiatives in the financial services industry, thereby contributing to the increasing disaggregation of the industry and bringing a spike in ecosystem- and platform-based business models. Again, this combination of factors ensures an ideal setting for my research.

3.2 Research Design

The research approach used in this study builds on a multiple-case study design and engages in grounded theory-building (Eisenhardt, 1989; Strauss & Corbin, 1990). The decision to adopt this method was based on a number of considerations. First, there is a lack of prior theory and research regarding the governance-related decisions in ecosystems. Grounded theory-building from cases is especially suitable in new topic areas (Eisenhardt, 1989) and in the absence of prior theory explaining the phenomenon

(Graebner, 2004). Second, the case study research method is particularly suitable in situations in which the investigator aims to explore "how" or "why" questions (Eisenhardt & Graebner, 2007). Third, the methodology permits the collection and comparison of multiple cases and is thus likely to yield a more precise and more generalizable conceptual model than a single case design (Eisenhardt, 1991; Yin, 2018).

The banks in my study are all key players in the European banking industry and the ecosystem initiatives I investigated are all comparable in terms of size and geographic scope. The selection of firms was based on the following criteria: First, given my dissertation's research focus, I initially needed to identify firms where the phenomenon of interest was likely to be observable. To that end, I used insight developed in over 100 interviews with executives from more than 80 different organizations to evaluate their research fit.⁸ This initial list was further extended by 20 additional firms based on an outside-in analysis of their respective business models (these firms were not included in the initial interview group).

Second, to facilitate the comparability of cases, I decided to restrict my focus to one industry. For this reason, I initially divided the long list of firms into separate industries, each of which was global in terms of its markets, competitors and collaboration network. As a next step, I compared the firms within each industry to specify the most promising industry for this study. This comparison was based on two criteria: 1) The industry needed to have enough firms in the sample to allow for a multiple-case comparison (factoring in that not all firms would accept the research request); 2) The industry needed to show characteristics that supported the aim of my study (e.g., high degree of digitalization, presence of comparable ecosystem initiatives) and it had to lend itself to cross-case analysis (i.e., level playing-field in terms of geographic scope, maturity and business models between firms). This analysis led to the selection of the financial services industry and a preliminary short list of 24 firms.

Third, I contacted these 24 firms to enquire about their interest in participating in my research, which resulted in a refined short list of seven financial services institutions that signaled their willingness to participate. Figures A1 and A2 in Appendix A show

⁸ These interviews were part of another study that was conducted together with other researchers. I conducted 32 of these interviews myself.

sample letters of the research requests that were sent out via e-mail to the shortlisted firms.

Fourth, I conducted short exploratory interviews with key contacts from each firm, thereby ensuring their fit for my research. I ensured as far as possible that the firms were collaborating with independent external partners to work on new ecosystem value propositions and that their activities were in advanced stages of implementation (i.e., the collaborations had to be established and past the early conception or planning phases). This ensured that all firms had established governance guidelines or policies and that discussions could revolve around the ecosystem's emergence, the relationships therein, as well as around established rules of collaboration with partners. This process resulted in a refined list of five banks, which I included in my study. Lastly, for those banks that had multiple parallel ecosystem initiatives (e.g., one focusing on housing, another on personal finance), I asked the banks' informants to help me identify the initiatives (hereafter referred to as "cases") most suitable to my investigation (i.e., where governance-related questions between hierarchically-independent partners were best observable).

The selection of cases was thus based on theoretical sampling (Glaser & Strauss, 1967). This sampling approach permits the use of cases that are best suited to "fill theoretical categories and provide examples of polar types" (Eisenhardt, 1989, p. 537), in which the phenomenon of interest is "transparently observable." The number of cases complies with Eisenhardt's recommendation regarding the sample size for a multiple-case method approach (Eisenhardt, 1989). In her seminal work, Eisenhardt (1989, p. 545) states that "a number between 4 and 10 cases usually works well" and allows for sufficient complexity in the theoretical constructs without creating too much complexity and volume of data. A sample size of five allows for a systematic and methodical description and analysis, as well as for a comprehensive contextual interpretation of case data (Haeffliger, Jäger, & Krogh, 2010). An overview of my final cases, which I will refer to as "Alpha," "Beta," "Gamma," "Delta," and "Epsilon," and their most important characteristics is given in Table 3.

3.3 Data Collection

I used several data sources to triangulate the findings of each case, which improves confidence in the accuracy of the findings (Jick, 1979; Ozcan & Eisenhardt, 2009).

First, I collected archival data, including business publications, internet sources, corporate material such as internal memos and presentations, and other documents informants provided. The archival data constituted a helpful source of information and allowed me to probe the insights gathered from the other sources, to control for retrospective bias and to triangulate information (see Gilbert, 2005).

Second, I conducted a number of pilot interviews (12 in total) with industry experts as well as leading scholars in the field. These informants were individuals who had significant experience related to the phenomenon, the financial industry, as well as the firms I had chosen. I used the findings from these interviews to support my case selection, to develop the interview guides, and to facilitate the data interpretation.

Third, I conducted semi-structured interviews, which formed the primary data source for my study. Following the method of Graebner (2004), the informants were identified through "snowball sampling," whereby the initial contact identifies further respondents (i.e., individuals who had been most involved in the ecosystem's decision-making processes). The group of informants for each firm typically included a member of the executive board, the vice president in charge of strategic planning or strategic relationships, and the vice president in charge of digital business development. I collected qualitative data in 33 interviews with these executives. Prior to the interviews, I explained the topic and purpose of my research to each informant. In addition, prior to each interview, I reviewed information from previous interviews and archival data. However, to encourage candid answers and to ensure informants' anonymity, this information was not shared with subsequent interview partners.

The interview guide consisted of three parts.⁹ The first part included general questions about the ecosystem's history and the informant's role and involvement in the ecosystem, among others. This part of the interview helped me to get a general grasp of

⁹ My interview approach was very similar to the one used by Ozcan and Eisenhardt (2009).

the situation and of the role the informants played. The second part of the interview included a series of open-ended questions about the major events in the formation of ecosystem ties with complementors, the evolution of each relationship, how the opportunity had presented itself, and so forth. In the third and final part, the questions focused on the governance decisions, as well as on specific issues that the ecosystem and related literature had identified as critical. I asked questions about the informant's perspective on governance mechanisms, his or her perception of the distribution of power and control rights within the ecosystem, and the drivers of governance-related decisions. This interview structure guided the interviews and allowed me to collect specific, factual information on the case, as well as more open-ended narrative information (see Ozcan & Eisenhardt, 2009). Table A1 in Appendix A shows the structure of the interview guide and exemplary questions from each of the three parts. Whenever possible, interviews were recorded and transcribed directly after the interview. The transcriptions were done as closely to verbatim as possible, in order to avoid any unconscious bias during transcription.

Finally, I conducted a number of follow-up conversations with informants after the initial data collection phase, mainly via e-mail or telephone. The purpose of such follow-ups was to fill identified gaps in the data or to clarify statements found to be vague.

The interviews were conducted both in German and in English. Similarly, the archival case data collected for this study was both in German and in English. All data (interview transcripts and archival data) was kept in the original language throughout the data collection and data analysis phases. For ease of presentation and reading, I translated the German texts to English. The translation was reviewed by a professional proofreader after the data analysis phase.

As the interview data was my main source of information, it was important to prevent information bias, retrospective sensemaking, and social answering to ensure the reliability of my results (Eisenhardt & Graebner, 2007; Miller, Cardinal, & Glick, 1997). Following practices applied by Bourgeois and Eisenhardt (1988) and Ozcan and Eisenhardt (2009), I addressed potential information bias in several ways. First, the up-front definition of a clear research question and the development of clear interview guidelines prior to data collection (with extensions and additional questions where it

seemed appropriate) ensured process consistency and strengthened the internal validity of my findings (Yin, 2018). Second, I complemented each interview with extensive notes that included all information, irrespective of the apparent relevance at the time of the interview (Eisenhardt, 1989). Third, to reduce recall and rationalization bias, I cross-checked interview information based on data collected from archival sources and information gathered in prior interviews. Fourth, I interviewed executives from multiple levels and from diverse functional disciplines, which produced various perspectives and reduced informant bias (Maxwell, 2005; Miles & Huberman, 1994). Also, all interviewees were motivated to participate in the study, and they found the topic interesting themselves, which has proven to increase the validity of results (Miller et al., 1997). Fifth, to encourage candor, I assured the informants that their information would remain anonymous (Ozcan & Eisenhardt, 2009; Schweisfurth & Herstatt, 2014), which also reduces recall bias (Huber & Power, 1985). Sixth, I prepared and submitted a summary of the case descriptions and proof quotes to the informants to increase the reliability of my findings. Their comments and remarks were subsequently incorporated in the text. Seventh, the theoretical sampling approach and the close reflection of and iteration with extant literature are both proven measures to strengthen the theoretical arguments and improve the validity of results (Eisenhardt, 1989; Kester, Griffin, Hultink, & Lauche, 2011; Ozcan & Eisenhardt, 2009). Finally, I continuously discussed the emerging conceptual framework and empirical findings with research partners and supervisors. The research partners and supervisors, who were not involved in the data collection, played a "devil's advocate" role (Järvi et al., 2018) by critically questioning and evaluating each step. Overall, while no method is perfect, I put great emphasis on the data collection procedure to deal with typical reliability and validity issues.

Table 2 provides an overview of my data collection.

Table 2*Overview of Data Collection*

(1) Archival data			
Internal communication documents (if available)	- Internal presentations		
	- Workshop material		
External communication documents	- Press releases		
	- Website information/announcements		
	- Company presentations (e.g., on firm website)		
	- Management interviews on ecosystem activities		
Other publications relating to the cases/the study	- Third party research on open banking		
	- Expert interviews/publications		
	- Industry reports (e.g., open banking monitoring report)		
(2) Expert interviews			
Back-ground	Role/focus	Count	Duration
Practitioner	Consulting expert for Digital Banking	1	80 min
	Expert on Open Banking regulation	1	30 min
	Expert on FinTech collaboration	1	60 min
	Expert on Open Banking and PSD2	1	45 min
	Expert on Open Innovation	2	83 min (1x 36 min, 1x 47 min)
	CCO of European Bank	1	60 min
	Expert on Open/Digital Banking	1	90 min
Academic	Research focus on ecosystems	1	60 min
	Research focus on software platforms	1	45 min
	Research focus on meta-organizations	1	45 min
	Expert on qualitative research	1	45 min
Total		12	Ø 54 min (643 min in total)

(Table continued on next page)

*Overview of Data Collection (continued)***(3) Case interviews**

Case	Interviewee position	Count	Duration
Alpha	Chief Digital Officer	1	30 min
	MD of Innovation & Digital Strategy	1	30 min
	Head Platforms & Disruptive Techn.	1	65 min
	Project Manager	1	60 min
	Head of Innovation Lab (Europe)	1	30 min
	Vice President 1	2	75 min (1x 30 min, 1x 45 min)
	Vice President 2	1	45 min
	Vice President 3	1	60 min
Beta	Head of Digitalization Strategy	1	30 min
	Head of Lending Journeys	2	60 min (2x 30 min)
	Partnership Manager 1 & 2	1	45 min
	COO of Digitalization & Head of Digitalization Strategy	4 ¹⁰	210 min (2x 60 min; 2x 45 min)
Gamma	Head of Digital Strategy	1	30 min
	ED & Partnership Manager	2	90 min (2x 45 min)
	Managing Director & BU Head	1	60 min
	Program Manager	1	30 min
	ED of Corporate Development	1	30 min
	Head of Lending Platforms	1	45 min
Delta	Head of Ecosystem Partnerships	2	150 min (1x 60 min, 1x 90 min)
	Board Member of Ecosystem Venture	1	45 min
	CEO of Ecosystem Venture	1	60 min
Epsilon	Chairman of the Board of Directors	4	250 min (1x 34 min, 2x 60 min, 1x 96 min)
	Board Member Ecosystem Venture	1	60 min
Total		33	Ø 48 min (1,590 min in total)

(4) Follow-ups

Selected follow-ups (mainly via telephone) to fill gaps in the data, clarify statements that were vague or to focus on specific events or decisions more deeply.

¹⁰ Interviews were conducted by fellow researchers who kindly allowed me to use the interview data for this study.

3.4 Data Analysis

My data analysis followed established practices of comparative case study research, using rich case descriptions and within-case and cross-case comparison techniques (Eisenhardt, 1989; Yin, 2018). I initially assembled all data (interview transcripts, archival data, publicly available data and interview notes) for each case to create individual case write-ups. The resulting case write-ups involved narratives, selected quotes from informants, and tables summarizing key facts about the ecosystem. Once this had been completed, I started the coding process on a within-case basis, using a thematic coding approach (Flick, 2006; Yin, 2010).¹¹

In a first step, I engaged in a careful and "active" reading of the data, looking out for possible patterns and differences that emerged during this process (Braun & Clarke, 2006). In a second step, I searched for and coded statements about the governance choices and partner characteristics in each case, which resulted in a preliminary list of first-order codes that I consolidated across all cases. In a third step, I continuously iterated the coding, moving between the data and literature. This process helped me to further consolidate and group first-order codes that shared common characteristics into more general second-order themes. In a fourth and final step, I grouped second-order themes into aggregate themes by further abstracting the second-order themes and iteratively cycling between the data and the literature. The final aggregate themes appeared to best reflect the key elements of the overall story that emerged from the data. I independently conducted the first round of coding. Once this was completed, a research colleague interrogated the coding as "devil's advocate" (Eisenhardt, 1989; Järvi et al., 2018), which helped to further validate and refine the codes and themes. The final data structure is shown in Table B1 and B2 in Appendix B.

The case write-ups (including the tables and charts) and the thematic coding structure developed throughout the coding process served as a starting point for my cross-case comparison (Flick, 2006; Masucci et al., 2020). The cross-case comparison aimed to identify patterns through a systematic and iterative search for similarities and

¹¹ My approach was thus very similar to the one used in related studies on ecosystems (see Hannah and Eisenhardt, 2018; Järvi et al., 2018; Masucci et al., 2020).

differences across the five cases (Yin, 2018). More specifically, I checked for the presence of similar themes across multiple cases and whether I could determine similarities in multiple settings (Eisenhardt, 1989). The aim was to reveal patterns across variables of interest that could possibly explain the different governance decisions that I observed in the data. This flow of actions allowed me to identify distinct patterns and categorize cases according to variables of interest, such as the presence of uncertainty or a mix of formal and informal governance mechanisms. Based on this approach, I was able to induce tentative propositions between the variables. Once a set of tentative proposition had been developed, I applied the replication logic and revisited the data to see whether the data confirmed the proposed relationships and the emerging conceptual framework (Eisenhardt, 1989; Yin, 2018). The iterative cycling between proposed relationships and case data allowed me to challenge propositions and further improve my understanding of each case's underlying dynamics. I was thus able to build my model and elaborate on the relationships between the concepts that had emerged from the single case analysis. In addition to the iterations between data and emerging theoretical concepts, I used existing literature to better ground my theoretical constructs and reflect the relevance of theoretical insights. I thus "enfolded" relevant literature into my analysis, following recommended approaches to inductive theory development (Eisenhardt, 1989; Glaser & Strauss, 1967).

As discussed earlier, I put considerable emphasis on a careful research design to ensure rigor and validity, which is also true for the data analysis process. First, to enhance the external validity of my constructs, all elements of my model were compared and evaluated against the backdrop of existing literature (Eisenhardt, 1989) in the field of ecosystem research. Second, although I noticed some similarities and differences among the five cases during the analysis phase, I maintained individual case studies to support the replication logic across cases (Graebner, 2004). Third, the multiple-case research design further facilitated the external validity of my work (Yin, 2018). Fourth, throughout the data analysis process, findings and issues were regularly discussed with research partners and supervisors until we reached consensus regarding gaps to be filled, interpretation of findings, and possible alternative explanations (discussions took place at research seminars and in regular meetings with my supervisors). The results of this cross-case comparison are reported in Table 4.

4 Empirical Case Evidence

All banks' ecosystem strategies started out with the objective of staying relevant in the eyes of the customer due to a changing industry landscape characterized by de-regulation and new (digital) entrants. The banks feared becoming mere banking services providers without direct customer contact. *"Otherwise you risk becoming a disrespected niche player in the digital age. And it's extremely important that we want to avoid that, of course"* (Case B_Respondent C). Recognizing the growing success of platform-based and ecosystem-based business models in other industries, all the banks in my sample considered an ecosystem approach to be the way forward in responding to these emerging market challenges. Despite this common starting point, the five ecosystems varied in their respective ecosystem value propositions and the scope of activities, as shown in Table 3. The market launch of the five ecosystem cases I analyzed in this study was between 2016 and early 2020. Two of the cases (Alpha and Beta) aimed to expand the bank's existing online platform to a broad ecosystem with a variety of products and services; the other three cases (Gamma, Delta, Epsilon) aimed to establish an ecosystem focused on a specific customer journey (i.e., housing).

Their in-depth investigation allowed me to uncover several interesting patterns and differences in their ecosystem strategies and governance approaches, both within as well as across cases. The following case narratives, which are based on the accounts of the managers involved in the ecosystem initiatives and on related archival data, demonstrate aspects of the cases that help us to understand important implications for subsequent governance decisions.

4.1 Identifying Lead Firms' Ecosystem Strategy and Approach

4.1.1 Case Alpha

The bank's ecosystem activities started in 2016 when the bank adopted a new strategy to move beyond purely bank-related products and services. Alpha noticed that its customer relationships would be disrupted by digital entrants or competitors unless it found a way to stay relevant for its customers. *"Why aren't we offering more than just*

account, card, credit? (...) Guided by the goal 'How can we become more?', so how can we become something like a Financial Life Advisor for our customers?" (Case A_Respondent C). Consequently, Alpha planned to strengthen and expand its value proposition through an ecosystem of partners, adding complementary products and services to its existing business. Alpha explicitly distinguished between three different complementor groups (also called "ecosystem dimensions" by respondents), depending on the distance from its existing banking products. "Core banking" partners, the first group Alpha added to its ecosystem, assist by delivering products and services that readily strengthen the bank's existing banking value proposition (e.g., through improved payment solutions). "Near banking" partners complement Alpha by delivering financial products (e.g., deposit solutions) or products that are very close to a typical bank's offering (e.g., insurance products). The third complementor group, which Alpha called "beyond banking" partners, offers complementary products and services that expand far beyond the usual product offering of a traditional bank (e.g., tax administration, property solutions). The role of these complements is to increase the relevance of Alpha in the daily lives of its customers and increase the number of touchpoints with customers: *"We obviously want to be a platform of choice for our customers, not only to buy our products, but also to buy additional services"* (Case A_Respondent F).

Uncertainty underlying the relationship to complementors: Given the proximity of the "core banking" partners' offering to Alpha's established business, Alpha has a very clear view of what its partners' tasks and responsibilities should look like. *"I would say, from a relational perspective, in a way that's rather a vendor relationship"* (Case A_Respondent F). That is, Alpha can clearly specify the functionalities and performance requirements that it expects from its partners in this domain of the ecosystem blueprint. Similarly, as far as "near banking" partners are concerned, Alpha is quite familiar with the partners' offering and knows how to integrate it in the value proposition of the emerging ecosystem. Alpha's managers reasoned that from the perspective of the customer it would feel quite natural to buy these complements within Alpha's banking ecosystem, as one executive explained. *"The customer finds himself in [Alpha's] environment. The customer logs himself into the online banking where he can invest his money at other banks. The customer moves through the online platform where he can analyze his insurance coverage"* (Case A_Respondent C). However, the uncertainty increases with regard to the third complementor group, the "beyond

banking" partners. Given that complements from this third group are far from the bank's common area of expertise, Alpha's move "beyond banking" means completely unknown terrain for the bank as well as its customers. Not only is Alpha unfamiliar with these kinds of products and services and the way they can be sold on the platform, it is also completely unusual for its customers to find and purchase non-bank products and services on a bank's online platform. Hence, moving from "core banking" to "near banking" and eventually to "beyond banking" meant that Alpha was moving further away from its traditional core business and implied that the uncertainty with regard to the likely success of complementary offerings increased.

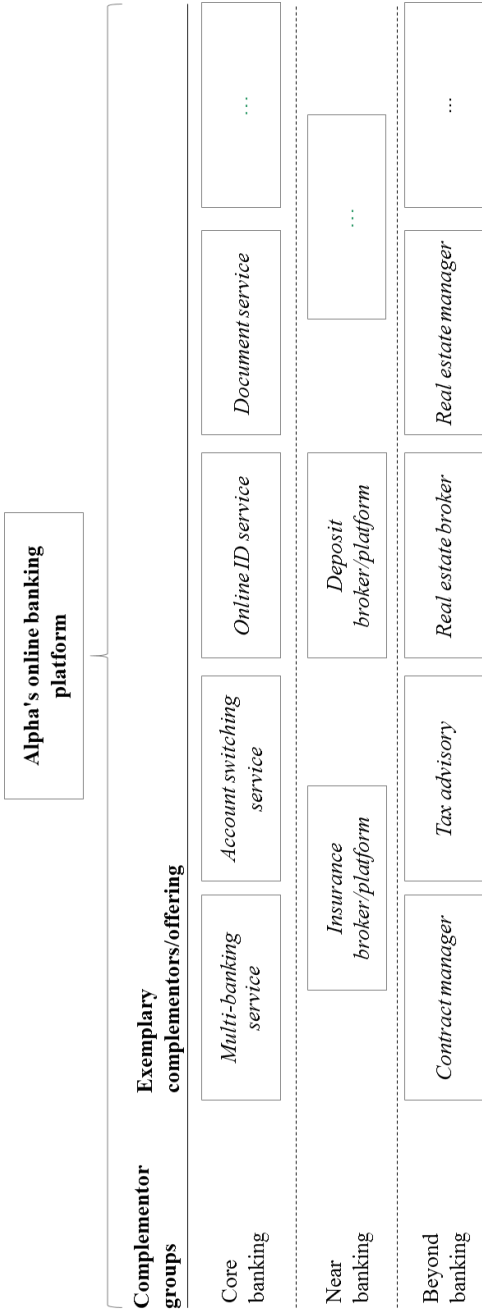
Criticality of complementors: Overall, the goal of Alpha's partnerships is to strengthen the existing offering (core banking dimension), to expand the banking-related offering for customers (near banking dimension), or to add attractive digital products and services to the online banking platform that help to keep customers on the platform and become the go-to place for all financial matters and beyond (beyond banking dimension). Differentiating between these complementor groups, informants gauged the complementors located in the core and near banking dimensions to be more critical. There are several reasons for this: First, the products or services offered in these dimensions are closely linked to and integrated with the bank's established business model. Given that the bank wants to maintain a flawless delivery of core banking services to its customers, complementors that want to provide products or services for these dimensions need to fulfill very strict access criteria in terms of quality and operational performance. Moreover, once the partnerships are established, the complementors have to undergo strict review and assessments on a regular basis (to ensure the (technical) operability, etc.). Second, the proximity of complementors' products and services to Alpha's core business implies that Alpha's and the complementors' offerings are perceived to be closely interrelated in the minds of Alpha's customers. In other words, customers apprehend complementors' products as if they were Alpha's own products. As a consequence of this, Alpha's reputation is at stake, since a negative experience with a complementor's product offering would directly fall back on Alpha. On the other hand, complementors in the beyond banking dimension are not considered to be as critical. This is because they are far less integrated into the technical systems of Alpha's existing business, so that an operational interruption would not affect Alpha's entire business. Additionally, the apparent distance of a

complementors' offering from Alpha's own core business implies that reputational risks and potential negative consequences for Alpha's established business are much less severe. Further, the complementary offerings in the beyond banking dimension are often at an early exploratory stage, which means that the volumes and traffic generated are relatively small compared to the offerings in the core and near banking dimension. As a result of the limited integration depth and the explorative nature of these partnerships, the capital expenditure and related investment risk is relatively low. So, overall, the criticality of complementors is high in the core and near banking dimensions but less so in the beyond banking dimension.

Organizational structure: In terms of the organizational structure used to embed the ecosystem activities, the ecosystem partnerships in the core and near banking dimensions are managed by the traditional business units who are closest to the respective product or service delivered by complementors. The ecosystem partnerships in the beyond banking dimension, however, are managed by a dedicated and newly founded digital unit. Nevertheless, all partnerships are built around the established business model, with Alpha's existing online banking platform building the heart and core of the ecosystem.

Figure 2 gives an overview of how Alpha's ecosystem is structured.

Figure 2
Illustrative Overview of Alpha's Ecosystem



4.1.2 Case Beta

This bank's ecosystem collaborations started in the first half of 2018 with the aim of increasing the bank's relevance in the minds of its customers. The new strategy was based on the realization that customers were increasingly expecting the same quality of service and digital experience that they were used to from large tech giants such as Amazon. As part of its new strategy, Beta envisioned a strengthening and expanding of its value proposition by adding complementors to its existing online banking platform and consequently creating an ecosystem. To identify potential products and services that could help to expand the offering, Beta analyzed the customer journey to identify customers' pain points, which it then tried to address with partners. *"We should not shy away from saying: 'That's a customer need, and we cannot fully satisfy this need independently'"* (Case B_Respondent B). Consequently, new partnerships were initiated to help Beta create a "customer stickiness" around its existing online banking platform. *"If we manage to add as many services and products of partners as possible and offer them to our customers, it will massively increase the customer satisfaction related to the ecosystem and our bank, and that's how we can create this stickiness"* (Case B_Respondent C).

Beta subsequently started three different partnerships, which it categorized into two operationally distinct groups. The first group includes two partners that assist in enhancing the value of Beta's focal banking value proposition by contributing bank-related products and services (i.e., payment and accounts receivable services). In contrast, the partner in the second group is further away from Beta's usual business domain, helping Beta explore new customer journeys that are outside the scope of traditional banking (i.e., bookkeeping), thereby also addressing new customers. Informants said that Beta will prospectively add additional complementors to its ecosystem once sufficient learnings have been created from initial partnerships.

Uncertainty underlying the relationship to complementors: Given the proximity of the first group's complementary offerings to its core business, Beta can clearly define expectations and requirements for these partnerships and draw on established processes for the assessment and selection of these partners. Informants said that they usually start with the established vendor selection process (which is used as a

baseline) and make adjustments where needed. Over the course of several meetings with potential partners, the uncertainty with regard to the partners' offering and operations is gradually reduced and the long list of potential partners is shortened step by step. The final selection of the best provider for a specific complementary product or service is usually based on a careful evaluation of the remaining three potential partners in the short list. Once the final selection is made, the further integration of partners follows a proven approach for partner management processes as well as a relatively strict protocol. Hence, although this kind of collaboration with externals is still relatively uncommon, the similarity to the relationship with traditional vendors allows Beta to build on and use established and proven processes for the partner search, selection and integration. Apart from that, the partnership with the second group's partner represented a true novelty in the industry. Both parties initially needed to run a series of mutual innovation workshops as neither side had a blueprint for how this partnership could work. Compared to the partnerships in the first group, this partnership is more explorative in nature and initially required both partners to engage in an innovative search effort to identify the right use case and approach for the future collaboration.

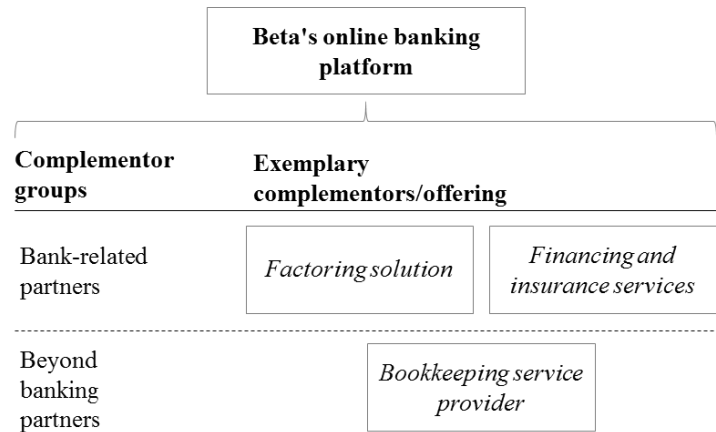
Criticality of complementors: Given that the products and services provided by the partners from the first group are very close to Beta's own business, Beta's operational and reputational risk is relatively high, especially since Beta is essentially forwarding its own clients to this group's partners. Further, the partnerships in the first group commonly require a deep technical integration and co-specialization from both sides to work effectively. Consequently, the quality of the products and services offered as well as the partners' operational performance is absolutely critical for Beta. Informants explained that in order to ensure the trustworthiness of partners and secure a flawless operation after the integration, the assessment and selection of these partners is very similar to a fully-fledged vendor selection process. Hence, depending on how deeply integrated the products and services are with Beta's own offering and systems, the efforts required to make this type of partnership work can be quite substantial. Compared to the first group of partners, who are providing products and services that are close to Beta's core business, the selection of the partner from the second group is far less critical. *"So we could have started with anybody. (...) And, you know, we could always go to the next bookkeeping system and say 'We want to do this with you' and basically implement the*

same solution somewhere else, too. So it wasn't as critical to make the selection" (Case B_Respondent A).

Organizational structure: In terms of the organizational structure used to embed the ecosystem activities, all ecosystem partnerships are managed by the traditional partnership management team as part of its normal partnership management process. This team collaborates closely with the bank's digital team responsible for the overall ecosystem strategy and approach. All ecosystem partnerships are built around the established business model with Beta's existing online banking platform building the heart and core of the ecosystem.

Figure 3 gives an overview of how Beta's ecosystem is structured.

Figure 3
Illustrative Overview of Beta's Ecosystem



4.1.3 Case Gamma

This bank's ecosystem was officially introduced in the first half of 2020 when its new housing ecosystem was launched. Gamma's executives reasoned that although mortgages generally ensure a long customer retention of up to twenty years, they lack customer interaction. *"You interact with the bank at the beginning and at the end of the mortgage period. In the meantime there's just the interest and amortization to be paid,*

but nothing else happens" (Case G_Respondent D). Due to the emerging competition of online mortgage platforms and the anticipated increase in demand for digital mortgage products, Gamma decided to build its own housing ecosystem. As part of its ecosystem strategy, Gamma planned to expand its pre-existing mortgage platform into a generative "housing ecosystem" by adding complementary "housing services" along the entire customer journey with the help of partners. *"Following our vision, we want to become the Apple for housing (...) the Google for home"* (Case G_Respondent B). Consequently, Gamma's ecosystems activities were located within a newly founded digital business department but launched as a separate brand.

I learned that Gamma explicitly differentiates between three different groups of complementors, depending on the complementor's activities in the ecosystem. Thus, the banks has financing partners, real estate brokers, and "house service" partners. The first group, the financing partners, consists of potential investors for the mortgages provided through Gamma's ecosystem (i.e., other banks, insurers, pension funds). Although Gamma can itself provide mortgage financing to potential customers, additional investors help to expand the mortgage offering substantially (i.e., in terms of prices, volumes, and maturity offered, as well as the overall mortgage portfolio size). In addition to the mortgage brokering service that Gamma provides to this complementor group, Gamma also manages the mortgages (lifecycle management of loans) and earns an additional fee for this task. This set-up allows Gamma to earn a commission (for the mortgage brokering service) and a service fee (for the lifecycle management) without the need to report the loans on its own balance sheet and without the obligation to allocate equity reserves. The second group, the real estate brokers, consists of partners that operate outside Gamma's main business domain, but nevertheless affect Gamma's ecosystem by generating leads for its mortgage business. The last group, the "house service" partners, offers the complementary products and services that expand far beyond Gamma's own business domain (e.g., furnishing or home décor). The relationship with these partners is focused on a trusted, strategic long-term collaboration, where partners can explore future ecosystem innovations together.

Uncertainty underlying the relationship to complementors: Given Gamma's own experience with mortgages, Gamma is very familiar with the needs and expectations of the first complementor group (i.e., the financing partners), which allows

Gamma to take over the administration of loans for its partners. However, Gamma's prior experience with partners from the other complementor groups is limited, especially with "house service" partners. Due to the fact that partners from this group have no overlap with Gamma's traditional business domain, Gamma has little competence in this area and the collaboration with this partner group means a totally unknown terrain for the bank. Therefore, partnerships with "house service" partners tend to be more explorative in nature. *"We are dependent on other players in that regard (...) partners that develop the housing topic with us and bring in their own competence in that segment"* (Case G_Respondent A).

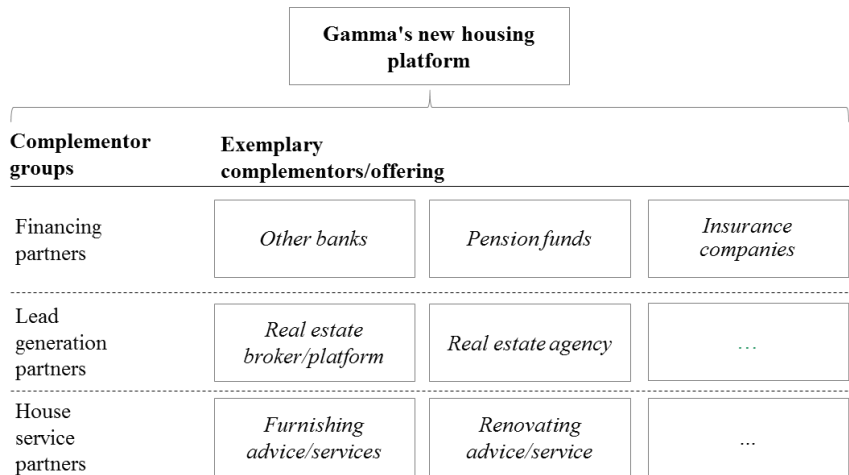
Criticality of complementors: From a strategic point of view, Gamma's executives gauged the second group, the real estate brokers, to be of high importance to its ecosystem simply because these partners engage with the customers who are likely to be in need of a mortgage product soon. In other words, these partners (and their customers) are very close to Gamma's own business (i.e., mortgage financing). Consequently, Gamma aims to establish a strong link to this group of complementors. *"Control tends to be more important for the real estate partners (...) purely because for the lead generation of mortgage financing, you need to be as close to the real estate agent or broker as possible"* (Case G_Respondent A). As far as the build-up and future development of the ecosystem is concerned, the "house service" partners play a critical role too since the bank does not have the expertise and competence that these partners bring to the ecosystem. The "house service" partners are the ones that help the bank to develop (through integrated, co-specialized offerings) and deliver the additional elements of the customer journey that lie outside the bank's core business and for which the bank has no internal expertise and competence. Because the availability of such partners is limited and competing ecosystems created a "run" on these partners, Gamma aimed to establish firm control over specific complementors: *"The strategic rationale for an equity stake is that we prevent our competitors from working with this partner (...) Especially in our market, competitors are building up housing ecosystems, which create almost a run on start-ups and small firms specialized in the housing ecosystem"* (Case G_Respondent A).

Organizational structure: In terms of the organizational structure used to embed the ecosystem activities, Gamma's ecosystem activities are run by a newly

formed division, which is still part of Gamma's core organization but staffed with a dedicated team responsible for the build-up and orchestration of ecosystem partnerships. Interesting in this respect, however, is the fact that Gamma uses a "bank-endorsed brand" to market its ecosystem. So from the perspective of the customer, the ecosystem has a separate brand, but Gamma's backing is still recognizable. Using this set-up was a deliberate decision made by Gamma's executives. They aimed to leverage the trust and recognition of Gamma's brand while at the same time allowing for a reintegration into the bank's core business activities in the future (i.e., when the bank wants to offer ecosystem-related services to its branch customers). *"We see our current approach as a transition phase (...) Our rationale is that once the platform business model gains acceptance in the market (...) it will also become the standard for traditional banks. Our approach then allows us to transfer our ecosystem business to our traditional business"* (Case G_Respondent C). Furthermore, Gamma's management argued that the build-up of ecosystems from scratch generally takes a lot of time (comparable competitors in other markets needed multiple years to gain substantial market share) and that the unknown brand could be one of the reasons why this takes so long. An informant explained that by using a bank-endorsed brand, Gamma was hoping to be able to accelerate this process.

Figure 4 gives an overview of how Gamma's ecosystem is structured.

Figure 4
Illustrative Overview of Gamma's Ecosystem



4.1.4 Case Delta

This bank's ecosystem activities were officially introduced in 2019 with the launch of its new housing ecosystem. The underlying strategic rationale was a lack of transparency and efficiency in the housing market, especially for customers trying to buy properties. For this reason, Delta was convinced that its ecosystem could solve an important pain point for customers in the real estate market. *"We want to disrupt the market, and we want to really tackle and solve these problems"* (Case D_Respondent A). Recognizing that Delta's own contribution to the ecosystem (i.e., mortgage loans) was going to be an important element but certainly not the most important one, the bank decided that partnerships were needed to realize the envisioned housing ecosystem. *"And we understand that our standard banking products are not sufficient enough to deliver that [i.e., the ecosystem value proposition] (...), which means that we have to go beyond banking (...) to really round up and strengthen the entire offering"* (Case D_Respondent A).

So, although Delta had a well-defined vision for the ecosystem, its management decided that the bank needed to collaborate with selected co-innovators to realize the

ecosystem value proposition. The conversations with Delta's executives revealed that the bank differentiates between two distinct complementor groups depending on their partnering status. The first complementor group consists of Delta's strategic co-innovation partners that provide complementary offerings that are absolutely crucial for the ecosystem value proposition to materialize (e.g., property valuation). The second group consists of real estate brokers and other partners that strengthen the value proposition further (e.g., complementary insurance products and services).

Uncertainty underlying the relationship to complementors: Given that the envisioned ecosystem value proposition is fairly unrelated to Delta's traditional banking business, it heavily depends on the contribution of its strategic co-innovation partners for the ecosystem build-up to succeed. In fact, the heart of the ecosystem's value proposition is centered on mutual collaboration with the two strategic partners in the joint venture. For this collaboration to work effectively, an alignment with strategic partners on the vision and approach with regard to the future ecosystem value proposition was absolutely critical, even before the collaboration started, as informants explained. *"So, the relationship with the joint venture partners is more of a strategic relationship. So, there you want to have each of them actually committed for the longer term"* (Case D_Respondent B). In addition, as the ecosystem is built from scratch, the ecosystem venture has to remain relatively flexible with regard to the details of the value proposition and the functionalities of the new platform. That is, as with every other new venture, it is not possible to foresee all possible contingencies and define a very detailed product roadmap in advance. So the ecosystem requires some flexibility to dynamically adjust the course of action and react based on new learnings generated along the way. *"It's fairly difficult to, at one point in time, define the future for the coming 12 to 18 months. The company [the joint venture] needs to also have a certain flexibility to deviate from what we now believe is best, on the basis of, yeah, further experiences basically, that we gain"* (Case D_Respondent B). Compared to this uncertainty with regard to the realization of the future ecosystem blueprint and the necessary alignment with strategic partners, the collaboration with the operational partners (the second complementor group) is relatively easy and less uncertain. The contribution of partners outside the joint venture is far less co-specialized and the tasks and responsibilities of these partners can be clearly envisioned in advance. For example, the role and activity of real estate agents can be easily visualized and it is relatively clear what the tasks and

responsibilities of insurance providers will be once their offering becomes available in the ecosystem.

Criticality of complementors: The first complementor group, the strategic co-innovation partners, provide the ecosystem venture with the real estate valuation engine, relevant demographic data, and customer journey expertise, which are all necessary to realize the ecosystem value proposition and deliver a unique digital customer experience. Prior to the start of the collaboration with these partners, Delta spent a substantial amount of time and effort to scout the right partners for the ecosystem endeavor. Delta's aim was to work with the respective market leaders to ensure the best possible set-up for the ecosystem. Thus, without the buy-in and contribution of these partners to the ecosystem, the ecosystem value proposition would be difficult or impossible to materialize, and potential alternative partners difficult to find. In fact, the risk of a joint venture partner deciding to break away from the ecosystem after several years of work (in order to collaborate with another competitor on the same topic) is what Delta's executives gauged to be the biggest risk for their ecosystem endeavor. In contrast to the partners from the first group, the complementors from the second group do not take on a central role in the build-up of the ecosystem and their contribution is less co-specialized (i.e., brokerage service, house or mortgage insurance, etc.). Delta's management explained that while these complementors are important on an operational level (e.g., the property agents as the final connecting link to the customer), they are not as important on a strategic level and can be replaced more easily. *"With regard to the property agents, or the other partners, it's not really something special in the ecosystem, it's rather a normal business relationship"* (Case D_Respondent C).

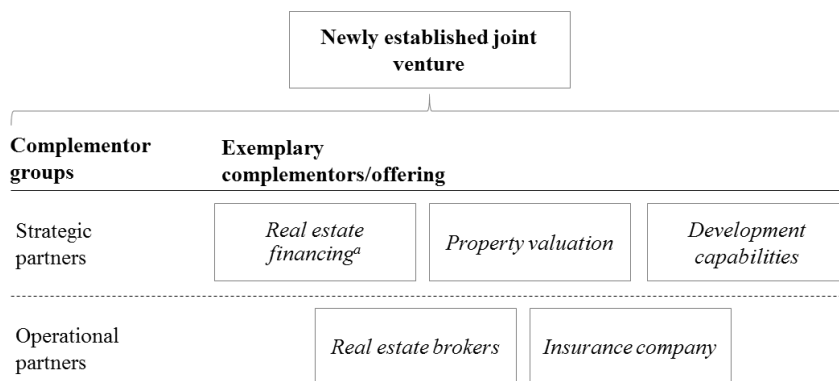
Organizational structure: In terms of the organizational structure used to embed the ecosystem activities, Delta uses a separate venture founded together with their co-innovation partners. Hence, the ecosystem activities are completely separate from Delta's core business, both legally as well as geographically. Delta also appointed a new management team to run the daily operations of the ecosystem venture. The rationale for the joint venture as the organizational form was based on several arguments: First, it ensures that all strategic partners are fully aligned with the vision and the activities going forward. More specifically, the joint venture structure ensures that Delta's strategic partners are highly incentivized to make the ecosystem a success,

which is enforced through the shared ownership in the venture. Their stake in the venture incentivizes partners to make decisions that increase the valuation of the ecosystem, as this will eventually determine their own value capture. Second, the separation gives the ecosystem venture more entrepreneurial freedom and flexibility to act quickly, compared to a home inside Delta's core organization. For example, the separated structure allows circumvention of part of the regulatory requirements for banks. Because Delta itself is not a majority investor and the ecosystem's core business is not directly bank-related, less stringent rules and policies apply to the joint venture. Third, the joint venture serves as a vehicle that allows the participating parties to bring in and organize their assets. This implies that the joint venture can be staffed with employees from all three strategic partners. It serves as a safe home for assets contributed by the partners (e.g., proprietary software is shared with the joint venture, but not with the partners directly), and the venture can independently employ its own employees as the ecosystem grows. Although Delta deliberately placed control over operational matters in the hands of the venture's management team, the bank maintained strategic control through regular advisory board meetings.

Figure 5 gives an overview of how Delta's ecosystem is structured.

Figure 5

Illustrative Overview of Delta's Ecosystem



^a Delta acting as complementor

4.1.5 Case Epsilon

This bank's ecosystem officially started in 2019, when Epsilon started a new effort to build an ecosystem around an integrated housing value proposition. The plan to build a digital housing ecosystem was based on the recognition that this could help Epsilon to successfully defend its mortgage business and respond to emerging competition in this segment from other banks and new competitors. Further, competing housing ecosystems were gradually expanding horizontally to offer additional elements of the housing customer journey and by doing so threatened Epsilon's core business directly. For instance, the lead firm of a competing ecosystem bought another player with a bank license in order to expand into the mortgage segment. *"Back then, the rationale was that the housing customer journey could really be a segment where an ecosystem approach could succeed. In that sense we try to build a network of connected services and bundle them in a way that is value generating for customers. To put it more precisely, starting with customers' desire to possess property to the final key delivery, or starting with the desire to renovate a property to the actual completion of the renovation work"* (Case E_Respondent B). Even though Epsilon had an ecosystem strategy, it lacked the capabilities to realize the envisioned housing ecosystem independently. Epsilon's core business (i.e., mortgages) covers only a small and secondary part of the entire housing customer journey. Consequently, Epsilon allied with a group of strategic partners that were deeply embedded in the local real estate market (property agents, promoters, and other real estate companies) and initiated a new joint venture to form the heart and center of the ecosystem endeavor. *"The underlying rationale was that we knew we had to take those partners on board who were actually catering to the primary needs of the customer"* (Case E_Respondent B).

Epsilon's management differentiates between two complementor groups, depending on whether complementors engage in a strategic or simply operational role within the ecosystem. *"The question then is: 'Do I take a partner as a supplier, who is interchangeable from a transactional point of view, or do I take my partners on a longer journey with me, where we develop things together?' "* (Case E_Respondent A). The first group consists of the strategic partners who are also co-owners of the ecosystem venture. The complementary products and services this group delivers, as well as their expertise regarding the real estate market, are crucial for Epsilon's ecosystem value

proposition to materialize (e.g., property valuation). The second group consists of so-called "service partners" that deliver complementary products and services strengthening the value proposition (e.g., relocation services, painters).

Uncertainty underlying the relationship to complementors: Epsilon made a deliberate decision to join forces with partners from the property industry because it lacked the internal resources and capabilities to successfully build and orchestrate a housing ecosystem. Due to the fact that Epsilon needed to closely collaborate with its joint venture partners in order for the housing ecosystem to succeed, full agreement and close alignment between the strategic partners with regard to the future ecosystem vision and strategy were absolutely crucial. To avoid future conflicts and ensure that all strategic partners were pulling in the same direction, Epsilon's management invested a substantial amount of time to create a mutual understanding and alignment with this complementor group. Epsilon's management noted that the collaboration with strategic partners meant a long-term commitment, which could only succeed if it was "an alliance of the willing" based on trust and a shared vision. Compared to the necessary alignment with strategic partners on strategic matters regarding the future ecosystem value proposition, the onboarding of partners from the second complementor group (the operational partners) was far easier. Operational partners are not included in strategic matters and are only responsible for the delivery of a certain sub-element of the customer journey. Partners from this second complementor group are thus supposed to perform more transactional roles by providing a relatively standardized product or service to the ecosystem, so that the need for co-specialization and alignment with the future ecosystem value proposition is limited.

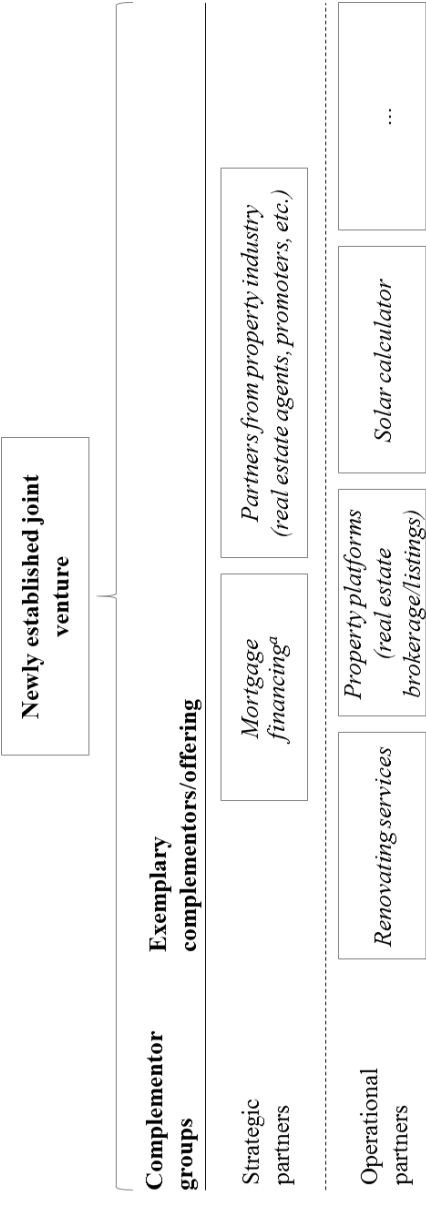
Criticality of complementors: The first complementor group, Epsilon's strategic joint venture partners, play a vital role in the build-up of the ecosystem. This group's partners provide deep expertise with regard to the property industry, have a vast network of property agents, and provide valuable knowledge about and contacts to other potential partners. Given that this complementor group is crucial for the ecosystem value proposition to materialize, Epsilon needs to ensure their buy-in and commitment to the ecosystem. In contrast to the strategic partners, the second complementor group's partners (the house service partners) do not take on a strategically important role in the build-up and orchestration of the ecosystem directly. Examples of partners in this group

include relocation services or painters. Epsilon's management said that while the strategic partners are also responsible for the seamless integration of offerings into the broader ecosystem value proposition and the coordination of activities with other (horizontally adjacent) parties, the operational partners' perspective does not expand beyond their own offering. *"The supplier will never have a perspective on the joint value proposition towards the customer (...) If I'm a supplier, I don't care about my customer's customer. My customer is my final stop"* (Case E_Respondent A). Hence, compared to the strategic partners from the first complementor group, these partners can be replaced more easily. In fact, to ensure the health and stability of the ecosystem, Epsilon's management aims at proactively building up redundancies for certain complementary offerings in order to reduce dependence and become more resilient. *"In order to have a healthy ecosystem, we need to make sure that it can survive outages of individual complementors. That means as far as central ecosystem services are concerned, we need to have multiple partners who can deliver a similar service to the ecosystem, so we purposefully build redundancy into the ecosystem"* (Case E_Respondent B).

Organizational structure: In terms of the organizational structure used to embed the ecosystem activities, Epsilon founded a separate venture together with its strategic partners. Hence, the core of the ecosystem activities is completely separate from Epsilon's traditional business, both legally as well as geographically. The newly formed joint venture forms the operational platform for all ecosystem-related activities. It is run by a dedicated management team, which Epsilon appointed together with its strategic partners. While Epsilon deliberately handed control over operational matters to the venture's management team, the bank maintains strategic control through regular advisory board meetings.

Figure 6 gives an overview of how Epsilon's ecosystem is structured. Table 3 summarizes the key complementor groups across the five case firms, including examples of the products and services provided by complementors.

Figure 6
Illustrative Overview of Epsilon's Ecosystem



^a Epsilon acting as complementor

Table 3
Description of Case Data

Case name	Ecosystem setting	Short description of envisioned blueprint	Scope of value proposition ^a	Complementor groups ^b	Exemplary partner offering
Alpha	Retail banking ecosystem	Banking platform as basis to become "financial life advisor" for customers through integration of additional products and services beyond the traditional bank offering	Broad (covering multiple customer journeys for retail customers)	Three (core banking partners, near banking partners, beyond banking partners)	- Insurance - Deposits - Tax advisory - Contract manager - Real estate manager
Beta	SME banking ecosystem	Banking platform as basis to "create stickiness around core products" through integration of additional products and services	Broad (covering different financial matters for SMEs)	Two (bank-related partners, beyond banking partners)	- Factoring - Financing and insurance - Bookkeeping

(Table continued on next page)

^a In terms of customer journeys covered.

^b Note that I used informants' denotation of complementor groups whenever possible; in all other cases, I defined a denotation that seemed most appropriate.

Description of Case Data (continued)

Case name	Ecosystem setting	Short description of envisioned blueprint	Scope of value proposition^a	Complementor groups^b	Exemplary partner offering
Gamma	Housing ecosystem	Mortgage platform as basis; additional housing-related products and services that complement offering	Narrow (focus on one specific customer journey)	Three (financing partners, lead generation partners, "house service partners")	- Financing - Furnishing services - Renovating services - Energy efficiency planning
Delta	Housing ecosystem	Joint venture with co-innovators as core of new housing ecosystem to solve customer pain points around housing customer journey	Narrow (focus on one specific customer journey)	Two (strategic partners, operational partners)	- Property valuation - Financing - Real estate brokerage - Insurance
Epsilon	Housing ecosystem	Joint venture with co-innovators as core of new housing ecosystem to solve customer pain points around housing customer journey	Narrow (focus on one specific customer journey)	Two (strategic partners, operational partners)	- Property valuation - Financing - Real estate brokerage - Insurance

^a In terms of customer journeys covered.

^b Note that I used informants' denotation of complementor groups whenever possible, in all other cases, I defined a denotation that seemed most appropriate.

4.2 Identifying Influencing Factors for Ecosystem Governance and Understanding Contrasting Governance Approaches

I observed that all ecosystems were comprised of multiple groups of heterogeneous complementors, in relation to which the lead firms use a common governance approach. Next, I explored the similarities and differences in the governance approaches applied to each "tier group," as well as the underlying drivers of lead firms' decisions.

My cross case comparison revealed that lead firms use different governance approaches (i.e., different mixes of governance mechanism and organizational form) for different complementor tiers, depending on the uncertainty regarding the envisioned ecosystem blueprint and the complementors' role in the ecosystem creation process. More specifically, my results reveal that whenever there was high uncertainty related to the ecosystem blueprint (domains of uncertainty) and complementors' explorative contribution was required (complementors' role), lead firms emphasized the use of informal governance mechanisms for the group of complementors in this tier. On the other hand, whenever lead firms faced low uncertainty because they had a well-established blueprint and they required complementors to converge around this existing blueprint, the lead firms emphasized the use of formal governance mechanisms for the group of complementors in this tier. Ultimately, the chosen organizational form supported lead firms' aspirations to explore or converge, as more collaborative partnerships, like joint ventures, were used to resolve uncertainty with partners, while relationships resembling a buyer-supplier contract prevailed in the ecosystem domains where the lead firms strived for convergence.

In the remainder of this section, I contrast the different domains of uncertainty and complementors' role in the ecosystem innovation process across the cases. This leads to my analysis of how these factors jointly affect lead firms' governance decisions regarding the mix of formal and informal governance mechanisms and the choice of organizational form. A summary of this cross-case comparison is shown in Table 4.

Table 4

Cross-Case Comparison Summary

	Case Alpha	Case Beta	Case Gamma	Case Delta	Case Epsilon	2 nd order themes	Aggregate themes
Summary of findings	- Stable and established solutions exist for ecosystem core - Overlap with existing capabilities allows clear envisioning of complementors' tasks and responsibilities	- Stable link to core partners - Experience with pre-existing mortgage platform allows envisioning in core	- Clear idea for core but uncertainty about right implementation and alignment with partners - Existing capabilities have limited relevance for realization of blueprint	Uncertainty in core Domains of uncertainty Uncertainty in periphery			
Exemplary evidence	- "These core banking products remain relatively static. I just buy a service, and it stays the way it is."	- "The easiest partner group are financing partners, the investors, this is self-explanatory." "[These partners] are banks, insurers, pension funds. These are classic financing contracts."	- "What kind of offering do we want to have as an MTP, and how do we want to develop this further? What will the next expansion stage look like, and what is needed to get there? And then we go out and see who can help us to get there."				
Summary of findings	- No expertise with peripheral elements - Need for mutual exploration and testing of peripheral offerings together with partners	- No prior expertise with peripheral elements - Need for exploration and testing of peripheral offering with partners	- Activities and position of peripheral partners can be clearly envisioned - Little need for exploration in periphery				
Exemplary evidence	- "Obviously, the further you go from core services, the riskier it is for us. We don't know exactly the customers. I mean, are they really willing to go through all platforms to buy services which are very far from the core banking services? This is a risk."	- "As a bank, we are good at providing financing, but our core competencies are not to facilitate a craftsman or tell you how the interior equipment should be designed."	- "These partners just have transactional contracts, such as 'deliver article 25 with quality level 63 by the day after tomorrow.' That's a purchase agreement."	● — Strong similarities across cases			● — Strong similarities across cases

(Table continued on next page)

Cross-Case Comparison Summary (continued)

	Case Alpha	Case Beta	Case Gamma	Case Delta	Case Epsilon	2 nd order themes	Aggregate themes
Summary of findings	- Complementors close to the ecosystem core stabilize the footprint by providing proven bank-related services (e.g., advanced payment service)	- Complementors close to the ecosystem core strengthen the mortgage offering or generate additional leads for the platform	- Peripheral complementors help to move from mortgage platform to housing ecosystem (mutual exploration)	- Peripheral complementors strengthen the blueprint through better functionality and filling of "blank spots" in the service spectrum (e.g., solar calculator)	- Innovative capacity of core complementors is central for the realization of the envisioned blueprint (mutual exploration of new value proposition)	Complementor role for ecosystem innovation Converging role (around the blueprint) Explorative role (to resolve uncertainty in the blueprint)	
Exemplary evidence	- "With these core partners, we seldomly do pilots with them. These are well-established technologies that we can implement directly instead."	- "It's important, also for the partners, that the core product of your ecosystem is really solid and built with a long-term perspective (...)."	- "The experience we made is that it's best to really start with an MVP. Does the customer use the additional offering? Does it make sense? Is it useful?"	- "If (...) we purposefully seek a partner who can deliver that (...) partners who are really just role players in a minor step along the broader customer journey."	- " (...) we concluded that there's some players in the market being [frame of partners] that do have certain capabilities that could be really useful (...) which we needed as part of the proposition."		
Summary of findings	- Peripheral complementors help the bank to expand breadth of the ecosystem offering and explore entirely new offerings customer journeys	- Peripheral complementors help to move from mortgage platform to housing ecosystem (mutual exploration)	- Peripheral complementors help to move from mortgage platform to housing ecosystem (mutual exploration)	- Peripheral complementors help to move from mortgage platform to housing ecosystem (mutual exploration)	- Peripheral complementors help to move from mortgage platform to housing ecosystem (mutual exploration)	- Peripheral complementors help to move from mortgage platform to housing ecosystem (mutual exploration)	
Exemplary evidence	- "The offerings in the beyond banking dimension are more at the beginning of their lifecycle, where you have some kind of idea or product and then you test it (...) It's far more iterative and there's a heatmap of potential topics for potential products and services (...)."	- "The experience we made is that it's best to really start with an MVP. Does the customer use the additional offering? Does it make sense? Is it useful?"	- "The experience we made is that it's best to really start with an MVP. Does the customer use the additional offering? Does it make sense? Is it useful?"	- "The experience we made is that it's best to really start with an MVP. Does the customer use the additional offering? Does it make sense? Is it useful?"	- "The experience we made is that it's best to really start with an MVP. Does the customer use the additional offering? Does it make sense? Is it useful?"		

● Strong similarities across cases —●

(Table continued on next page)

Cross-Case Comparison Summary (continued)

	Case Alpha	Case Beta	Case Gamma	Case Delta	Case Epsilon	2 nd order themes	Aggregate themes
<i>Summary of findings</i>	- Complementors in the ecosystem core are strictly governed (use of formal selection/control processes) - Rules for peripheral complementors are less stringent	- "The closer you are to a core banking service, the more closely you interact with the core products of the bank and the more likely you are to get a very bank-heavy, corporate driven agreement from our side."	- Aim to use the same formal agreement for all complementors	- Contract with complementors in the core serves only as basis for alignment and execution - Peripheral partners are governed mainly based on contractual means		Differences in the use of formal governance mechanisms	Governance choices per tier group
<i>Exemplary evidence</i>	- "It's simply a very open and transparent dialogue about how we can support them as a bank and how the startup [peripheral partner] could support us because we have an alignment of interest in the ideal case."		- "We are trying to treat each partner similarly. (...) He always try to reach the same kind of agreement with partners."	- "On the other end [with peripheral partners] it's purely transactional. 'I buy or I don't buy.' If you want to have that business, you don't need to talk much."		Differences in the use of informal governance mechanisms	
<i>Summary of findings</i>	- Informal aspects play a minor role for complementors close to core - Mutual exploration, open dialogue and exchange is more important for peripheral complementors		- Aim to have long-term collaborative relationship with all complementors	- Informal aspects are highly important for work with core complementors (alignment is critical) - Informal aspects are less relevant for the collaboration with peripheral complementors (purely transactional)		Differences in the use of organizational forms	
<i>Exemplary evidence</i>	- "It's always examine whether it makes sense to invest [in peripheral partners] or not. I just gives partners a better alignment of interest."		- "When the chemistry with a partner is not right, I don't work with this partner. This is all the more true if we are talking about the build-up of ecosystems (...)."	- "It's important to immediately talk with each other, if someone does not agree. I personally believe that this is much, much more important than the formal moment when such things are officially agreed upon in meetings."			
<i>Summary of findings</i>	- Relation to core complementors is "vendor-like" (market-based agreements) - Relation to peripheral partners is more collaborative in nature (partnership/alliance-based agreements)		- Aim to incentivize all complementors based on market-based agreements - Selected minority investments to increase alignment	- Core complementors are incentivized through shared ownership in JV (full alignment on mutual goals) - Relation to peripheral complementors is based on market-based agreements			● — Strong similarities across cases —●
<i>Exemplary evidence</i>			- "In investment has the advantage that we can achieve a stronger alignment of interests with these partners."	- "In this case we thought that a joint venture was the best structure because we really wanted to have a mutual buy-in of all strategic partners and not just a common service agreement."			

4.2.1 Comparing the Domains of Uncertainty Across Cases

In their role as orchestrators of an emerging ecosystem, all lead firms defined an ecosystem blueprint and tried to engage complementors in realizing this vision. However, since ecosystems were a relatively new phenomenon for all the case firms and the banking industry as whole, they could not clearly envision all blueprint elements. Consequently some elements of the blueprint remained rather uncertain and vague. Through my coding process, I identified that the banks' perceived uncertainty pertained either to central elements of the ecosystem (which I will refer to as the ecosystem core), or to peripheral elements of the ecosystem blueprint.

Since Alpha and Beta built their ecosystems around their existing banking business, envisioning the blueprint of activities that were close to the ecosystem core was relatively easy. Complementary products and services from partners in the core overlapped substantially with Alpha's and Beta's own business and the customers' needs and expectations were well known. Furthermore, these offerings were already well tested and remained relatively stable over time, so that Alpha and Beta could clearly specify this complementor group's positions and activities. *"These core banking products remain relatively static. I just buy a service, and it stays the way it is"* (Case A_Respondent B). *"That means you have a relatively clear structure for how to collaborate with each other"* (Case A_Respondent E). *"(...) the volatility there [in the core banking dimension] is negligible"* (Case A_Respondent F). *"Well, because obviously we're seeing that the return on investment is more secure when it's close to the core business"* (Case A_Respondent E).

In contrast, Alpha and Beta faced significantly higher uncertainty regarding offerings located on their ecosystem's periphery. *"The only thing I can say with regards to the 'beyond banking' dimension is that we often engage in areas where we don't have distinct expertise"* (Case A_Respondent A). *"These [beyond banking products and services] are topics that are so removed from the traditional banking that we say, 'We are not the experts' (...)"* (Case A_Respondent C). Alpha and Beta entered terrain completely unknown to them when they considered the broad range of potential peripheral applications and had to confront the uncertainty associated with providing products and services beyond banking. Hence, Alpha and Beta needed first to resolve

uncertainty as to the right set-up for the peripheral offers, and they had to align their vision with relevant stakeholders, both internally as well as externally. *"We would not claim that we knew how to go about it in each and every situation"* (Case B_Respondent B). *"I don't know if that's clear, but beyond banking means we are doing things that are unlike the traditional banking business. And therefore you obviously need [some change]. But we have people in our bank that still think banking is the foremost important thing and that they have no use for anything beyond banking. And you first need to convince these people"* (Case A_Respondent C).

I first considered whether this observation – that banks choose a well-known domain as their ecosystem blueprint's core, while moving toward the periphery, they became less knowledgeable – represented a general pattern across all cases. However, cases Delta and Epsilon gave evidence of a completely different scenario. These two cases focused on building up a value proposition with a very specific subject matter, notably, housing. Putting a specific, "non-bank" customer journey at the center of the ecosystem activities in these cases implied that the lead firms' capabilities (specifically related to financing) very limitedly overlapped with the new ecosystem value proposition's core, which was comprehensively related to housing. *"If the primary customer requirement is 'I need a house, I need an apartment,' then the question 'How can I get the financing?' is actually not the primary need, but the means to the end"* (Case E_Respondent B).

Therefore, regarding long-term commitment and aligning the mutual vision of the lead firms and their co-innovators, questions prevailed that generated high uncertainty as to the ecosystem's core elements. *"What's important is that all players in the ecosystem, if you are really setting it up as an ecosystem, get to know each other – what are the strengths, what is the strategy, how can we mutually explore and further develop the customer journey and the offering?"* (Case D_Respondent A). So, although the two firms had a clear idea and vision for the value proposition (i.e., housing) right from the start, uncertainty about the alignment with co-innovators and the details of the realization existed. Both firms had to spend a substantial amount of time to ensure that strategic partners were aligned regarding the course of action and the rules of collaboration going forward. The cooperation with these ecosystem partners thus focused on configuring and implementing core elements of the blueprint. In contrast,

evidence from Delta and Epsilon suggests that envisioning the contributions of peripheral partners was relatively straightforward once alignment on the core elements had been reached. *"We don't explore these services ourselves. We check who can act as partner and then we integrate this partner into our solution, but not into our governance"* (Case E_Respondent B). *"These partners just have transactional contracts, such as 'deliver article 25 with quality level 63 by the day after tomorrow.' That's a purchase agreement"* (Case E_Respondent A). Mapping out peripheral partners' activities in the ecosystem was not challenging, as these partners deliver largely standardized offerings that do not need further exploration or co-specialization to enable a successful link to the ecosystem.

Evidence from case Gamma supported aspects of both "polar types" (Eisenhardt & Graebner, 2007). Similar to Delta and Epsilon, Gamma focused on a specific, non-bank-related customer journey. In contrast to its counterparts, however, Gamma used the pre-existing mortgage platform as core and foundation for its ecosystem. Consequently, regarding what would become their ecosystem's core, they experienced very low uncertainty. Interestingly, the level of uncertainty in relation to peripheral offerings differed. While Gamma needed to engage in exploration and find the ideal *modus operandi* with "house service partners," other peripheral offerings (e.g., insurance services) were already well-established, which made it relatively easy to envision the collaboration with these partners.

Hence, while all cases faced uncertainty on their future ecosystem blueprint, the level of uncertainty differed between core and peripheral elements of the respective ecosystems and showed a contrasting pattern across cases. The uncertainty pattern emerging from my data appeared to be caused by the degree to which the lead firms needed to engage in explorative activities and align partners to the emerging blueprint.

4.2.2 Comparing Complementors' Role in Ecosystem Innovation Across Cases

My coding disclosed that, from the perspective of the lead firm trying to resolve the uncertainty underlying its envisioned blueprint, complementors had either an explorative or a convergent role in the ecosystem creation process.

In analyzing data from Alpha and Beta, I revealed that complementors close to the ecosystem core had to be well established firms with proven solutions that could readily be employed and that guaranteed maximum stability and reliability. *"If something goes wrong there, it's a complete disaster"* (Case A_Respondent B). *"We have relatively high and strict standards in terms of availability and quality"* (Case A_Respondent F). *"There [in the core banking dimension] we make sure that the technology is adequately secure, that there's a certain security level with regard to data leakage, technological requirements, system availability, et cetera et cetera"* (Case A_Respondent F). This evidence suggests that, because the functionalities in the core had remained relatively stable over time, and because a reliable performance was of utmost importance, complementors had to prove their own offering and their ability to augment Alpha's and Beta's offering in this domain, were sound. Evidence from case Gamma confirmed this pattern, where reliable core partners (i.e., financing partners) were needed to strengthen the ecosystem's core (i.e., mortgage financing). In contrast, complementors in Alpha's and Beta's periphery had a largely explorative role. Given that both the complementors and their respective offerings were relatively new and not well established in the industry yet, substantial explorative effort and testing was required to demonstrate their potential and to specify the required degree of co-specialization regarding other elements of the value proposition. *"In the near banking dimension and the beyond banking dimension, it's often the case that we simply just test a solution"* (Case A_Respondent D). *"(...) you need to test, because you never know how the customer will react"* (Case A_Respondent D).

In analyzing Delta and Epsilon, I revealed the exact opposite pattern. Evidence from these cases suggests that, given insufficiency of the banks' competencies to realize the focal value proposition, they were dependent on the generative ability of co-innovators to define and develop core functionalities within the envisaged ecosystem. *"The ideal partners to build such an ecosystem come directly from the property industry, because they are the ones who satisfy the primary customer need"* (Case E_Respondent B). Data from Delta and Epsilon revealed that peripheral partners performed a completely different role as they were not required to be innovative. Given that lead firms had a clear picture of the peripheral complementors' activities in the ecosystem, delivering stable, trustworthy products and services was all that mattered. *"So those other partnerships, for instance with the realtors, those are more important on an*

operational level, and less so on a strategic level" (Case D_Respondent B). Whenever specific gaps in the value proposition needed to be filled, the banks would approach established experts to form a more coherent and comprehensive customer experience. *"We purposefully seek a partner who can deliver that (...) partners who are really just role players in a minor step along the broader customer journey"* (Case E_Respondent A).

This evidence thus supports my observation that complementors take on a convergent role to reinforce the ecosystem blueprint when the respective domains of the vision are certain and stable. In contrast, lead firms require explorative complementor activities when they need domains of uncertainty in the ecosystem blueprint to be resolved.

4.2.3 Identifying Different Governance Approaches per Tier Group

My findings show that decisions on the mix of formal and informal governance mechanisms and the choice of organizational form were determined by the domains of uncertainty underlying the ecosystem blueprint and complementors' role of either reinforcing or exploring elements of this blueprint.

Choice of governance mechanisms: While I observed that in all cases partnerships needed a certain level of formal vetting procedures (e.g., basic compliance and regulatory requirements), my evidence nevertheless revealed a number of interesting differences across the cases. Data from Alpha and Beta showed that core partners (who play a convergent role) were governed based on stringent criteria . *"(...) if you're consuming the service, you want to review possible partners diligently to ensure that the partners delivering the service are really the best ones you can find"* (Case B_Respondent A). The lead firms clearly specified and monitored tasks and responsibilities. *"The closer you get to our core banking, the more likely we are to impose a 60-page contract on you. The further away you are from the core, the more relaxed the legal agreement underlying the relationship can be. I think that best explains it"* (Case A_Respondent B).

However, in the cases of Delta and Epsilon, the formal agreements with core partners seemed to be merely a starting point and broad basis for alignment. *"In my*

opinion, the contract is just a written version of the mutual understanding about what the rights and responsibilities of each party are, a formalization (...) The contract helps us to ensure that we thought about everything and really discussed all the details" (Case D_Respondent A). Thus, compared to Alpha and Beta, the formal contracts that Delta and Epsilon set up with their core partners served as preliminary framework and prerequisite for the collaboration, rather than as primary governance tool for the ongoing collaboration. Informants of cases Delta and Epsilon noted that the formal agreement was even subordinate to informal mechanisms when conflict arose. *"If you face each other in court in the end just to say, 'We agreed on X, you delivered Y. You failed to deliver what we had agreed upon' - that makes absolutely no sense. In the end, we want to mutually explore and achieve something together"* (Case D_Respondent C).

On the other hand, evidence from Alpha and Beta regarding their peripheral partners suggested that they received relatively easy access to the ecosystem, since Alpha and Beta applied less stringent rules for selecting and collaborating. *"If you are entering into a service level agreement with [Alpha], you will get a legal agreement, so elaborate you will want to kill yourself [referring to Alpha's core partners]. However, if you are entering into a collaborative partnership, it's more at eye level in many respects [referring to Alpha's peripheral partners]. (...) You are moving from a purely sourcing perspective into a more collaborative, cooperative environment"* (Case A_Respondent B). *"[in the core banking] we are relatively uncompromising. When it comes to beyond banking, however, we are relatively willing to make a compromise, from my perspective"* (Case A_Respondent B).

In contrast, both Delta and Epsilon confirmed that their relation to peripheral partners was based solely on *transactional* agreements, i.e., the use of formal governance mechanisms prevailed. *"On the other end [with peripheral partners] it's purely transactional. 'I buy or I don't buy.' If you want to have that business, you don't need to talk much"* (Case E_Respondent A). *"The other [peripheral] players that are connected to [ecosystem name] somehow are important to [ecosystem name], but you also want to have the flexibility to let them go and start partnerships with other initiatives"* (Case D_Respondent B). I theorized that lead firms put more emphasis on formal mechanisms, i.e., clearly specified rules of obligation, when the respective domain of the blueprint exhibits low uncertainty (which allows them to specify partners'

future tasks and responsibilities). Evidence from all cases in which the use of formal agreements regulated the well-known elements of the blueprint, supports this logic. In this way, lead firms are able to maintain stability and control over the respective elements of the blueprint.

Analyzing the use of informal governance mechanisms across the five cases revealed that the importance of informal governance mechanisms differed across cases, as well as across complementor groups within each case. My case data suggested that lead firms adapted their selection criteria according to the underlying uncertainty and complementors' role. Evidence from both Alpha and Beta supported the importance of informal mechanisms in their relation to peripheral partners. *"So it was more this innovation willingness and openness that kind of drove it [the peripheral partner selection]"* (Case B_Respondent A). Also, informal aspects, such as trust, seemed to make up for the lack of formal mechanisms in these relations (at least to some extent). *"Trust is even more important in the beyond banking dimension, because I give startups access to my customers, although I don't have full control over their product. And that's why trust is necessary there"* (Case A_Respondent C).

The opposite kind of evidence emerged for Delta and Epsilon, where I found strong evidence of informal mechanisms being important regarding the collaborative work between the lead firms and their co-innovators in their ecosystems' core. *"The topic of common understanding of what you want to achieve together, that's the single most important topic"* (Case D_Respondent A). *"If mutual trust is missing, or if trust in the mutual idea is missing, then it [the strategic partnership] doesn't work"* (Case D_Respondent C). Informants from cases Delta and Epsilon explained that they gauged informal alignment on the future vision and approach with their strategic partners as mission-critical for the success of the relationship and the entire ecosystem endeavor. Consequently, managers from these lead firms spent a substantial amount of time on informal discussions even before the collaboration officially started. The discussions evolved not only around elements of new ecosystem value proposition, but also around the mutual collaboration: *"(...) we not only need to think about the value proposition in the visioning-part [planning phase], but also about the set-up of the mutual collaboration. And this is where questions such as 'Are we open, are we closed? How long should the collaboration last? Are we consulted when decisions about new things*

are made? Can we make it contractually binding, to implement it [decisions] in the firm [in the individual partner firms]?' are discussed" Case E_Respondent A. "If you are doing it right, a lot of communication and dialogue is necessary" (Case D_Respondent A).

Overall, evidence from these cases suggested that a cooperative long-term partnership based on mutual trust, a common vision and open dialogue were seen as the primary success factors, while the actual formal agreement seemed of marginal importance, as the following statement illustrates: *"Purely from a contractual point of view, you can agree on quite a lot of things. But I personally believe (...) I would never start a partnership with someone if I am not sure that he has exactly the same understanding about what an ecosystem is, or if he does not have the same understanding of the success factors in an ecosystem, or is someone who is not aware that everything needs to be considered from the customer perspective, and that you are constantly searching for a win-win situation with all partners. If I have a partner who gives me the feeling that this 100% commitment is not there, then it will probably be difficult to include someone like this [as strategic partner in the ecosystem's core]. It actually doesn't matter what is agreed by contract"* (Case E_Respondent B).

While I observed a clear tendency to tailor governance mechanisms in all aforementioned cases, Gamma applied a rather undifferentiated governance approach to all partners. *"In principle, we are trying to treat each partner similarly. (...) We always try to reach the same kind of agreement with partners; sometimes we succeed, sometimes we don't"* (Case G_Respondent D). Nevertheless, as far as the relationship to "house-services partners" was concerned (i.e., the peripheral partners operating in an uncertain ecosystem domain), the daily collaboration was tailored to mutual exploration and learning. *"But day to day, on an operative level, we collaborate very closely [with peripheral partners] because these start-ups are still being built-up. In our case, we are also in the build-up phase. That's how it usually is if the others don't have a completed ecosystem either, because it's also just the beginning of the journey. In the build-up phase, you closely exchange information and you try to maximize synergies. So you also work in an agile approach there. You develop smaller MVPs together, you engage in knowledge sharing, without slowing one another down. Instead, you try to support one*

another. So it's a completely different way of working (...). And this is very important" (Case G_Respondent B).

The data thus confirmed the role and importance of informal governance mechanisms, relative to more formal mechanisms, whenever lead firms are operating in domains of uncertainty. When they entered unknown terrain, the lead firms relied on the collaborative, explorative contributions of partners whom they could trust. My cases, in which the importance of informal governance mechanisms for uncertain domains of the value proposition can be observed, provided evidence that supports this logic. *"If I'm simply ordering a service like, 'I want three servers', I will be able to sit back, compare the different offerings of potential providers, and select one of them - I don't need to talk to anyone in such a case. So of course, there's a difference, whether I'm ordering standard services based on service agreements, or whether I want to develop something new. And if it's an ecosystem, which is far more complex, the need to talk to each other will be even greater"* (Case D_Respondent A).

Choice of organizational form: Lead firms' choice of organizational form further supported the pattern that emerged from my data regarding the mix of formal and informal governance mechanisms applied on a specific complementor tier. Whenever a lead firm was exposed to a domain of uncertainty and complementors' role was to provide their generative ability as co-innovators – as in the case of Delta's and Epsilon's relation to its core partners – joint venture partnerships were established. The lead firms I interviewed stated two reasons for this approach. First, the venture-structure served as the foundation and organizational vehicle for the joint explorative efforts. Second, the shared ownership ensured maximum alignment of partners' future vision and approach, and further supported the aforementioned relational efforts to reach alignment. In contrast, when lead firms were operating in domains of low uncertainty and complementors' role was to provide stable and reliable complementary products or services – as in the case the case of Delta's and Epsilon's relation to peripheral partners – market-based relationships were pursued, for instance by creating a standardized interface that complementors could join by accepting the lead firm's terms. Setting up the contractual agreements for these market-based relationships was only possible because the partners' tasks and responsibilities could be clearly envisioned, so that writing and enforcing contracts was relatively easy.

Similarly, when lead firms faced low uncertainty regarding the core of their ecosystem value proposition and complementors' role was to reinforce and protect the established blueprint and converge their complementing contribution with the existing bank offering, lead firms' employed *"vendor-like relationships"* (see cases Alpha and Beta). However, when the lead firm's lack of experience with *"beyond banking"* products resulted in uncertainty in the ecosystem's periphery, partners were more *loosely attached* and the underlying partnerships took on a more explorative nature. I can explain the seemingly counterintuitive finding that both Alpha and Gamma regularly used minority-equity investments for complementors in the periphery, by referring to their intent to lock-out competitors (especially when alternatives are limitedly available and partners thus count as critical), to gain full insight, and to create even stronger alignment with complementors they did not yet know well. In other words, the stronger ties allowed them to counteract the uncertainty with regard to partners' and competitors' behavior. *"An investment has the advantage that we can achieve a stronger alignment of interests with these partners"* (Case G_Respondent D). *"On the one hand, they can't kick you out, and on the other hand, you can get a broad set and more influence accordingly, depending how big the equity stake is"* (Case G_Respondent A).

In sum, my findings suggest that lead firms' governance decisions were jointly affected by their uncertainty regarding the envisioned ecosystem blueprint and complementors' roles in the ecosystem innovation process. Lead firms emphasized the importance of using informal governance mechanisms when they needed their complementors to contribute in an explorative role. When the ecosystem blueprint underlying complementary products or services was well established, the use of formal governance mechanism prevailed to ensure complementors' convergence around this blueprint. The organizational form reflected lead firms' aspirations regarding the complementor role. More specifically, reliance on collaborative partnerships and joint ventures prevailed when lead firms needed to engage in mutual exploration with partners to resolve the underlying uncertainty. However, I observed the use of market-based contractual agreements when the underlying uncertainty was low, as this allowed the lead firms to specify task and responsibilities in detail and to reinforce the exiting blueprint. Hence, rather than applying a uniform governance approach to all complementors, the banks used different governance approaches within the same ecosystem. However, they did not customize the governance mechanisms to individual

complementors or positions based on technological interdependence. Instead, they applied a similar set of rules to entire groups of complementors, thereby forming distinctly governed tiers of complementors that differed in the mix of formal and informal governance mechanisms and underlying organizational form.

4.3 A Model of a Multi-Tier Governance Process

Drawing on my cross-case evidence of five different ecosystems in the financial services industry, I have developed a conceptual model that synthesizes how, in my context, lead firms' designed the governance of their innovation ecosystems with heterogeneous complementors (see Figure 7). When the lead firms started out with ecosystem creation, they defined an overarching blueprint for the ecosystem. In the process, they recognized the degree of uncertainty underlying each element of the blueprint. The uncertainty regarding the ecosystem blueprint differed across domains, as not all elements of the blueprint were equally (un)certain. Depending on whether lead firms planned to build an ecosystem around their established business or a new ecosystem focused on a specific customer journey, their uncertainty related either to core or to peripheral elements of the ecosystem blueprint.

In uncertain domains of the ecosystem blueprint, lead firms found it more difficult to clearly define complementors' activities, tasks and responsibilities. For instance, when they engaged with complementors for the first time and the mutual offering constituted a novelty for both parties as well as the industry as a whole, it was difficult to foresee and specify all the details of the future collaboration. Hence, in domains of uncertainty the complementors' role was to engage in exploration to resolve this uncertainty. In contrast, in relatively certain domains of the ecosystem blueprint, complementors' role was to converge around the blueprint that the lead firm had defined. For example, when lead firms could clearly envision what a specific complementary offering needed to look like, they were able to clearly specify the complementors' tasks and responsibilities.

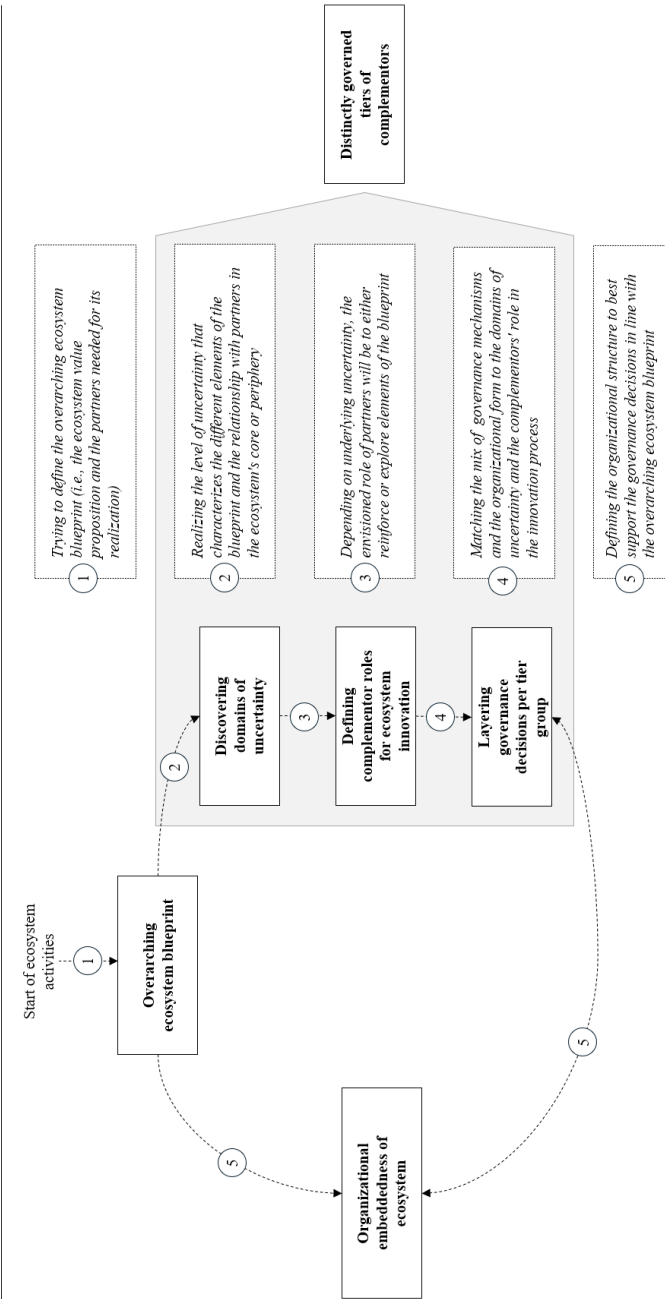
The uncertainty with regard to specific elements of an envisioned ecosystem blueprint thus determined the range of feasible governance decisions. Lead firms subsequently chose a mix of governance mechanisms and underlying organizational

form that matched the underlying uncertainty and complementors' role in the ecosystem. By doing this, the lead firms created what I call "tiers of complementors." Complementors within a specific tier group were subject to the same or a similar governance approach, while lead firms' governance approach differed between tier groups.

Lastly, depending on whether the lead firm aimed to build an ecosystem of complementors around its existing core business, or an ecosystem focusing on a specific customer journey, the emerging ecosystem was either embedded in the lead firm's existing organizational structure or located in a separate organizational unit or entity. When a separate legal entity was chosen as home for the new ecosystem activities, it was also geographically separated from lead firms' established business (in Figure 7, I refer to this as organizational embeddedness).¹²

¹² Note that my argument is focused on the organizational structure used to facilitate the ecosystem activities. I acknowledge that the perceived separation from the core business is also a matter of branding. Branding-related decisions, however, are out of this dissertation's scope.

Figure 7
Lead Firms' Multi-Tier Governance Design Process



5 Discussion and Implications

In this dissertation, I studied how lead firms in innovation ecosystems govern their relationships with multiple heterogeneous complementors. I undertook an inductive, multiple-case study in the financial services industry to elucidate the factors that influence lead firms' decisions on the mix of formal and informal governance mechanisms and the organizational form underlying their relationships with complementors. Following recent trends in the industry, incumbent banks' competitiveness has become increasingly dependent on their ability to please their customers with the digital experience they have become accustomed to through other services. This has led to a surge in ecosystem initiatives in the financial industry, making it an ideal setting for my research.

My observation is that lead firms trying to realize an ecosystem blueprint in an innovation ecosystem with heterogeneous complementors form multiple tiers of complementors differentiated by a distinct governance approach. The governance of each complementor tier matches the underlying uncertainty and complementors' role regarding exploring or converging around core or peripheral elements of the ecosystem blueprint. Specifically, lead firms choose formal governance mechanisms and market-based relationships when they face low uncertainty and when complementors' role is to converge around the predefined blueprint. However, when uncertainty is high, informal governance mechanisms and collaborative organizational forms encourage the explorative role of complementors with a view to resolving the uncertainty. These findings illustrate that the nature of a new ecosystem value proposition and the ambiguity surrounding it, as well as the role that complementors play in its realization, have implications for the feasibility of lead firms' governance choices.

Overall, my findings are in line with previous literature where the underlying uncertainty and nature of the exchange relationship has been suggested to have implications for effectiveness and efficiency of governance decisions (see for example, Felin and Zenger, 2014; Kapoor and Lee, 2013; Williamson and De Meyer, 2012). By deliberately focusing on the decisions and rules of engagement that influence relationships and the behavior of participating parties in ecosystems, this work answers several recent calls in the ecosystem literature (Jacobides et al., 2018; McIntyre &

Srinivasan, 2017) and augments prior research on ecosystem governance (Kapoor & Lee, 2013; Wareham et al., 2014). In addition, the study reveals a number of interesting practical implications for firms trying to facilitate the emergence of an ecosystem and, more generally, for firms attempting to respond to the general threats and opportunities digitalization brings. More specifically, by exploring the governance decisions of five different lead firms in ecosystems, this study provides new empirical insight for ecosystem design choices, ecosystem strategy, and the emergence of new ecosystems. A better understanding of these topics is paramount since "business and innovation move towards more open and networked environments" (De Silva et al., 2018, p. 70) at an unprecedented pace.

In what follows, I discuss the specific implications of my findings for research, the study's limitations and future research opportunities, as well as implications for practice in more detail.

5.1 Implications for Research

My study demonstrates how lead firms build innovation ecosystems with heterogeneous complementors by creating a governance structure with different tiers of complementors. I provide empirical evidence for how the uncertainty about the future ecosystem value proposition and complementors' role jointly affect lead firms' governance decisions as they are observed in innovation ecosystems. By shedding light on the mechanisms underpinning such governance decisions, my study informs the literature in several ways.

5.1.1 Ecosystem Literature

First and foremost, this study makes a case to ecosystem scholars, especially through its insights into ecosystem governance and potential strategies for building up and growing ecosystems.

Ecosystem governance: By suggesting that lead firms differentiate between distinct complementor groups and tailor their governance choices to the underlying uncertainty and to complementors' roles in the innovation process, I contribute to the

literature on ecosystem governance. First, prior studies have not adequately explained how lead firms define an ecosystem governance approach (Kapoor, 2018) when they are faced with a large variety of heterogenous complementors (Adner, 2017). By introducing the concept of multiple complementor tiers, I contribute to a more nuanced understanding of ecosystem governance in these settings (Adner, 2017; Kapoor, 2018; Kapoor & Lee, 2013). I find that lead firms use different governance approaches within the context of a single ecosystem, leading to complementor tiers. The lead firms in my study blended approaches of platform governance (i.e., a high standardization of complementor interaction) with approaches typically observed in innovation ecosystems (such as a tailored mix of formal and informal mechanisms; see Kapoor, 2018).

My findings correlate with the literature on modularity, where scholars distinguish between an ecosystem's stable core and fast-changing peripheral elements (Baldwin & Clark, 2000). Interestingly, however, I find that lead firms can conceptualize the periphery in an innovation ecosystem in different layers ("or tiers"). This differentiation is grounded in the lead firms' strategic considerations regarding the structure of the ecosystem. My study demonstrates that, while peripheral actors are of lesser strategic importance to the ecosystem value proposition, they do not necessarily evolve more rapidly (as the literature on modularity would suggest). This is because complementors' activities in the peripheral areas depend on lead firms' ecosystem blueprint, which under certain circumstances, can demand for very specific, stable peripheral complements. With these findings, I add to the emerging empirical literature that has studied the architectural design of ecosystems (Adner & Kapoor, 2010; Dattée et al., 2018; Kapoor & Agarwal, 2017). In addition, my findings show that tiered governance structures do not result solely from the complementors' attempt to comply with technological requirements the lead firm imposes. Instead, they sprout from lead firms' response to their uncertainty regarding the ecosystem blueprint and complementors' role in the emerging ecosystem. This study's results show that it makes a fundamental difference to lead firms whether they need to align with partners contributing generative capacity to the ecosystem, or with partners performing very specific activities and where the expected complementary output can easily be envisioned. My work thus provides empirical evidence for prior work on the structural aspects of ecosystems and the importance for lead firms to consider complementors' positions and activities in the ecosystem (Adner, 2017; Adner & Kapoor, 2010). Only if

lead firms clearly perceive their blueprints' underlying uncertainty and how complementors can help them to either explore or reinforce elements of the ecosystem blueprint, can they make governance decisions that reconcile uncertainty and the complementors' role in creating an ideal alignment with partners. With these findings, I also contribute empirical evidence supporting the "tiered decision-making structure" proposed by Nambisan and Sawhney (2011, p. 47). They proposed that lead firms allocate more decision-making competencies to complementors who take on more critical roles in ecosystems. Against this background, my work provides a more nuanced perspective by shedding light on complementors' actual role in the innovation process (i.e., either exploring or reinforcing elements of the envisioned blueprint).

Second, I explored specific governance strategies that firms can use to effectively manage membership and inter-firm relations in an ecosystem (Jacobides et al., 2018). So far, empirical research exploring the structural, configurational design aspects of ecosystems (Dattée et al., 2018; Saadatmand et al., 2019) and how they relate to the effective management and incentivization of complementors (McIntyre & Srinivasan, 2017) has been scarce. I contribute by providing empirical evidence for how lead firms consider both the organizational form and the mix of formal and informal mechanisms for managing complementors. The study thus adds detail to prior literature on ecosystem governance, which up to now has focused on only one of the two dimensions (see Järvi et al., 2018; Kapoor and Lee, 2013). By analyzing the relative importance of informal mechanisms for specific complementor groups, I shed new light on the governance of ecosystems where economic and cognitive interdependencies (Thomas & Autio, 2020) play a prominent role in aligning partners. In particular, my results show that informal mechanisms are used to resolve the uncertainty about future value propositions. My results reveal that high uncertainty about the ecosystem's value proposition and a required exploratory role of complementors is tied to informal governance mechanisms. This finding is in line with prior work on informal networks, where scholars have shown that exploratory outcomes can be better achieved with informal social relationships than with formal relationships (Lechner, Frankenberger, & Floyd, 2010; Tsai & Ghoshal, 1998). Similarly, my results are consistent with prior work on relational contracting that has shown the effectiveness of relational governance (relative to formal contracting) when firms operate in volatile environments (Carson et al., 2006). More generally, these findings provide evidence for the use of and shift towards "soft power instruments," and

they show that firms rely more heavily on mutual goals and visions (Benlian et al., 2015; Yoffie & Kwak, 2006) for the governance of complementors in ecosystems. My results are also in line with prior work on interorganizational governance showing that hybrid organizational forms (such as alliances and joint ventures) are more suitable than market-based relations when firms face uncertain and complex environments (Albers, Wohlgezogen, & Zajac, 2016; Felin & Zenger, 2014; Gulati & Singh, 1998; Leiblein & Macher, 2009). My work thus contributes to a more nuanced understanding for how lead firms govern relations in ecosystems, thereby addressing several recent calls in the ecosystem literature (Adner, 2017; Dattée et al., 2018; Jacobides et al., 2018).

Ecosystem creation strategies: My study also contributes to the literature on ecosystem creation strategies of incumbent firms that are reacting to increasing digitalization (Nambisan et al., 2019; Yoo et al., 2012). My findings show two distinct strategies of ecosystem creation by an incumbent firm. Some incumbents build an ecosystem around the existing business, which helps to enhance the existing value proposition, essentially turning their current offering into an ecosystem. This strategy corresponds with the idea of making an existing product the core of a platform ecosystem (Gawer & Cusumano, 2008; Zhu & Furr, 2016). Alternatively, other incumbents focus on a (new) promising value proposition and federate partners around their envisioned blueprint, akin to the ecosystem creation strategy Ansari et al. (2016) described in the television sector. I find that these two distinct strategies, one focused on enhancing a core product with ecosystem partners and one on uniting partners around a value proposition, can occur in the same industry and result from similar lead firm positions. These ecosystem creation strategies provide a complementary lens compared to prior work on ecosystem strategies that has focused on position-taking in ecosystems (see Hannah and Eisenhardt, 2018).

Further, by discussing how external factors, such as uncertainty about customer preferences or competing ecosystems' potential moves (e.g., locking-in critical complementors), affect lead firms' thinking regarding the appropriate set-up and governance, I indirectly answer a call by Tiwana et al. (2010). These authors asked for new research to explore how environmental dynamics influence lead firms' ecosystem design and governance decisions and how external factors impact the suitability of endogenous (governance) choices. In a similar vein, Dattée et al. (2018) called for a

qualitative comparative analysis of different ecosystem blueprints. In this regard, evidence from my cases confirms that lead firms can indeed choose between different ecosystem designs or blueprints, and that if a firm chooses "configurations of interdependencies with components suppliers and complementors" (Dattée et al., 2018, p. 493) it is (at least partly) determined by lead firms' respective ecosystem strategies.

My findings also contribute to and extend recent work by Furr and Shipilov (2018) who distinguished between "centralized" and "adaptive" ecosystem strategies. They found that lead firms can either act as "brokers," who facilitate the exchange of separated offerings, or as "orchestrators," who encourage partners to collaborate and co-innovate. They view these roles as two distinct strategies, the suitability of each depending on the particular circumstances in the lead firm's environment. They argue that "while centralized ecosystem strategies depend on having specific, well-defined problems and solutions (...), adaptive ecosystem strategies are suited for situations where the problem and the solution are uncertain or still being sorted out" (Furr & Shipilov, 2018, p. 61). While my findings and central argument resonates well with the claim that lead firms adapt their strategy to the uncertainty underlying the ecosystem activity, I posit that they can in fact pursue a "dual strategy" in which elements of the two archetypical strategies are employed at the same time. In line with Furr and Shipilov (2018), I find that lead firms encourage close collaboration and problem solving when problems are uncertain and elements of the ecosystem are still vague. In such circumstances, contracts (with joint venture partners, see case Delta and Epsilon) were indeed kept somewhat flexible and open, because it is simply too costly, if not impossible, to "spell out every possible contingency" in an uncertain environment (Furr & Shipilov, 2018, p. 64; see also de Figueiredo & Silverman, 2017). In contrast, if the environment was more certain (i.e., the lead firm could more easily envision the elements of the blueprint), the lead firms employed market-based agreements. Again, this finding resonates well with what Furr and Shipilov (2018) defined as a characteristic element of a "centralized ecosystem strategy." In contrast to these scholars' work, however, I found that lead firms employed both strategies simultaneously, because not all elements of the ecosystem blueprint were equally (un)certain. In this regard, my findings enhance our understanding of how lead firms cope with uncertainty in the process of ecosystem creation by introducing the concept of domains of uncertainty. Earlier publications have considered uncertainty regarding the entire blueprint (Dattée

et al., 2018; Furr & Shipilov, 2018), whereas my findings show that firms can also face uncertainty regarding a specific domain of the blueprint. My study thus extends Furr and Shipilov's (2018) work in this area by showing that dual strategies exist and explaining how they are employed in practice.

More specifically, evidence from my cases suggests that the joint venture structure cases Delta and Epsilon used, allowed the lead firms to be "adaptive" where needed (in the ecosystem's core) and "centralized" where possible (in the ecosystem's periphery). The findings show that lead firms preferred the joint venture structure when they needed to closely and flexibly collaborate with partners to realize the envisioned ecosystem value proposition. In these circumstances, the joint venture as organizational form can serve as a vehicle to organize collaborative ("adaptive") activities, exchange knowledge and resources and build the frame that allows them to use partner-specific, informal governance mechanisms (see Furr & Shipilov, 2018). At the same time, the joint venture can itself build formal, market-based ties to peripheral partners, thereby acting as "broker" facilitating "centralized" exchange in the ecosystem's periphery (see Furr & Shipilov, 2018). Evidence from my cases thus revealed that incumbents can use joint ventures as an organizational form to co-sponsor and manage the emergence of ecosystems that have only a limited overlap with their established core business. The study thereby answers Jacobides et al.'s (2018) recent call in which they encouraged scholars to explore the use of alliances to co-sponsor, manage, and grow ecosystems.

Last, I contribute to the literature on the organizational design of ecosystems, in particular regarding the question of organizationally integrating ecosystem activities. I find that incumbent firms tend to (structurally and geographically) separate their ecosystem activities when the core of their envisioned ecosystem value proposition is distinct from their existing business. In contrast, incumbents integrate their ecosystem activities when they are trying to build a generative ecosystem around their existing business (e.g., banks that want to become the key platform for all the financial matters of their customer). My study thus provides new empirical evidence for how firms adapt their organizational structure in response to their engagement in ecosystems (Joseph & Gaba, 2020; Kapoor, 2018; Puranam, Alexy, & Reitzig, 2014). Given that aspects of organizational design are closely interrelated with structure, the next section turns to the structural ecosystem perspective.

Structural ecosystem perspective: By means of exploring the ecosystem-level structural aspects, my work contributes important empirical evidence to Adner's (2017) structural perspective and Joseph and Gaba's (2020) recent conceptual work. My data shows that in four out of five cases, lead firms located the primary responsibility for the ecosystem activities in structurally separated teams or units. In this regard, reports from informants seem to confirm the intra-organizational conflicts Joseph and Gaba (2020) noted. In their study, these authors found that segregated activities can lead to divergent perspectives, which can be problematic as "in the cases of both inadvertent and intentional divergence, the potential for intraorganizational conflict over problems and solutions will increase" (Joseph & Gaba, 2020, p. 289). Evidence from one case (Alpha) confirms that such conflicts are especially salient when the new domain (i.e., the ecosystem activities) affect the position and operation of the established business (Birkinshaw & Lingblad, 2005; Galunic & Eisenhardt, 2001; Joseph & Gaba, 2020). These results are thus in line with the notion that ecosystems built around an established business model create new and additional tensions due to the heightened intra-organizational interdependencies, which leads to further complexity and coordination challenges in the lead firm (Joseph & Gaba, 2020).

Additionally, my analysis shows that lead firms use different organizational forms (e.g., joint ventures vs. market-based arrangements) as ecosystem design lever to align the search criteria in the ecosystem (Joseph & Gaba, 2020) and stimulate ecosystem innovation (Cusumano & Gawer, 2002). For instance, the joint venture set-up used by cases Delta and Epsilon allowed them to openly share information and more efficiently coordinate innovative efforts with their strategic partners. Similarly, the analysis revealed that cases Alpha and Gamma forged direct relationships with individual upstream firms to align on innovative search efforts and ensure that partners were working on complementary innovations that benefitted the ecosystem. These findings are in line with prior research that has found that that firms can form direct interorganizational ties to gain more control (Das & Teng, 1998), to influence partners' innovative activities (Joseph & Gaba, 2020; Kirsch, Sambamurthy, Ko, & Purvis, 2002), and to coordinate the use of resources with partners (Das & Teng, 2000; Foerderer et al., 2014; Tiwana, 2008). Importantly, however, such direct equity ties create a form of path-dependency (Adner & Levinthal, 2004; Tiwana et al., 2010) if lead firms restrict themselves to a particular complementor. This limits their ability to access other,

alternative complements. In addition, forging direct ties can be seen as a robust control measure that could hurt the ecosystem's generativity (e.g., Boudreau, 2010; Tilson et al., 2010; Wareham et al., 2014) and might discourage other complementors (Cusumano & Gawer, 2002) from collaborating with the lead firm. This risk is especially salient for those complementors that want to maintain their independence and fear the lead firm's power and excessive influence. Direct (equity) ties can thus create a dilemma which Ganco et al. (2020) described as a "tradeoff between reducing the size of the combinatorial pool (...) and improving alignment of the innovative search process" (Ganco et al., 2020, p. 667). Nevertheless, an advantage of direct (equity) ties is that the complementor's innovations cannot be leveraged by other, competing ecosystems (unless approved by the lead firm or otherwise contractually agreed). Case Gamma, for instance, described how their minority equity stake enabled them to dictate that a collaboration with other financial institutions (i.e., Gamma's competitors) is forbidden, unless Gamma themselves permitted it. By contrasting different ecosystem structures within the same industry, my work therefore provides important new empirical evidence illustrating how lead firms' governance decisions relate to structural aspects at the firm- and ecosystem-level, thereby contributing to earlier work in this domain (Adner, 2017; Joseph & Gaba, 2020).

5.1.2 Open Innovation Literature

Another contribution this study makes, is to conversations on organizing innovative activity by discussing the concepts of open innovation (e.g., Bogers et al., 2017; Zobel & Hagedoorn, 2020) against the backdrop of my findings. While previous work in the field of open innovation (OI) studied different aspects of openness in terms of search openness (e.g., Laursen & Salter, 2006; Leiponen & Helfat, 2010; Salge, Farchi, Barrett, & Dopson, 2013), returns from open innovation (e.g., Laursen & Salter, 2014), and new product development (e.g., Salge et al., 2013), the OI literature has been surprisingly silent about collaboration mechanisms and governance. Recently, OI scholars highlighted that new forms of collaboration, such as innovation ecosystems, require more attention. Specifically, we need to study the interactions between multiple heterogeneous actors (Bogers et al., 2017), the potential tensions between cooperation

and competition (Holgersson, Granstrand, & Bogers, 2018), as well as the openness of governance in such networks (Bogers et al., 2017; Zobel & Hagedoorn, 2020).

In the light of these questions, my empirical examination of lead firms' governance decisions provides valuable evidence for the importance of informal governance (Järvi et al., 2018) and the relational contracting element Zobel and Hagedoorn (2018) recently put forward. I found that informal governance mechanisms are critical elements for ecosystem governance, especially when the underlying blueprint is still vague (Dattée et al., 2018) and complementors engage in mutual explorative activities. Further, by illustrating how lead firms combine traditional organizational forms (e.g., joint venture) with informal governance mechanisms (e.g., open dialogue), the study addresses another recent call for research (Zobel & Hagedoorn, 2020). Following here, I will discuss these contributions in more detail.

Relational contracting in ecosystems: Based on my analysis of lead firms' relationship to complementors, I found evidence in favor of Zobel and Hagedoorn's (2020) claim that as firms' organizational boundaries become more open, relational contracting becomes more important. Evidence from my cases confirmed that when lead firms entered into long-term collaborative partnerships with strategic partners, social norms such as mutual trust and open dialogue mattered more than the actual written contract. More specifically, the written agreements formed the legal basis and frame for the cooperation, but played only a minor role in the actual coordination with strategic partners in the joint venture. In this regard, this study's findings also provide new insights on the effect that the relationship's duration and intensity have on the governance of OI activities, which remains another understudied area of research (Adner & Kapoor, 2010; Zobel & Hagedoorn, 2020). Evidence from my cases suggests that the nature and intensity of exchange between partners decisively influence the importance of relational contracting. More specifically, relational contracting seems to be particularly important when a long-term and close collaboration based on mutual exploration and communication is necessary (as in the case of Delta's and Epsilon's relationship to joint venture partners). In such a setting, trust is an important informal safeguard, which ensures that partners act faithfully, work towards the mutual goal, and can share resources and knowledge more openly (Dyer & Singh, 1998; Kale et al., 2000; Phelps, 2010; Powell, 1990). So, as my cases' evidence suggests, if mutual collaboration

and knowledge exchange were crucial for solving the (ambiguous) innovation problem, trust played a fundamentally important role. In fact, informants explained that the authority formal contracts exert, plays only a subordinate role in the mutual exchange between strategic partners. Especially when conflicts arose, open dialogue and trusted exchange were of fundamental importance to solve them, irrespective of how the factual decision rights were distributed among partners. As one informant put it: *"The decision rights don't matter in informal dialogues but the mutual partnership and the mutual goal do. So, you have to listen closely. Even if the partner holds only 0.5 percent of the decision rights, or even if he holds nothing. If the partner is unhappy or if something is important to him, you need to pay attention and figure out how you can address his needs. Otherwise the collaboration won't work for long"* (Case D_Respondent A).

In addition, when lead firms entered into trusted long-term relationships, the underlying agreements were kept somewhat open and flexible, defining partners' required capacity and resources, rather than their exact tasks, responsibilities or the expected output. In particular, when lead firms needed ecosystem partners to engage in joint problem-solving activities and resolve the uncertainty underlying specific elements of the envisioned blueprint, the formal agreements focused on aspects of the mutual collaboration, rather than on future outputs, which were difficult or even impossible to define, given the uncertain environment at the time the relationships were established (see e.g., Furr & Shipilov, 2018; Schilling & Steensma, 2002; Teece, 1986; Williamson & De Meyer, 2012). However, when the underlying uncertainty regarding specific elements of the blueprint was low, tasks and responsibilities could be clearly defined and were put into formal contracts (Schilling & Steensma, 2002; Teece, 1986). This evidence is in line with the relational contracting perspective, in which contracts are kept open and incomplete by design and mutual trust matters more than formal contracts do (Faems et al., 2008; Todeva & Knoke, 2005; Zobel & Hagedoorn, 2020). Further, the findings resonate well with prior arguments of Williamson and De Meyer (2012) and Furr and Shipilov (2018) regarding the design of formal agreements between partners in adaptive ecosystem settings and lead firms' ideal ecosystem strategies in (un)certain environments.

In sum, by uncovering how lead firms mix formal and informal governance mechanisms and how they evaluate the importance of written agreements, my work

provides fresh insight in an understudied area of research. More specifically, the study sheds new light on the role and importance of social norms relative to the actual written contract in an ecosystem context. Such new knowledge and insight is important for our understanding of how firms create and capture value through engagement in OI activities (Zobel & Hagedoorn, 2020).

Governance of open innovation activities: By explicitly connecting the heterogeneity in complementors' roles in the ecosystem innovation process (Laursen & Salter, 2006) to the lead firms' governance decisions that my study has unearthed, I also add to a better understanding of governance processes in OI contexts (West & Bogers, 2014). My analysis shows that lead firms use different governance mechanisms depending on whether they need complementors to engage in explorative problem-solving (when the uncertainty is high) or to solve relatively simple problems (when the uncertainty is low). My finding that complementors' actual role in the innovation process affects governance decisions thus extends prior research that differentiated partners based on their individual firm characteristics, such as their resource endowment or type (e.g., Gesing et al., 2015). Further, evidence from my cases suggests that different OI settings require distinct governance decisions. As the partners resolve early uncertainty through mutual exploration, stricter governance becomes more favorable (Furr & Shipilov, 2018). Therefore, the mix of governance modes (i.e., the combination of organizational form and governance mechanisms) needs to be adjusted over time (Zobel & Hagedoorn, 2020).

Moreover, my cases illustrate how firms engage in an ecosystem context, in which decision-making rights are distributed among multiple diverse actors. This remains another underexplored field of research (Bogers et al., 2017). Evidence from cases Delta and Epsilon confirms prior findings by Gulati et al. (2012, p. 578) that "flatter, more egalitarian designs" based on shared decision-making rights and responsibilities can be deployed systematically to create stronger incentives and alignment with strategically important partners. I found this to be critical when members' explorative search effort is essential to resolve uncertainty underlying the ecosystem blueprint and when complementors' innovations are of fundamental importance to the ecosystem's success, as was the case in Delta's and Epsilon's relationship to their joint venture partners. In this light, findings from my cases provide

empirical evidence for the proposition that (lead) firms purposefully share decision rights to positively influence the motivation and incentives of partners collaborating in an OI context (Gulati et al., 2012; Nambisan & Sawhney, 2011; Tiwana et al., 2010).

5.1.3 Other Literature Streams

Besides the contributions made to the ecosystem and open innovation literature, the results of this dissertation have implications for cognate literature streams as well. In what follows, I first discuss the implications this study has for research on (1) resource dependence, and then I turn to a discussion of the implications for research on (2) ambidexterity.

(1) Resource dependence literature: Early research in the field of resource dependence theory (RDT) found that firms' dependence on external resources influences their behavior (Pfeffer & Salancik, 1978). Researchers investigated the impact external factors have on firms' attempts to build more stable exchange relationships and the options firms have in managing dependence and reducing uncertainty. Such options include mergers and acquisitions, joint ventures alliances, board interlocks, political action and executive succession (e.g., Gulati & Sytch, 2007; Ozcan & Eisenhardt, 2009; Park & Mezias, 2005; Pfeffer, 1972; Pfeffer & Salancik, 1978; Piskorski & Casciaro, 2005; Stearns et al., 1987).

While these studies provided valuable insights that could explain interorganizational ties and dependence relationships, important questions remain, especially in the light of rapidly changing environments and emerging new forms of collaboration (Hillman et al., 2009). Wry et al. (2013) noted that we still need to advance our understanding of the environmental complexities, which remain an understudied area of this theory. Referring to Pfeffer and Salancik (1978) they noted that "environmental complexity may vary systematically around different issues and decisions" (Wry et al., 2013, p. 476) and called for more research on how managers and organizations respond to such issues. Similarly, Hillman et al. (2009) noted that rapidly changing environments and the "dynamic nature of interdependencies" (p. 1419) might require alternative forms of interorganizational links and scholars should investigate additional actions and strategies that firms can use as a response to environmental

dependence and uncertainty. In the light of these questions, my dissertation contributes to the resource dependence literature by studying how lead firms make different governance decisions in the context of dependencies and uncertainties in their ecosystem environment.

First, I provide empirical evidence for several of the theory's main premises in an ecosystem context. My case analysis revealed that lead firms attempt to build closer ties as a means of encountering dependence in their resource exchange and to restructure competitive interdependencies with rival ecosystems. More specifically, case data from all cases, except Beta, confirmed that lead firms considered measures such as exclusive contracts and direct ties based on minority equity investments as a means to gain more control and lock out potential competitors of competing ecosystems. These findings point to the importance of strategic actions in encountering competitive uncertainty and securing a stable supply of critical complements. They resonate well with the RD perspective on how firms can manage competitive uncertainty (Burgers et al., 1993; Pfeffer & Salancik, 1978). Closer ties generally imply more coordination with complementors (Heide, 1994), which in turn helps to create a more predictable environment (Cyert & March, 1963; Thompson, 1967). Thereby, from the perspective of the lead firm, coordinating reduces environmental uncertainty and increases stability in the exchange relationship (Pfeffer, 1972; Pfeffer & Salancik, 1978). A further advantage of closer ties relates to the increased control of both internal and external resources, e.g., through carefully controlling complementors' resource contributions as well as complementors' use of lead firms' resources (Das & Teng, 1998, 2000; Foerderer et al., 2014),

In addition, I found evidence showing that, under specific circumstances, lead firms create links to multiple complementors (Gulati et al., 2012; Nambisan & Sawhney, 2011) in order to actively restructure the interdependencies in their environment to their advantage (Wry et al., 2013). This could be observed when a lock-in of a single complementor would have had negative consequences (Katila et al., 2008), such as path dependence (Adner & Levinthal, 2004; Tiwana et al., 2010) or hampered generativity (Tilson et al., 2010; Wareham et al., 2014). For instance, evidence from case Epsilon showed that the lead firm deliberately fostered redundancy of complementors in areas where reliance on only one could negatively affect the ecosystem's stability and

performance. Similarly, several informants (from Alpha, Delta and Epsilon) explained that they would typically create relatively open ecosystem boundaries when the market was very heterogeneous and when ecosystem customers preferred to choose from a range of different complements. Hence, while a smaller number of linkages would have been easier to monitor and control, they deliberately fostered multiple linkages when interdependencies in their environment required them to do so. The rationale was to *"create the least number of linkages possible, but as many as necessary."* This observation supports prior claims suggesting that complex environments require more complex or more differentiated linkages between firms (Aldrich, 1979; Anderson & Tushman, 2001; Dess & Beard, 1984; Stearns et al., 1987) and that firms should avoid a premature lock-in of partners when faced with a heterogeneous environment (Drees & Heugens, 2013).

Overall, these results shed new light on the strategies and tactics lead firms employ in ecosystems to manage interdependencies in their environment. The findings resonate well with prior arguments by Gulati et al. (2012) who posit that firms "may also use boundary arrangements to shape the nature of the relationship between its constituent entities, in particular the exclusivity and duration of membership" (Gulati et al., 2012, p. 577). In the light of this prior work, my study thus provides further empirical evidence that properly designing organizational boundaries and choosing the right organizational form are critical mechanisms for lead firms (Gulati et al., 2012; Wareham et al., 2014) in managing and controlling exchange relationships with complementors.

Second, this work demonstrates how lead firms' governance decisions are made in a complex and dynamic ecosystem environment, where most of the theory's traditional, more hierarchical strategies and are either no longer applicable or not feasible (Hillman et al., 2009; Zobel & Hagedoorn, 2020). Evidence from my cases illustrates that informal governance mechanisms, such as mutual trust and shared vision, are important alternative mechanisms for lead firms to monitor and discipline complementors (Autio & Thomas, 2014; Benlian et al., 2015; Tiwana et al., 2010; Zobel & Hagedoorn, 2020). From the RDT perspective, informal governance mechanisms can therefore be seen as an extension of the RDT toolbox (Hillman et al., 2009), which has mainly been focused on formal mechanisms. However, I posit that informal governance mechanisms are especially important in the context of high-velocity environments and

new forms of collaboration (such as platforms and ecosystems), where more hierarchical forms of control usually do not exist (Gulati et al., 2012; Jacobides et al., 2018; Wareham et al., 2014) and equity-based control is of limited relevance (Zobel & Hagedoorn, 2020). This study can thus be seen as an attempt to explore alternative, more informal control strategies and responds to a call in the RTD literature to explore additional actions that firms can take to manage resource dependence and uncertainty (Hillman et al., 2009).

Third, this study illustrates that different environmental conditions require different firm responses. By discussing how specific external conditions shape lead firms' decisions, this work responds to calls in the literature to study environmental contingencies and explore understudied aspects of environmental complexity (Hillman et al., 2009). For example, in a complex environment where lead firms find it difficult to envision the future success of complementary products or services (i.e., when the respective elements of the future ecosystem blueprint are still uncertain), building particularly strong-ties that lock-in specific complementors would not be the ideal strategy (Adner & Levinthal, 2004; Gruber et al., 2008; McGrath & MacMillan, 2000; Tiwana et al., 2010). Similarly, as discussed in previous examples, when lead firms enter into direct, close relationships with certain complementors, it will most likely alter the ecosystem's generativity and other prospective complementors' behavior (Boudreau, 2010; Cusumano & Gawer, 2002). Both arguments point to the path-dependent nature of lead firms' decisions in ecosystems (influencing feasible options in future decision) (Wry et al., 2013) and the potential negative consequences of tie formation, which the lead firm needs to anticipate prior to the tie formation (Hallen et al., 2014; Katila et al., 2008). This study thus sheds light on the potential negative aspects of tie formation in an ecosystem context (Hillman et al., 2009; Katila et al., 2008).

In sum, my findings underscore the importance of understanding firms' external environment, especially with regard to resource dependence and uncertainties, when studying organizations' behavior in interorganizational relationships (Buchanan, 1992; Pfeffer & Leong, 1977; Pfeffer & Salancik, 1978).

(2) Ambidexterity literature: This work also makes a case of interest to scholars studying organizational ambidexterity. Firms' decisions about their organizational set-up and where to embed the explorative ecosystem activities speak

right to the notion of organizational ambidexterity (Jansen, Tempelaar, van den Bosch, & Volberda, 2009; Markides & Charitou, 2004; O'Reilly & Tushman, 2008, 2013; Raisch & Birkinshaw, 2008; Tushman & O'Reilly, 1996). Ambidexterity, defined as "an organization's ability to be aligned and efficient in its management of today's business demands while simultaneously being adaptive to changes in the environment" (Raisch & Birkinshaw, 2008, p. 375), fits my observation of an incumbent bank's reaction to changes in the environment very well, and it suits their endeavor to investigate ecosystem activities.¹³ In this respect, it is interesting to contrast my study with insights from the ambidexterity research stream.

Overall, my finding that lead firms make different governance decisions depending on whether complementors are needed to engage in an explorative or reinforcing role resonates well with insights from the ambidexterity literature. More specifically, case data from Alpha, Gamma, Delta and Epsilon confirmed that incumbent firms tend to use a structurally separated team or unit to work on new business models ideas (i.e., planning and realizing the ecosystem blueprint). Further, cases Alpha and Beta, which both built the ecosystem around their existing business, kept the responsibility for exploitative activities within the larger, established organization (i.e., reinforcement was desired where the blueprint was stable and could easily be envisioned). In contrast, cases Alpha and Beta used more loosely coupled arrangements when they needed to facilitate explorative innovative search efforts (i.e., in their ecosystems' periphery, where the blueprint was still vague and lead firms desired exploration). In addition, case firms Delta and Epsilon used joint ventures as organizational form to access the new resources and capabilities necessary for the ecosystem's build-up and to jointly resolve the uncertainty (Inkpen, 2001) regarding the ecosystem blueprint. This set-up also helped them to adapt to their environment (Doz, 1996; Kraatz, 1998) and maintain or even extend their competitive advantage (Ireland, Hitt, & Vaidyanath, 2002; Kumar & Nti, 1998).

¹³ Similarly, (Burgelman, 1991, 2002) distinguished between variation-reducing and variation-increasing strategic processes, which relates to exploitative and explorative processes (see Raisch & Birkinshaw, 2008). This, again, illustrates the parallels between research on organizational ambidexterity and my observation that lead firms in ecosystems applied distinct governance approaches for complementors with explorative and those with exploitative roles.

Besides supporting the general propositions from research on organizational ambidexterity (e.g., Benner & Tushman, 2003; Lavie, Stettner, & Tushman, 2010), my work also sheds new light on the contextual factors that influence firms' decision to choose a spatial separation strategy instead of a contextual ambidexterity strategy.¹⁴ Although prior work in the field of organizational ambidexterity has explored different strategies to become more ambidextrous, research examining the contextual factors influencing which strategy best fits a particular situation is still relatively scarce (Markides, 2013). My study thus provides empirical evidence to an unresearched area in this literature stream.

More specifically, evidence from my cases shows that lead firms preferred to embed the ecosystem business model in a separate entity when the successful build-up required them to collaborate closely with strategic partners. Using a separate organizational set-up allowed them to provide the ecosystem venture with the flexibility and autonomy it needed to succeed. It would have been impossible to achieve the same level of flexibility and autonomy within the established organizational structure. For instance, the separated ecosystem venture allowed lead firms to establish a new corporate culture, flexibly collaborate with externals and so forth. Informants from case Delta also stated that the spatial separation implied fewer legal restrictions and requirements for the ecosystem compared to a home inside their established business. However, when lead firms had pre-existing assets that they wanted to use as a starting point and basis for their ecosystem activities they kept the ecosystem activities closer to their existing business. For instance, case Gamma's ecosystem activities were located in a newly founded business unit but kept within the established organizational structure because they wanted to build on their pre-existing mortgage-platform. Also, informants of case Gamma argued that the co-branding strategy (using a bank-endorsed brand for the ecosystem activities) would make it easier to leverage synergies with the existing business, i.e., to offer and sell the ecosystem value proposition through the established branch-network.

¹⁴ In this context, spatial separation describes the physical separation of business models (Markides, 2013; Tushman & O'Reilly, 1996), while contextual separation is defined as "the behavioural capacity to simultaneously demonstrate alignment and adaptability" (Gibson & Birkinshaw, 2004: 209).

While this is far from being a comprehensive list of contextual factors, it nevertheless points to an interesting connection that exists between lead firms' ecosystem strategies and their business model choices. Research on business models and organizational ambidexterity (Gilbert & Bower, 2002; Markides, 2013; Markides & Charitou, 2004) explores questions that are quite similar to ones in the current debate on ecosystem phenomena, considering e.g., how to organize value chain activities, what to separate, where to keep control, and how to balance flexibility and control (Jacobides et al., 2018; Kapoor, 2018). Given that these two streams' research interests significantly overlap, I argue that there is much to learn from applying a business model and ambidexterity perspective to ecosystem phenomena. My analysis of ecosystems' structural aspects (Adner, 2017; Jacobides et al., 2018) and the discussion of likely implications of using a separated ecosystem set-up (i.e., a spatial separation strategy) vs. an integrated ecosystem set-up (i.e., a contextual separation strategy) should thus be seen as a first (empirical) step in this direction.

5.2 Limitations and Avenues for Future Research

I am aware of the limitations of this multiple-case study, which open up promising avenues for future research. First, my work draws on a sample of five cases within a single industry setting. While this approach enhances the comparability across cases and helps to identify the critical discriminant factors, it raises concerns about the generalizability of the results and the model (Siggelkow, 2007). In particular, the industry in which my study is set – the financial services industry – presents some idiosyncratic characteristics (e.g. strict regulatory requirements, emerging competition from other industries as well as from start-ups) which could limit the generalizability of my findings. While I believe that most of the ecosystem dynamics and governance decisions I have investigated can also be observed in other industries and that my insights apply to other contexts as well, the envisioned blueprints might be influenced by factors specific to the financial industry. Future research could thus replicate my analysis and investigate governance approaches in other industries and contexts. Similarly, I would encourage work that extends my analysis to discover potential boundary conditions of company size, ecosystem maturity, and context of the ecosystem value proposition. For example, it would be interesting to investigate whether firms use

different approaches when their ecosystem activities focus on customer journeys that are closer to their established business domain (e.g., construction companies' approach towards housing ecosystems). As organizations across various industries are moving towards more open, networked settings, investigating parallel approaches concerning the build-up of ecosystems tailored to specific customer journeys versus those built around the existing business constitutes an interesting future research avenue. Future studies could take the findings from this multiple-case study and apply them to a broader set of industries and different customer journeys.

Second, even though I took great care in the data collection process (e.g., through data triangulation and regular discussion of findings and propositions with supervisors), my study's results might still be subject to respondent bias. Given the retrospective nature of most interviews (reflecting with informants how the governance decisions were made), the responses could be affected by hindsight bias, omissions, and recollection errors.

Third, future research could investigate the multi-level implications of different ecosystem blueprints and strategies. While I have discussed the implications for the governance of complementors and touched upon additional consequences in this study, there is much more to be explored. For example, questions future research should analyze and investigate would relate to the implications for lead firms' profitability, customer relationships, organizational identity, and position within the broader industry architecture.

Fourth, my study offers limited evidence on how the relation to complementors changes once the domains of uncertainty shift or what happens if the uncertainty is clarified altogether. A longer time horizon would be required to observe how lead firms' engagement with complementors changes once they have a clear conception of all elements of the envisioned blueprint, which is likely to influence appropriate strategies and governance approaches. Therefore, future research should study the governance decisions based on a longitudinal data set and focus on reactions to changes concerning the ecosystem value proposition, or on changes that affect the level of uncertainty underlying the exchange relationship (e.g., complementors' behavioral patterns, competitors' reactions, etc.). For example, the informal relationships I observed in my cases might become more formal over time due to the underlying uncertainty about the

respective ecosystem domain being resolved. Exploring how lead firms react to changing environmental conditions and how their governance approach changes over time, is thus a promising area for future research.

Fifth, although I interviewed multiple informants from different levels and backgrounds within each lead firm, my study provides no direct account of how lead firms' complementors see their specific role in the emerging ecosystem. I indirectly captured their perspectives and gained an understanding of the role that the lead firms envisioned for their partners, as well as the incentive mechanisms they deployed. However, this might have limited the set of relevant factors I was able to capture. Future research should delve deeper into discussions between lead firms and complementors in order to explore possible influences that complementors had on the relationship's characteristics. It would also be interesting to see how the relationships between the lead firm and its complementors change once specific complementors become more relevant as their positions are strengthened. For example, when shifts in customers' preferences or new complementary offerings lead to a shift in ecosystem bottlenecks, the power balance within ecosystems could change.

Sixth, while I believe that my model can be applied to lead firms in other industries and contexts as well, it does not reflect banks' decisions taken from the complementor's position. Future research should thus explore banks' decision-making processes in ecosystems led by other firms. For example, new research could investigate what happens when the bank deliberately takes on a complementary role in an e-commerce ecosystem, providing banking-as-a-service functions to the ecosystem. In such a setting, the aforementioned implications for the bank's profitability, customer relationship, etc. will most likely be different. Further, the bank's different structural position could then also have implications for the availability and effectiveness of governance choices. For instance, being a complementor in the e-commerce ecosystem would put the bank in a position located upstream, which is likely to change complementors' incentives (their distance to the end customer increases respectively). Hence, the implications banks' structural positions have for their governance choices and the dynamics within ecosystems are a promising area for future research.

Seventh, I have conducted my analysis from the perspective of the lead firm in charge of designing and orchestrating the ecosystem. While this is a well-justified

perspective for many commonly known ecosystems (especially ecosystems that are organized around a central platform), it is less suitable for ecosystems where these processes are more collaborative and where a lead firm does not even exist, or where the lead firm has less power. Therefore, I cannot establish the generalizability of my findings across ecosystem settings where lead firms are not in charge of the ecosystem design and governance. It would therefore be interesting to see what boundary conditions are needed to extend the generalizability of my findings to ecosystems where no clear lead firm exists, or where lead firms find it more difficult to enforce their envisioned blueprint.

Despite these limitations, I believe my exploratory study of lead firms' governance choices and its findings shed light on previously under-investigated aspects of relevant strategic dynamics in innovation ecosystems, and that it points to interesting avenues for future research on ecosystem governance.

5.3 Implications for Practice

Apart from the research contributions, this dissertation also has several important practical implications. The findings delivered through analyzing five different financial services ecosystems can serve as helpful guideline for managers of lead firms, to advise during the ecosystem planning and emergence phases, as well as on the ongoing ecosystem partnership management. The implications for practitioners can be grouped into three broad but interrelated categories, namely distinct ecosystem strategies and their implications (5.3.1), governance decisions in innovation ecosystems (5.3.2), and coordination challenges and capabilities required by lead firms (5.3.3). I discuss each of these topics in more detail in the remainder of this section.

5.3.1 Distinct Ecosystem Strategies and Their Implications

My research indicates that incumbent firms can choose between different ecosystem blueprints or strategies. The analysis of my case studies revealed that incumbent banks' either tried to build an ecosystem of complements around their existing business, or to nurture a separate ecosystem focused on a specific customer journey. I subsequently

labelled these strategies "generative ecosystem strategy" and "convergent ecosystem strategy" respectively. These labels should reflect the process of expanding an existing product-focused value proposition into an ecosystem value proposition (i.e., a generative process) versus closely cooperating in order to configure a new ecosystem value proposition from scratch (i.e., a convergent process). Based on my cases' observations, I argue that these two distinct ecosystem strategies are both valid ones for incumbents trying to take on the role of lead firms in emerging ecosystems. Yet, the different ecosystem strategies this study has disclosed, have some important practical implications for the potential conflicts and challenges that lead firms face in building up and ongoingly managing their ecosystem.

Figures 8 and 9 give an illustrative overview of both ecosystem blueprints' design. Table 5 gives a description of both ecosystem strategies and the most important managerial take-away issues from an incumbent bank's perspective. Next, I discuss the key challenges and the managerial implications of both strategies.

Figure 8
Illustrative Overview of Lead Firms' "Generative Ecosystem Strategy"

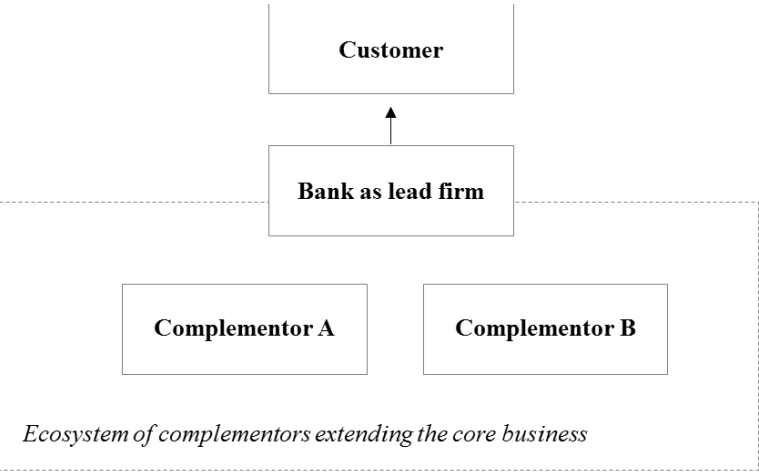


Figure 9
Illustrative Overview of Lead Firms' "Convergent Ecosystem Strategy"

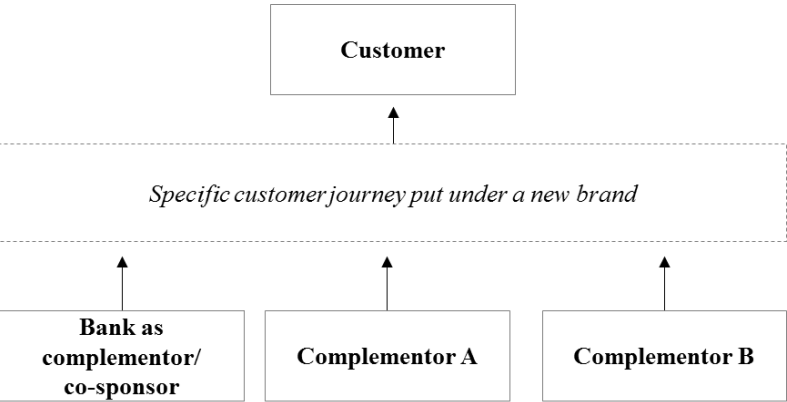


Table 5
Ecosystem Strategies (or "Blueprints")

	(1) Generative ecosystem strategy	(2) Convergent ecosystem strategy
Description	- Ecosystem is built around the established business - The heart and center of the ecosystem is formed by the bank's existing offering, i.e., the online banking platform - Aims to build a generative ecosystem of complements around the existing offering, essentially moving from product- to platform-strategy over time (Zhu & Furr, 2016)	- Ecosystem strategy aims to develop a (separate) specific customer journey, e.g., housing - The heart and center of the ecosystem is not necessarily related to the bank's existing offering - Bank co-sponsors (and leads) the ecosystem
Objectives and implications	- Overall aim is that the bank stays relevant in the mind of the customer; it is vital to maintain the bank's existing customer base - Bank can start with existing (online) banking platform and build on established organizational structures, resources and employees (e.g., making the ecosystem endeavor the digital unit's responsibility) - Banks need to start with a strong product or service that excites customers and prevents them from churning (Zhu & Furr, 2016)	- Overall aim is to tailor offering to a specific customer need - Bank needs to start from scratch and find strategic partners for developing the new value proposition - Bank offering plays only a secondary role in the new ecosystem (e.g., housing is the primary need, while financing (decision) is enabling the primary need) - Entrepreneurial mindset and business-building capabilities required for the build-up of the new venture

(Table continued on next page)

Ecosystem Strategies (or "Blueprints") (continued)

(1) Generative ecosystem strategy		(2) Convergent ecosystem strategy
Key advantages	- Easier access to existing resources and capabilities - Existing customer base and trusted brand can serve as an asset: good starting point to reach scale quickly and attract complementors	- Freedom and flexibility for explorative ecosystem activities (e.g., through close collaboration with strategic partners) - Ability to circumvent (some, if not all) legal restrictions by establishing a separate venture to embed the ecosystem activities
Key challenges	- Intra-organizational challenges are more substantial: when ecosystem activities are constrained by legacy processes, infrastructure and approval processes, negative consequences might severely hamper ecosystem endeavor (e.g., lack of speed) and send a negative signal to (prospective) complementors - Possible limitations/constraints concerning non-bank customer journeys (e.g., conflicts between bank brand and non-bank customer journeys) - Mindset-shift required from product-focus towards value generation across complementors (Zhu & Furr, 2016), which is difficult if ecosystem thinking is limited to a small group/a single unit	- Risk of becoming a "white-label back-office" when bank is merely providing banking services to others' ecosystems - More challenging to leverage existing assets from the core business, e.g., transfer existing customer base to new ecosystem venture - Connection and integration of multiple, separate ecosystem journeys is necessary to unleash synergies (e.g., insights across separated customers' journeys) (Jacobides, 2019) - Strong management ties required to create linkage between remaining core banking business and separated ecosystem activities

(1) Generative ecosystem strategy focused on the existing business: As my observation of cases Alpha, Beta, and Gamma¹⁵ showed, incumbent firms can build a generative ecosystem of complements around their existing business. Lead firms with this strategy will find it easier to access resources and capabilities which serve as an advantage in the build-up of the ecosystem, from the established business. For example, incumbent banks' extensive customer base can help to attract potential complementors, essentially solving well-known difficulties to create indirect network effects (where one side of the platform attracts the other side, i.e., users attract complementors, and vice versa). Similarly, the trusted brand of an established bank can help to create confidence in the ecosystems, which is especially important for financial products. While this is certainly a valid strategy also observed in other industries (e.g., Siemens' Mindsphere platform in the mechanical engineering industry, or Microsoft's Outlook in the software industry (see Zhu & Furr, 2016)), it requires careful consideration regarding several challenges and implications, which I discuss in the following paragraphs.

Implied challenges: First, firms need to start with a strong product or service (Zhu & Furr, 2016) that prevents the existing customer base from churning and moving to competitors. For example, if Alpha's and Beta's core products (i.e., retail/SME bank accounts/services) are no longer attractive to their customers, it will be far more challenging to convince customers of the third-party offerings' value. The challenge stems from the fact that the number of available third-party offerings will be somewhat limited in the early stages of the ecosystem build-up. Further, in the beginning, the complementary offering is likely neither well integrated with the banks' offering, nor are different complements co-specialized amongst each other. Hence, if the existing core offering is not competitive, lead firms will most likely find it difficult to turn their product users into ecosystem offering users (Zhu & Furr, 2016) and thereby stop the decline in their customer base. Today, we find many financial institutions trying to protect their legacy business by adding digital components and new partnerships, with

¹⁵ Note that although Gamma also focused on a specific customer journey (i.e., housing), they built on the existing mortgage platform, which they aim to expand into a housing ecosystem. While this could be seen as a somewhat hybrid approach involving the two aforementioned strategies, I label it as "generative ecosystem strategy." Given that Gamma uses a bank-endorsed brand, builds on assets and competencies from its established business, keeps the ecosystem activities within the established organization, and will eventually integrate the ecosystem offering in its established core business, I find this to be a valid perspective and best suited to the purpose of this discussion.

an aim to slowly mature into an ecosystem-based business model (see Jacobides, 2019). However, as Zhu and Furr (2016, p. 74) put it, "a great platform starts with a great product." So, lead firms need to consider the interdependencies with their existing business, which might require them to innovate the current offering to use it as foundation and starting point for their new ecosystem. A lead firm that fails to do so, will lack the valuable and defendable asset needed as pre-condition to succeed in their envisioned role as ecosystem leaders (Gawer & Cusumano, 2008; Jacobides, 2019; Zhu & Furr, 2016). Without such a strong foundation, banks' existing customers will, in the long-run, most likely prefer more attractive (and cheaper) competitors such as neo-banks that provide a tailored offering to digitally adept customers without the legacy that hinders incumbents' ecosystem activities.

Second, the transition from a product to an ecosystem-based business model will take time. During the transition period firms should apply what Zhu and Furr (2016) called a "hybrid business model." Although customers will be offered additional value from an increasing number of complementary offerings attached to the ecosystem, it is most likely still the lead firm's core product that earns most of its revenues and prevents customers from leaving (Zhu & Furr, 2016). Yet again, a strong core product is a critical prerequisite for this ecosystem strategy, especially when the firm finds itself in a transition phase (Zhu & Furr, 2016). For the transition to succeed, employees need to adopt a new mindset that is not solely focused on the existing (legacy) offering but appreciates the value of complementary offerings by external partners (Brandenburger & Nalebuff, 1996; Jacobides, 2019; Zhu & Furr, 2016).

Third, to successfully turn the existing customer base into users of the emerging ecosystem Zhu and Furr (2016) argue that three elements are essential: added value for the customer, consistency between the third-party offering and the firm's existing brand, and attention to user feedback for the further development and improvement of the ecosystem. Reflecting on these elements with the evidence from my cases, I find a number of important consequences for lead firms. Evaluating the future success and the potential of the value complementors can add, requires some knowledge about and understanding of the functionalities and the possible ways that additional offerings can be integrated and combined. This points to the importance of integrative dynamic capabilities (Helfat & Raubitschek, 2018). Moreover, the existing brand will in some

ways restrict the lead firm's ecosystem strategy as customers' perceptions need to be kept in mind when additional complements are added under the umbrella of the existing brand. Case evidence indicated that customers find it quite natural to buy other, non-banking financial products on the bank's online banking platform (e.g., insurance products). In contrast, customers first have to get used to products that go beyond the traditional banking-domain (see cases Alpha and Beta). For example, while it might still feel natural to upload and manage a lease agreement on the bank's portal, customers would probably find it very odd to search for a new apartment on the bank's online platform. That incumbent banks are somehow restricted by the existing interdependencies with their established business (especially in terms of branding), raises the questions as to when, rather than if, lead firms will transfer customers to another portal, or when it makes sense to market a new customer journey under a separate brand. For instance, incumbents could transfer their customers to a separate website, which in its "look and feel" appears to be a housing platform, not a banking platform, just as Gamma did.

Fourth, Zhu and Furr (2016) noted that a successful move to an ecosystem-based business model will most likely cause competitors to react. While a strong, difficult to replicate, core product certainly plays a vital role in that respect (Jacobides, 2019), preventing customers from switching to competing ecosystems might require some additional strategies. Zhu and Furr (2016) note that equity ties, acquisitions, proprietary standards, and exclusive contracts can make competitors' entry more difficult and will in that way counter competing ecosystems. Similarly, Gulati et al. (2012) noted that lead firms, by determining the exclusivity and duration of the relationship, can lock out competitors and bind complementors to the ecosystem: "Especially in highly competitive market environments, exclusive contributions from members may be vital to strategically differentiate [the ecosystem]" (Gulati et al., 2012, p. 577). This approach is especially valuable when the lead firm faces direct competition from another ecosystem (Gulati et al., 2012). Looking at the case data of firms that used their existing business as a foundation for the new ecosystem, I find evidence for the aforementioned strategic actions in cases Alpha and Gamma. Both firms entered into direct, long-term relationships with complementors to lock-out competitors. Case Beta, however, completely separated its decision to invest from its ecosystem-related decisions, which held them back from using equity ties as a strategic tool to facilitate the transition

towards an ecosystem-based model. Nevertheless, managers should consider that even if the possibility for equity investment (and ultimately acquisitions) exists, this strategy can only be used selectively, as it would be costly to invest in every partner. Also, such direct ties might even be counterproductive, given that too much control can hinder the ecosystem's generativity (Boudreau, 2010; Tilson et al., 2010; Wareham et al., 2014) and discourage existing as well as potential complementors (Cusumano & Gawer, 2002), as discussed earlier.

Link to established business: Given that the case firms considered their ecosystem activities as strategically important explorative activities that do not yet contribute a significant portion of revenue or profit (at least in early phases of the ecosystem build-up), I find interesting parallels to research on organizational ambidexterity. This has a number of practical implications for lead firms. According to O'Reilly and Tushman (2008), the advantage of an ambidextrous organizational set-up, such as the one employed by cases Alpha, Beta and Gamma, is that the explorative unit can leverage the assets and capabilities of the established business (in contrast to an organizational spin-out where this is more difficult). However, to unleash potential synergies with the established business, firms need to have senior management support. The task of senior managers is to ensure that both the explorative and the exploitative units are strategically aligned and that the required linkages to seize the benefits work effectively (Markides & Charitou, 2004; O'Reilly & Tushman, 2004, 2008).

A practical implication of this is that lead firms with this strategy need to ensure they build the necessary managerial ties between the established business (where most or all of the exploitative activities take place) and the digital teams or units/divisions (where most or all of the explorative ecosystem activities take place). However, in this respect it is important that managers in the established business do not hinder the ecosystem activities with legacy thinking, processes or structure (O'Reilly & Tushman, 2008). Instead, they need to sense and solve emerging conflicts between the two separated units (Andriopoulos & Lewis, 2009; Gilbert & Bower, 2002; Smith & Tushman, 2005; Westerman, McFarlan, & Iansiti, 2006). If this does not happen, the legacy requirements will unnecessarily burden the ecosystem endeavor and in the worst case, alienate complementors (pointing to the conflicts mentioned above that can result from intra-organizational interdependencies). According to O'Reilly and Tushman

(2008, p. 199) "a clear strategic intent, an over-arching [*sic*] vision and values, an aligned senior team, an appropriate organizational architecture with targeted integration, and the ability of the senior team to manage the inevitable trade-offs and conflict" are crucial in this regard.

(2) Convergent ecosystem strategy focused on a specific customer journey: Case firms that wanted to arrange and tailor the entire ecosystem's activities around one specific primary customer need (e.g., housing), chose this ecosystem strategy. Given that the banks' own offerings were of only secondary importance from the customers' perspective, lead firms could choose a high degree of separation from the established core business. This indicates that the degree to which the established business model and the ecosystem value proposition overlap, has implications for the ecosystem strategy and the ideal organizational set-up. Based on evidence from my cases, I posit that when lead firms' envisioned ecosystem is built around a specific customer journey (of which the value proposition's critical elements are distinctly different from the established business), a complete separation might be the best option. In this case, the lead firm can assign the ecosystem activities to a new brand name, develop new value chain activities and create an entirely new culture within a separate venture (Markides, 2013). The spatial separation of ecosystem activities from the established business will allow the lead firms to create small and autonomous teams or units, thereby nurturing "a culture of autonomy and risk taking that could not exist in a large, centralized organization" (Tushman & O'Reilly, 1996, p. 25).¹⁶ Especially in highly regulated industries, such as the financial industry, a separated venture might even be a means by which to circumvent some of the regulatory requirements that limited the freedom and flexibility of the established business, as case evidence from case Delta indicated. While these are some of the critical motives for employing a convergent ecosystem strategy, the strategy comes with several distinct challenges and implications, which the following paragraphs deal with in more detail.

¹⁶ Note that while cases Alpha, Beta and Gamma were truly ambidextrous organizations that embedded the explorative activities within the boundaries of the existing business (Jansen et al., 2009; Lavie et al., 2010; O'Reilly & Tushman, 2013), cases Delta and Epsilon used a more extreme form of organizational separation, in which the ecosystem activities were located in an external, largely autonomous venture (Ahuja, Lampert, & Tandon, 2008; Lavie et al., 2010).

Implied challenges: Using a separated set-up (in which the ecosystem activities are detached from the lead firm's established business) to execute the convergent ecosystem strategy implies that the lead firm will find it harder to build on and leverage existing assets and resources located in the established business (Markides, 2013). The separated structure makes a later integration more difficult, if not impossible (Iansiti, McFarlan, & Westerman, 2003). Therefore, the decision on where to embed the ecosystem activities should consider the trade-off between potential synergies on the one hand, and flexibility and speed on the other, as the ambidexterity literature has extensively covered (e.g., Gilbert & Bower, 2002; Gulati & Garino, 2000; Markides, 2013).

Another implication concerns the long-term strategy when ecosystem activities are focused on a specific customer journey and separated from the legacy core business. The challenge arises when multiple, parallel ecosystem endeavors exist, each focusing on a different customer journey (for instance, when a mobility ecosystem follows a housing ecosystem). More specifically, will different customer journeys be kept entirely separate, or are there opportunities to connect and cross-utilize customer journeys? To realize the synergies between separated endeavors and maximize value creation across its ecosystems, the lead firm will need to consider how to connect these "ecosystem verticals" (Jacobides, 2019) in a way that allows it to leverage data and insights across customer journeys. For example, as Jacobides (2019) illustrated, PingAn, the Chinese financial conglomerate, first created focused ecosystems and only later connected these verticals through functionalities that could be leveraged across the ecosystem verticals (e.g., bank accounts, insurances, etc.). Only then were the verticals integrated into a new customer account. Such a strategy allows firms to break down the complexity of the hundreds of possible avenues they could pursue and to focus on one customer journey at a time. Over time, the lead firm can then combine and integrate its separated endeavors, thereby unleashing synergies across customer journeys. While this strategy worked well for PingAn it requires some foresight. For instance, a successful future integration needs to be founded on a farsighted branding strategy and IT infrastructure decisions (e.g., focus on modularity and scalability) that can prevent potential complications concerning future (re-) integration efforts.

Further, for the greenfield development of the ecosystem to succeed, compared to the first strategy (in which the lead firm can start from and build on the established business model), the lead firm here requires relatively more business-building capabilities. Hence, following this strategy, firms should ensure they have the entrepreneurial talent and venturing capabilities in place to start their ecosystem endeavor. If these capabilities do not exist in-house, the lead firm would be well-advised to either source these capabilities from a strategic partner or work with independent partners (venture builders or advisors) to source them. Further, important effects of this strategy concern the timeline and investment requirements. Due to the required venturing building activities, implementing the convergent ecosystem strategy is likely to be more time-consuming and capital intensive than the generative ecosystem strategy. Depending on the specific set-up, the generative ecosystem strategy allows firms to start relatively quickly as there is no need to build up a brand, establish the infrastructure, hire employees, etc. In contrast, the convergent ecosystem strategy generally requires more upfront (strategic) planning and a multi-year implementation and scaling effort. For example, a manager of case Gamma explained that they deliberately chose to use a bank-endorsed brand because they were convinced that this enabled them to establish the ecosystem activities more rapidly and reach scale sooner than with a completely new, separated brand or venture.

Even before this, when the lead firm collaborates with strategic partners within a joint entity, a long discourse about the future strategy, value generation, value sharing mechanisms, and appropriate governance becomes necessary. As one informant from case Epsilon stressed, the initial alignment effort can be substantial, because partners have to agree on aspects of the customer-facing ecosystem value proposition, as well as on aspects of the mutual collaboration. So, while the convergent ecosystem strategy allows the company to circumvent some (if not all) of the intra-organizational interdependencies, the challenges related to aligning with (strategic) partners are substantially higher. Another related implication concerns access to customers and control over the customer interface. Given that lead firms with this strategy usually collaborate with strategic partners and thus do not have sole discretionary power over the customer, the cross-selling potential is limited. In other words, it is probably more challenging to approach the customer and sell additional products or services from the lead firm's established business that are outside the scope of the ecosystem value

proposition (e.g., selling a consumer loan in addition to the mortgage provided through the ecosystem).¹⁷ Managers of lead firms would thus be well-advised to carefully consider these implications when they start out with their ecosystem planning.

Link to established business: Similarly to the first strategy, lead firms following the convergent ecosystem strategy need to consider whether and how they can leverage potential synergies that exist with the established core business. In contrast to the generative strategy, however, the ecosystem activities are typically not embedded in the established organization. Thus, it becomes more difficult to access and leverage existing assets and capabilities and more elaborate ties are required to unleash potential synergies with the core. Based on the analysis of case data from case Delta and case Epsilon, I find several important managerial implications in this regard.

First, when the lead firm sets up a joint venture with strategic partners, it should consider an equity stake that is sufficient to obtain a board seat in the joint venture. Case Delta and Epsilon both had multiple board seats which enabled them to influence the ecosystem venture's strategic direction.

Second, in the early phases of the ecosystem build-up, when the strategic partners plan to align on the future governance of the ecosystem venture, the lead firm would be well-advised to claim sole rights of deciding, veto rights, or pre-emptive rights regarding matters that overlap with the lead firm's established business or other sensitive issues.¹⁸ For example, case Epsilon agreed with its strategic partners that it obtained the primary right to deliver bank-related products and services to the ecosystem. Similarly, case Delta ensured that it had the right to decide on the future internationalization strategy and to claim an exclusive collaboration, in order to deter the strategic partners from suddenly starting to realize a similar ecosystem idea by working with competitors. In other words, it is crucial that lead firms implement contractual safeguards and maintain control over matters that are strategically important and (could) affect their established business.

¹⁷ Notably, cross-selling in a convergent ecosystem bears challenges related to a number of interesting questions regarding data ownership and data protection in ecosystems. However, these questions are outside the scope of this work.

¹⁸ Notably, the distribution of decision-making rights will also be a matter of negotiation and dependent on the partners' individual power positions.

Third, although the convergent ecosystem strategy can naturally lead to a separation from the established core business (especially if there is limited overlap between the established business model and the ecosystem business model), lead firms can still find ways of leveraging core capabilities that benefit the ecosystem venture. For instance, the firms in my sample transferred some of their talent from the core business to the ecosystem venture. This ensured that key employees in the venture had the right mindset and capabilities. Also, these employees were well aware of the core business's needs and requirements. If such key employees maintain a regular exchange and dialogue with the core business, they can be strong advocates and mediators for the lead firm. Similarly, lead firms can build on the established venture building capabilities and know-how of their core business. For example, case Delta used its internal corporate venturing department to initiate, test, and scale the ecosystem venture. Delta's board seats further ensured strong management ties that allowed the bank to react and bring in required capabilities from the bank's core business whenever needed. Hence, lead firms are advised, wherever possible to leverage the established business's assets and capabilities if they want to "get the best of both worlds."

Contrasting the two ecosystem strategies: Overall, I find that the generative ecosystem strategy allows lead firms to stay closer to their established business model. That is, they can leave their existing business model relatively unchanged, while the new complementary products and services help them to expand their value proposition and move from a product-based to an ecosystem-based business model over time (Jacobides, 2019; Zhu & Furr, 2016). However, the move to a broad portfolio of integrated complements will take time. In the meantime, the lead firm needs to ensure that the established offering prevents customers from churning (Zhu & Furr, 2016). During the transition phase, it is important that the established organization does not underestimate the importance of the ecosystem endeavor and the advantages and value of additional third-party products and services, which will have only a negligible volume and value in the beginning. When lead firms fear that the internal opposition and barriers within the established business are too high, they should consider spatially separating teams working on ecosystem activities.¹⁹ Otherwise, when the ecosystem activities are

¹⁹ Note that apart from spatial separation, lead firms should also consider other means of overcoming internal barriers, such as changes to the organizational culture and processes, as well as internal

built on and need to comply with legacy infrastructure and (approval) processes, the negative consequences can severely hamper the ecosystem endeavor and send a negative signal to existing and potential complementors. This also resonates well with Jacobides (2019) who noted that banks and insurance companies commonly try to add a few digital activities in the hope that this will suffice to eventually mature into an ecosystem. Yet, in order to succeed, these legacy firms need to consider negative intra-organizational interdependencies with their existing business and need to align their traditional (core) business with the new (ecosystem) activities in a way that addresses the difficulties (Jacobides, 2019).

As far as the convergent ecosystem strategy is concerned, I argue that the ability to tailor all activities and decisions to the customers' needs is one of this strategy's key advantages. Firms that pursue this strategy and embed the ecosystem activities within a new venture located a certain distance from the established business, can act more flexibly and rapidly than in the legacy organization. However, I posit that firms need to develop a clear view of their strategic intent and the future approach when working with strategic partners. Otherwise the banks risk becoming "white-label back offices" that merely provide (commodity) banking products and services to an ecosystem they only partially own and control. This risk is especially salient in customer journeys where the bank plays only a minor or subordinate role. So, unless the lead firm holds a substantial equity share, obtains a board seat, and considers how it can create meaningful synergies with its core business, the whole ecosystem venture is nothing more than a strategic investment to hedge the lead firm's core business. No matter how active or passive the lead firms' role is when they pursue a convergent ecosystem strategy, it raises a series of questions, e.g., on how this approach will change the banks' role in the long-run, whether these banks will turn into a hybrid of a "banking-as-a-service" platform and a venture capital firm, or whether they will find a way to keep the primary customer relationship while they act as "the spider in the web" of multiple customer journeys. Whichever way, lead firms pursuing the convergent ecosystem strategy should be aware that reliance on a single specific customer journey will not prevent the demise of their established business. In other words, although a successful participation as a lead firm

communication measures that address internal conflicts and raise awareness of the underlying ecosystem strategy (Cusumano & Gawer, 2002).

in a separated (e.g., housing) ecosystem might prove to be a profitable approach, it leaves the established business and the respective challenges mostly untouched.

Turning to lead firms' aim for generating value and contrasting the two ecosystem strategies, the question arises as to which one is more profitable in the long run. Considering evidence from my cases, it seems reasonable to imagine a future where banks increasingly engage in the role of a complementary banking service provider in (others') ecosystems which organize business activities around entire customer journeys instead of around isolated products or services. This would imply that the convergent ecosystem strategy is more viable in the long-run, since a traditional bank's core offering is merely a means to an end, but does not directly address the primary customer need of housing, mobility, etc., making it increasingly difficult for traditional banks to maintain a strong customer relationship. In any case, the role banks fulfill has changed rapidly in the last two decades and this development is likely to continue in the future, which leaves space for interesting debates and exciting questions.

5.3.2 Governance Decisions in Innovation Ecosystems

One of the lead firm's primary responsibilities is to govern the ecosystem of diverse complementors. With the increasing importance of ecosystems across industries and settings, managers charged with ecosystem design, ecosystem strategy, or partnership management, require a clear perspective on how the formal linkage to complementors should be structured and how the ongoing collaboration with them should be managed. So far, however, research has delivered only partial answers to practitioners and provided no clear picture of how partnerships among different firms in ecosystems should be governed. This study can thus be seen as an attempt to provide a more comprehensive overview of the governance dimensions and the underlying subdimensions or decisions that lead firms face. In this sense, the discussion that follows should facilitate managers' decision-making when they are faced with having to initiate new ecosystem partnerships.

Organizational form underlying the lead firm-complementor-relationship:

As far as the organizational form is concerned, my research findings indicate that firms

need to reach clarity about the uncertainty regarding the future ecosystem value proposition and the relationship to complementors required to realize the envisioned ecosystem blueprint. As my case evidence shows, the uncertainty is likely to differ across domains of the blueprint depending on the starting-point and the envisioned ecosystem value proposition. I propose that in deciding how to govern relations within a given ecosystem, managers should factor in the complementors' roles in the innovation process (either reinforcing or exploring elements of the blueprint), which will influence the range of feasible and preferable governance choices. When a specific domain of the future ecosystem blueprint can be clearly envisioned, so that the innovation problem and the preferred solution can be clearly articulated and put into writing, lead firms should consider using formal market-based arrangements (Felin & Zenger, 2014; Nickerson & Zenger, 2004). By establishing a market-based link to complementors, lead firms can create stable relationships with them and reinforce the preferred ecosystem blueprint. For example, a housing ecosystem's lead firm that requires complementors to provide a secure and reliable relocation service for customers, could develop such a stable link.

In contrast, when a specific domain of the future ecosystem blueprint is surrounded by substantial uncertainty and complementors' explorative effort is required to resolve this uncertainty, market-based arrangements are not ideal. This is because in an environment of high uncertainty and complexity, the cost of writing and reinforcing contracts increases substantially (Carson et al., 2006; Gesing et al., 2015; Leiblein & Miller, 2003). So, when domains of the blueprint and the respective relationship to complementors are highly uncertain, hybrid organizational forms are likely to be the better choice (Felin & Zenger, 2014; Gulati & Singh, 1998; Leiblein & Macher, 2009). Under these circumstances, alliance-based arrangements are superior to market-based arrangements because they allow lead firms to invite external partners to contribute their innovative knowledge and engage in collaborative exploration (Felin & Zenger, 2014). Thereby the partners help the lead firm to resolve the uncertain domains. Further, based on insight from my cases, I argue that such direct relationships with complementors can help lead firms to influence complementors' innovative efforts. Alliance-based arrangements allow lead firms to better coordinate and control partners' activities (Das & Teng, 1998, 2000; Foerderer et al., 2014), and more openly exchange innovation and resources with them. Hence, lead firms can more directly observe and direct the innovative activities, e.g., by influencing the choice and use of resources (Tiwana,

2008), and ensuring the ongoing provision of offerings to the ecosystem (Foerderer et al., 2014).

Considering that different alliance arrangements exist (Leiblein & Macher, 2009), lead firms' have to decide which linkage type would be most suited to a given complementor. When lead firms' experience high uncertainty about partners' or competitors' behavior, they should contemplate using equity partnerships that allow them to control and monitor partners' behavior closely. For example, cases Alpha and Gamma used this organizational form when they needed to lock-out competitors and create stronger alignment with their partners. However, lead firms need to understand that this can become very costly as the number of partnerships increases and/or if follow-on investments are required. When lead firms rely on a single complementor, it can create some kind of path-dependency (Adner & Levinthal, 2004; Tiwana et al., 2010).

Lead firms that face substantial uncertainty about central elements of the ecosystem value proposition and that require close coordination and communication with selected partners to realize the blueprint, should consider a joint venture arrangement. Compared to the equity arrangement, the joint venture allows the lead firm to establish stronger communication and coordination channels at both managerial and operational levels (Leiblein & Macher, 2009), which is essential when lead firms want to solve more complex innovation problems. For example, cases Delta and Epsilon used this organizational form to co-locate key employees in the joint venture and transfer other resources and assets they needed to define and implement a new complex ecosystem value proposition in collaboration with strategic partners. The new entity can further be used to establish formal market-based relationships in ecosystem domains where the uncertainty is low. Especially when lead firms aim to build an ecosystem around a specific customer journey, the joint venture organizational form can be ideal for incumbents to co-sponsor and manage the ecosystem activities. In this setting, shared decision-making rights and shared ownership in the new venture are potent mechanisms for lead firms to positively influence partners' incentives and create strong alignment (Gulati et al., 2012; Nambisan & Sawhney, 2011; Tiwana et al., 2010).

Mix of governance mechanisms: When it comes to the use and mix of governance mechanisms, my research indicates that lead firms should again consider the underlying uncertainty and the need for joint exploration with complementors. When

a long-term explorative relationship is critical (e.g., to resolve uncertainty related to core elements of the new ecosystem value proposition), lead firms should make sure they find partners with whom they can build a trusted, collaborative partnership. Given that informal relationships have proven to be more efficient when exploratory outcomes are crucial to the success of the relationship (Lechner et al., 2010; Tsai & Ghoshal, 1998), the lead firm should find strategic partners with whom it can openly discuss and agree on the envisioned ecosystem strategy, the implementation approach and all other matters that are important to the relationship. Managers of cases Delta and Epsilon explained that they invested substantial time and effort to create robust informal governance mechanisms, which they calculated would be critical for the collaboration's success. Based on my observations from these cases, I posit that lead firms would be well-advised to nurture open informal dialogues with strategic partners in order to create an environment that puts the mutual endeavor and common interests at the heart of the collaboration. As far as the contract underlying the relationship with these strategic partners is concerned, lead firms should employ relatively flexible and open-ended contracts that emphasize the mutual efforts and required resources, instead of concrete outcomes or tasks which are difficult or impossible to specify in advance (Felin & Zenger, 2014; Furr & Shipilov, 2018; Williamson & De Meyer, 2012; Zobel & Hagedoorn, 2020).

In contrast, if the uncertainty concerning a specific ecosystem domain is low and the provision of a stable and reliable complementary offering is preferred (to reinforce an envisioned blueprint), lead firms can rely more heavily on formal governance mechanisms. In my sample, the lead firms relied on strict formal agreements to manage relationships with complementors in certain ecosystem domains (i.e., where the uncertainty concerning the ecosystem blueprint was low). Such agreements included, for instance, complementors agreeing to provide complementary insurance services in a housing ecosystem. Informal, more relational governance mechanisms were less critical for these partnerships. Lead firms should consider how they decrease their dependence on complementors in such certain ecosystem domains, for example, by nurturing multiple similar partnerships and intentionally creating redundancy.

Hence, depending on the uncertainty underlying a specific ecosystem domain and the respective relationship to complementors, different organizational forms and

governance mechanisms are required (see Furr & Shipilov, 2018; Williamson & De Meyer, 2012). In sum, my study is a clear call to make these governance dimensions and the aforementioned decision-making aids a standard component in the toolbox for ecosystem design and strategy. I posit that lead firms should match their governance to the uncertainty underlying the relationship to complementors. Specifically, I argue that lead firms should establish somewhat flexible and explorative relationships when facing substantial uncertainty and ambiguity about the future ecosystem value proposition. In contrast, when such uncertainties are considerably less, lead firms should choose relatively formalized relationships in order to stabilize the envisioned blueprint and take advantage of the benefits that come with stricter governance. Finally, my argument can act as a note of caution to managers that standardizing governance mechanisms across different complementors might not necessarily be the best option. Depending on the uncertainties and complementors' role in the ecosystem innovation process, managers should in some cases establish explorative relationships, while in other relationships they should aim to reinforce the existing blueprint, thereby creating differently governed tiers of complementors.

5.3.3 Coordination Challenges and Capabilities Required by Lead Firms

Apart from the consequences regarding lead firms' ecosystem strategies and the governance of complementors, my study has produced some interesting insights into lead firms' coordination challenges in building up their ecosystems. These challenges stem from both the inter-firm as well as intra-firm interdependencies that exist in ecosystems. In what follows, I first discuss the observed coordination challenges and then I turn to a discussion of the practical implications for the capabilities lead firms require.

Coordination challenges: As far as the intra-firm challenges are concerned, informants stated that the alignment with other business units and departments as well as the required mindset-shift posed significant challenges when the ecosystem was built around the bank's established business (generative ecosystem strategy). For example, evidence gained from case Alpha revealed that the ecosystem team struggled to convince other department heads of the meaningfulness of their efforts. Given that the emerging ecosystem partnerships related to non-traditional banking activities, generally

had relatively low volumes and were equipped with relatively low budgets, their contribution had low priority relative to other initiatives in the organization. *"Of course, we depend on the overall group to a certain extent. (...) we are also dependent on the corporate group who has to allow us to take action because we don't have proprietary access to the customers. So we are dependent on the marketing department and on other marketing campaigns. That means we are a bit [constrained] there"* (Case A_Respondent C). Generally, problems arose as the (digital) teams responsible for building ecosystem partnerships were isolated from other teams in the remainder of the organization. Consequently, they depended on other departments to align with (and approve) marketing activities, technology investments, external communication, and so forth.

Hence, managers need to be alert to the emergence of such conflicts when ecosystem initiatives are built on the organization's existing infrastructure and directly address the organization's existing customer base. The findings indicate that when a new, separated team (i.e., the team tasked with building up the ecosystem) wants to address and serve the established customer base directly, other departments will most likely oppose them and claim the sole responsibility for customer interaction. While such challenges are not necessarily specific to ecosystems, they can become even more delicate when entirely new non-bank products or services are concerned. The internal barriers to promote initiatives that are new to the industry are then likely to be even higher.²⁰ Evidence from my cases thus confirms Kapoor's (2018) notion that firms need to consider how the established organizational design will support or contradict the ecosystem value creation activities. Given that lead firms can choose between distinct ecosystem blueprints, managers in charge of ecosystem design and strategy should therefore be aware that they are likely to face additional and more significant challenges related to intra-organizational coordination and alignment when the ecosystem is built around the existing business model (i.e., when the lead firm pursues a generative ecosystem strategy).

Apart from the challenges that stem from the intra-organizational interdependencies, my data also provides evidence for the challenges that can arise from

²⁰ See also Cusumano and Gawer (2002) as well as Joseph and Gaba (2020), for a discussion of the internal organizational challenges and conflicts that arise as a consequence of ecosystem engagements.

interorganizational coordination. I observed that while the lead firms considered the interdependencies with individual complementors or groups of complementors right from the start, they estimated the co-specialization between complements as playing a secondary role and, therefore, as something they would tackle some time later. Although this is a viable approach and trying to solve all tasks simultaneously would most likely overwhelm the (lead) firms' orchestration capacity and capability (Helfat & Raubitschek, 2018), this observation nevertheless points to an important challenge lead firms face. While historically lead firms could focus on the interaction with individual component suppliers (e.g., a supplier providing a specific software), they are now required to oversee the ecosystem's overall activity system (Cusumano & Gawer, 2002; Helfat & Raubitschek, 2018; Iansiti & Levien, 2004; Lee & Berente, 2012). Hence, in contrast to traditional alliance relationships, where firms could focus on managing dyadic relationships (Kapoor, 2018), lead firms in ecosystems need to consider the interdependencies between all relevant parties (Adner, 2017; Iansiti & Levien, 2004; Kapoor, 2018). This includes both the interdependencies with direct ecosystem affiliates, and those with competitors, regulators, or existing (component) suppliers (Ansari et al., 2016). That complementors can have multiple roles and contribute both upstream as well downstream activities to the ecosystem further adds to this complexity (Kapoor, 2018).

Implications for lead firms' capabilities: The aforementioned coordination challenges observed in my data have some important implications for managers and the capabilities required to succeed in the role as lead firm.

First, the breadth and diversity of new partnerships and possible interdependencies (within and across organizations) implies that firms participating in ecosystems, and lead firms in particular, need to develop strong integrative capabilities (Helfat & Raubitschek, 2018). Integrative capabilities provide lead firms with the capacity to communicate and coordinate effectively within the organization and with complementors (Helfat & Campo-Rembado, 2016; Helfat & Raubitschek, 2018). As such, they play not only an important role in successfully managing intra-organizational interdependencies (e.g., conflict between business units), but also in managing interorganizational interdependencies (e.g., conflicts between complementors) (Helfat & Raubitschek, 2018; Joseph & Gaba, 2020; Lee & Berente, 2012).

Second, to maximize the ecosystem's value creation potential, lead firms need to direct, sponsor, and sometimes even actively engage in complementary innovation (Cusumano & Gawer, 2002; Iansiti & Levien, 2004; Zhu & Liu, 2018). Even prior to such engagement, they need the capacity to spot, understand and realize opportunities as well as threats for value creation with and across complements, which points to the importance of firms' environmental scanning and sensing capabilities (Helfat & Raubitschek, 2018). These tasks, however, require lead firms to build up knowledge and capabilities that extend beyond their traditional business domain (Brusoni et al., 2001; Helfat & Raubitschek, 2018). Interestingly, however, some informants stated that they leave the development of complementary innovations totally up to partners, due to their lack of internal expertise. Of course, the ability to rely on external partners' capabilities is one of the advantages of an ecosystem approach. However, excessive reliance on partners' innovative contributions and failure to foster co-innovation and co-specialization across complements can restrict the ecosystem's value creation potential. Overreliance on complementors' innovation is especially risky in a situation where complementors do not have the broad knowledge necessary to foresee interdependencies with other complements (about which they might not even know). It is then challenging for complementors to engage in the innovative activities that maximize value creation across complements and in the ecosystem as a whole. Hence, lead firms that have some inhouse capabilities and knowledge of complementary offerings can more readily engage in discussion about future innovations and direct co-specialization efforts (e.g., Gawer & Cusumano, 2002; Helfat & Raubitschek, 2018).²¹

Notwithstanding the abovementioned findings, my analyses show that ecosystems can contain very diverse complementors, taking on different roles in the ecosystem innovation process. This implies that the importance of capabilities in complementary offerings varies as well. That is, in an environment of low uncertainty, where lead firms have a very clear notion of the complementary product and service to be provided and where complements are supposed to stay relatively stable over time, the need for in-house capabilities is somewhat limited. In contrast, when the lead firm operates in an uncertain domain and complementors are required to engage in

²¹ Note that potential innovations will not only concern complementary products and services, but also innovations resulting from co-specialization between complements and the lead firm's offering.

explorative innovation together with the lead firm, the value of in-house capabilities increases accordingly. Knowledge of the complement functionalities and system-level interdependencies with the ecosystem core and other complements can then help the lead firm to direct and support complementors' innovative efforts more effectively. However, while these arguments have a bearing on the conditions that render in-house capabilities particularly important, it is safe to say that lead firms would be well-advised to build up at least some fundamental knowledge in critical areas. For example, they should have some general knowledge of the trends and developments in strategically important complementary markets, and the technological aspects that affect the functionalities and performance of the ecosystem's technological core. Quite likely, the required knowledge will expand far beyond the traditional industry-domain, which can pose a substantial investment and recruiting effort for lead firms. Such investments can be well observed in the financial industry. Over the past two decades, banks and insurers had to make significant investments in technological infrastructure and capabilities to provide complementors with the state-of-the-art API platforms that complementors are used to from other industries.

Third, the ecosystem blueprint will influence the interdependencies that exist within the lead firm and between ecosystem participants. Empirical evidence from my cases suggests that incumbents can reduce intra-firm interdependencies when their ecosystem blueprint focuses on a specific customer journey that is only partly related to the existing business (i.e., when the lead firm pursues an integrative ecosystem strategy). For example, case Delta's informants explained that the separated set-up was a deliberate decision in order to circumvent internal organizational obstacles. This evidence provides further empirical support for the importance of lead firms' integrative capabilities that enable them to design an ecosystem blueprint that supports the alignment of ecosystem-related activities within and across the lead firm (Helfat & Raubitschek, 2018). Lead firms' managers should thus constantly consider and evaluate potential internal and system-level interdependencies during the ecosystem design and strategy process.

Fourth, the aforementioned interorganizational interdependencies also have a number of more general implications for lead firms' alliance capabilities (e.g., Hoffmann, 2005; Kale, Dyer, & Singh, 2002). Several case firms indicated that they draw on existing alliance capabilities and processes to manage the ecosystem

partnerships. While the pre-existing alliance capabilities can be helpful and much of the related knowledge and capabilities of the management and collaboration in alliances will be applicable in the context of ecosystems as well (Helfat & Raubitschek, 2018; Kale et al., 2002), some important differences remain. The differences stem from the fact that lead firms need to align a broad variety of very diverse actors (Adner, 2017) and interdependencies between them (as described above). As Kapoor (2018, p. 11) noted: "while creating and managing a network of alliances is an important aspect of how firms could manage interdependent activities in an ecosystem, this aspect is a subset of considerations and choices that are available to firms embedded in an ecosystem." Consequently, the importance of advanced alliance capabilities will further increase in view of the growing relevance of ecosystem activities (Zobel & Hagedoorn, 2020), and lead firms need to take note of the strategic importance and complexity of this task. The fact that lead firms in ecosystems, unlike in traditional supplier-relationships, can benefit from the strength and power of partners, requires a mindset shift (Van Alstyne, Parker, & Choudary, 2016). In this context, evidence from my cases suggests that lead firms' understanding needs to extend far beyond knowledge of complementors' role and function. I argue that understanding the motives and incentives of strategically important complementors is paramount for the ecosystem collaborations to succeed, particularly when more formal governance mechanisms are difficult or too costly to implement. Only then can the lead firm design a mix of formal and informal governance mechanisms that draw complementors to the ecosystem and lead to a win-win situation for the lead firm and its partners.

Fifth, my findings suggest that managers (and policymakers) should ensure that explorative efforts are not hindered by cumbersome internal or regulatory processes. Especially in the highly regulated financial industry, where strict rules regarding access and collaboration with external parties exist, establishing flexible, collaborative relations with other firms can become a real challenge. In the light of recent efforts to increase competition and encourage cross-industry collaboration in the financial industry, it seems important to consider circumstances where less stringent partner management processes are possible. For example, it might prove fruitful to implement a more straightforward, less stringent due diligence and onboarding process for complementors that do not link directly to the organizations' core systems (in which case the underlying operational risks are substantially lower). Lead firms (and regulators

alike) should thus devise a plan as to when it is necessary to stick to established partnership management processes that are often very formal and rigid, and when they should apply a looser rein in governing complementors. Even though some complementors might resemble traditional suppliers, lead firms' governance perspective for ecosystem partnerships needs to change. Lead firms' perspective needs to change from a focus on purely transactional relationships, to a more flexible, long-term, collaborative approach (especially when the complementors need to engage in explorative activities).

Lastly, incumbent (lead) firms need to learn how to investigate and rigorously test the likely success of a new complementary offering, pointing to lead firms' innovation and integrative capabilities (Helfat & Raubitschek, 2018). While such capabilities are not only useful in the context of ecosystems, they are also vital to lead firms, as they need to decide which complementary offering they should add to their emerging ecosystem. Through my interview data, I observed that while some banks applied a rigid testing approach, other banks seemed to hold on to the partnerships, even if they failed to meet pre-defined goals and expectations. While it is important to iterate and innovate based on what failed attempts have taught them, lead firms should not forget to "hedge their bets," and therefore not become overly reliant on a specific complementor. Instead, it might prove worthwhile to establish multiple partnerships and test which ones succeed, before costly technical integration efforts are underway. Yet again, evaluating the likely future success of a collaboration requires some knowledge that extends beyond the traditional banking domain, and might also require entrepreneurial and business-building capabilities that are often scarce in incumbent organizations. As the case data indicates, the banks with established innovation capabilities (e.g., in-house corporate venturing and business building units/programs) provided a clear plan on how to select, test, and proceed with ecosystem partnerships. In contrast, other banks, where such capabilities were lacking or not particularly pronounced, seemed to have a more unstructured approach. Lead firm managers are thus advised to map out clear KPIs, set up a structured performance measurement for ecosystem partnerships, and specify the respective adaptive measures.

6 Conclusion

This dissertation's main purpose was to study lead firms' governance decisions in innovation ecosystems. More specifically, the study attempted to understand how lead firms in innovation ecosystems govern their relationships with multiple heterogeneous complementors. The study has discussed the established literature on ecosystems and has highlighted extant gaps in the literature with regard to our understanding of firms' governance decisions. It has suggested that a comprehensive understanding of inter-firm collaboration in ecosystems requires us to analyze both the underlying organizational form as well as the mix of formal and informal governance mechanisms that lead firms use to coordinate the relationship with complementors.

By studying a sample of five different ecosystems in the financial services industry, this dissertation has revealed several interesting findings. It has demonstrated that lead firms of an emerging innovation ecosystem including multiple heterogeneous complementors formed distinctly governed tiers of complementors. In particular, this research project has disclosed that lead firms' governance decisions related to each complementor tier are subject to uncertainty regarding the envisioned ecosystem blueprint and complementors' role in the ecosystem innovation process. The findings suggest that when lead firms face high uncertainty related to the envisioned ecosystem blueprint and require complementors' explorative efforts, the lead firms rely more heavily on informal governance mechanisms to manage the relationship with these complementors. In contrast, when lead firms faced low uncertainty and complementors are required to reinforce an existing blueprint, the lead firms rely on formal governance mechanisms to manage the relationship with these complementors. In line with this finding, I noted that the chosen organizational form supports the lead firms' efforts to explore or strengthen specific domains of the ecosystem blueprint.

In addition, this dissertation has found that lead firms of the same industry can use different ecosystem blueprints or strategies. In particular, it has shown that lead firms' ecosystem blueprints either focused on building up a generative ecosystem around the established business, or on building up an ecosystem around a specific customer journey. While lead firms building a generative ecosystem experienced low uncertainty in their ecosystem's core and higher uncertainty in their ecosystem's periphery, the

opposite pattern emerged in ecosystems where lead firms' efforts were focused on a specific customer journey.

This dissertation has contributed to the literature on ecosystems by disclosing that lead firms in innovation ecosystems use multiple parallel governance approaches that are tailored to the distinct complementor tier. By analyzing lead firms' governance decisions, the dissertation has advanced our understanding of firms' collaboration behavior in ecosystems. The study has also contributed to our understanding of open innovation activities by exploring how firms engage in innovative activities when decision- and ownership-rights do not reside in the hands of a single player, and partners' future tasks and responsibilities are difficult to define.

By highlighting the implications for lead firms' ecosystem strategies, their governance approach, and their required capabilities, this dissertation has also contributed to managerial practice. In particular, it has discussed the challenges and consequences of each ecosystem strategy, indicating what managers of lead firms need to consider when they determine the organizational form and mix of governance mechanisms used to manage the relationship with partners. I encourage additional conceptual and empirical research in this domain to further advance our understanding for firms' behavior in ecosystems. Most importantly, I call on scholars to study how firms' collaboration behavior changes under varying environmental conditions, particularly as the level of uncertainty with regard to the envisioned ecosystem value proposition changes.

Given that an increasing number of firms across industries engages in ecosystem- and platform-based activities with other firms, a better understanding of such systems' governance and the underlying dynamics is more relevant than ever before. I hope that my dissertation will shed some light on this fascinating but understudied aspect of ecosystems and that it will positively impact future research endeavors, as well as managerial practice.

Appendices

Appendix A

Figure A1

Research Requests Sent to Managers of Case Firms (E-Mail Draft - English Version)

SUBJECT: Successful ecosystem design & strategy in financial services – effective collaboration mechanisms

Dear XXX,

I am contacting you to inform you about an interesting research project on ecosystems at the University of St.Gallen, which we think might interest you.

Let me briefly outline the key aspects of our research:

About our research: Together with **Prof. Dr. Karolin Frankenberg** (Academic Director EMBA and Full Professor at the Institute of Management & Strategy) and **Prof. Dr. Oliver Gassmann** (Full Professor at the Institute of Technology Management), I am conducting research in the field of ecosystem design, strategy and decision-making. Specifically, our aim is to explore the **distribution of access and control rights within financial services ecosystems**.

About the relevance for the financial industry: Firms operating in ecosystems face a series of new challenges, as success depends on the innovative output of others as much as it depends on the firms' own innovations. In particular, large banks and insurers that are orchestrating or building up the ecosystem need to consider how the shared value proposition will lead to a win-win situation for all firms. This includes the critical question of how access and control rights should be distributed among players. Our research aims to develop a better understanding for these dynamics to contribute to a more successful collaboration between firms in financial services ecosystems.

About your benefits: If you agree to participate in our research, you will, of course, benefit from a number of advantages:

- **Analysis of your ecosystem and benchmarking** with other financial services ecosystems
- Overview of **practical recommendations for improved collaboration** with your partners
- Synopsis of **implications for the design** of financial services ecosystems as well as the **strategy and decision making** therein
- **Summary of major research findings**
- **Access to research documents** and details (e.g., journal article, conference material)

Since XXX has already gained experience in the build-up and orchestration of ecosystems, your opinion would be of particular interest to us. We would be happy to discuss this topic in a **short call (10-15 minutes)** with you. If you cannot participate in this discussion, we would appreciate your reply with contact information for an individual that might be open to talking about these challenges.

I would be very pleased to tell you more about our research via phone (+49 175 318 6234) or email (andreas.reiter@student.unisg.ch).

We are looking forward to hearing from you.

Best,
Andreas Reiter

Andreas Reiter
PhD Candidate, Institute of Management & Strategy



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Figure A2

Research Requests Sent to Managers of Case Firms (E-Mail Draft - German Version)

BETREFF: Successful Ecosystem Design & Strategy in Financial Services – Mechanismen zur erfolgreichen Zusammenarbeit

Liebe Frau X, lieber Herr Y,

ich kontaktiere Sie, weil ich Sie gerne über ein spannendes Forschungsprojekt an der Universität St. Gallen zum Thema Ecosystems informieren möchte. Lassen Sie mich bitte die wichtigsten Eckpunkte dazu kurz zusammenfassen:

Über unsere Forschung: Zusammen mit Prof. Dr. Karolin Frankenberger (Akademische Direktorin des Executive MBA und Professorin am Institut für Betriebswirtschaft) und Prof. Dr. Oliver Gassmann (Professor am Institut für Technologiemanagement) forsche ich zu den Themen Strategie, Architektur und Entscheidungen in Ecosystems. Im Detail geht es uns darum, die **Verteilung von Zugangs- und Kontrollrechten zwischen Firmen eines Financial Services Ecosystems** besser zu verstehen.

Über die Relevanz für die Finanzindustrie: Viele Unternehmen stehen vor der Herausforderung, mit Partnern in einem Ecosystem effektiv zusammenzuarbeiten und eine Win-Win-Situationen für alle Beteiligten zu schaffen. Speziell große Banken und Versicherungen die das Ecosystem aufbauen oder leiten, müssen dabei eine geeignete Balance zwischen Flexibilität und Kontrolle finden. Mit unserer Forschung wollen wir dieses Zusammenspiel besser verstehen, und so zu einer besseren Zusammenarbeit in Ecosystems der Finanzindustrie beitragen.

Über Ihre Vorteile: Wenn Sie uns im Rahmen von Interviews bei der Forschung unterstützen, würden Sie von einer ganzen Reihe an Vorteilen profitieren:

- **Analyse Ihres Ecosystems und Benchmarking** mit anderen Ecosystems aus der Finanzindustrie
- Übersicht an praktischen **Handlungsempfehlungen zur verbesserten Zusammenarbeit**
- Ableitung von **Implikationen in Hinblick auf Strategie, Design und Entscheidungsfindung** in Ecosystems aus der Finanzindustrie
- **Zusammenfassung** der wichtigsten **Forschungsergebnisse**
- **Zugang zu Forschungsunterlagen** und -details (z.B. Fachartikel und Konferenzunterlagen)

Da XXX bereits ein breites Ecosystem aufgebaut hat, würde uns Ihre Sichtweise besonders interessieren. Es würde uns sehr freuen, wenn wir die Relevanz für Ihr XXX Ecosystem anhand eines **kurzen Telefonats (10-15 Minuten)** gemeinsam besprechen könnten. Falls Sie nicht an dem Gespräch teilnehmen können, wären wir Ihnen dankbar, wenn Sie für uns einen Kontakt zu einer interessierten Person aus Ihrem Unternehmen herstellen könnten.

Gerne kann ich Ihnen per Telefon (+49 175 318 6234) oder E-Mail (andreas.reiter@student.unisg.ch) noch mehr Details zu unserer Forschung erzählen.

Wir freuen uns auf Ihre Rückmeldung!

Beste Grüße
Andreas Reiter

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Table A1*Interview Guide for Interviews With Case Firms*

Exemplary interview questions
Part 1 – Background
- What is your background and your role in your firm's ecosystem activities? - Where did the idea to build an ecosystem come from? - What is the structure of your ecosystem? - How did the ecosystem evolve over time? - How is value created and captured?
Part 2 – History of ecosystem partnerships (complementor ties)
- How did you identify ecosystem partners? - Which factors influenced the partner selection? - How many alternatives existed at the time the tie was formed? - What is the organizational form (e.g., joint venture, equity tie vs. non-equity) that you use for your relationship with this partner/ group of partners? And why? - Who decided on the roles and activities of ecosystem partners?
Part 3 – Governance mechanisms and contract design
- How are rules related to membership participation and rule-setting designed and distributed among players? - Are there formal rules of conduct and coordination mechanisms within the ecosystem? If so, how were these rules designed and enforced? - Are there informal rules, such as social norms or a dominant culture, within the ecosystem? If so, how were they established and propagated? - How do you achieve joint decision-making with your partner firms? - Which factors influence the choice and the combination of formal and informal rules? - How are your ecosystem contracts designed – what was the process and the outcome?

Appendix B

Table B1

Coding Scheme

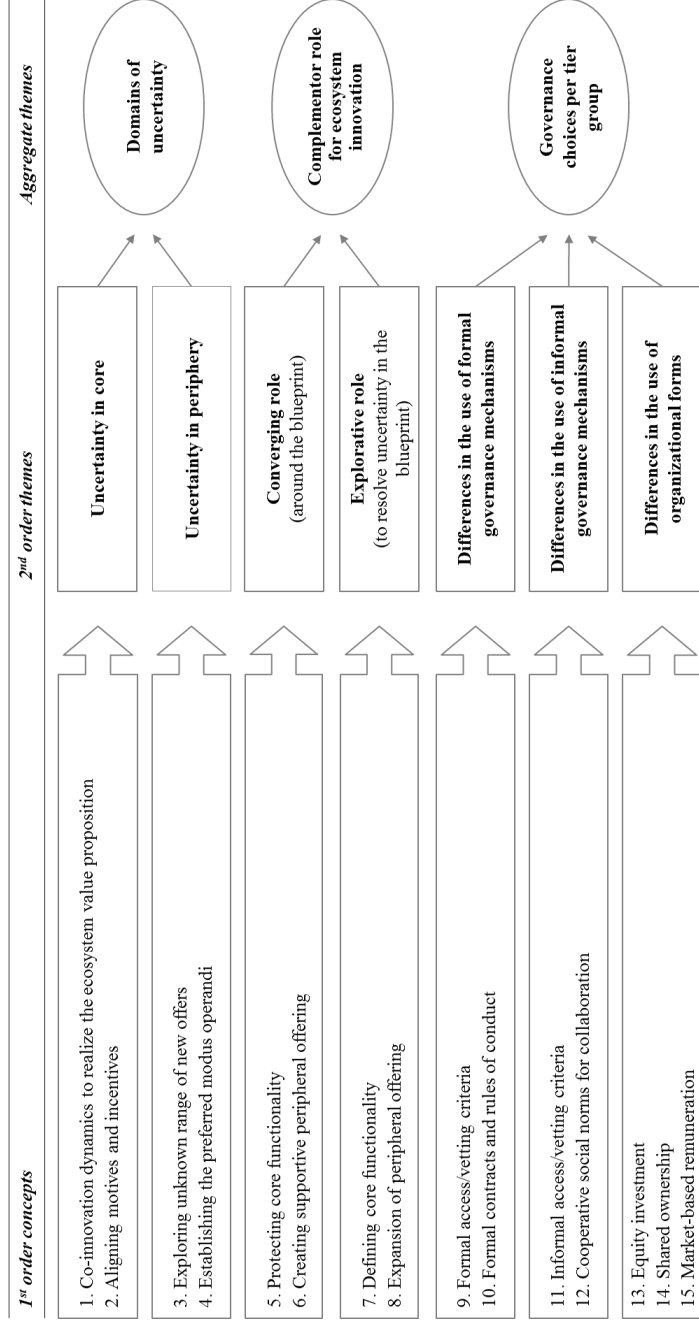


Table B2
Exemplifying Evidence

1 st order concepts and exemplifying quotations	2 nd order themes	
1. Co-innovation dynamics to realize the ecosystem value proposition		
- It all starts with what is needed for the [name ecosystem]. So, what kind of offering do we want to have as an MVP, and how do we want to develop this further? What will the next expansion stage look like, and what is needed to get there? And then we go out and see who can help us to get there. It really starts with the purpose and the assets that everyone can bring to make it happen. (Case D_Respondent A) - The ecosystem represents the joint value proposition, which needs to be developed further. (Case E_Respondent A)	Uncertainty in core	
2. Aligning motives and incentives		
- We literally said to ourselves "we can design the governance in whatever way we want"; what really matters in the end is that we reach consensus with regard to "what's an ecosystem really" and about the success factors and then to start to build and orchestrate the ecosystem around the primary customer need. (Case E_Respondent B) - What's important to me is, if you are collaborating over a longer period, that partners develop a joint view (...) that partners develop a joint roadmap and clarify "where are we heading?" (Case E_Respondent A) - That's important, that all partners have a mutual understanding, not just for the platform within the ecosystem, but for how the ecosystem as a whole can mutually be developed further. (Case D_Respondent A) - When we are talking about the governance of ecosystems, I personally believe that this is a very, very important issue. The strategy needs to be very clear so that everyone understands it and that everyone believes in it and everyone is willing to work on the collective effort to make it happen. (Case D_Respondent A)		

(Table continued on next page)

1 st order concepts and exemplifying quotations	2 nd order themes
3. Exploring unknown range of new offers - Obviously, the further you go from core services, the riskier it is for us. We don't know exactly the customers. I mean, are they really willing to go through all platforms to buy services which are very far from the core banking services? This is a risk. (Case A_Respondent E) - From a customer perspective this is something new. So how much traction could this kind of offer have in the short term? There is still a question mark. (Case A_Respondent E) - Bank customers are just not used to it and that's why you need to be careful with regard to pilots ... where you integrate things, and how far you can really go with it. (Case A_Respondent D) - As a bank, we are good at providing financing, but our core competencies are not to facilitate a craftsman or tell you how the interior equipment should be designed. (Case G_Respondent A) - What are potential value-adding [peripheral] services we could offer to our customers? (Case A_Resp. A)	
4. Establishing the preferred modus operandi - For beyond banking, a change of mind is required in the organization as well as in the customer's mind. That's because the customer first needs to understand, "Yeah, completing my tax declaration with the help of my bank, that actually makes complete sense." But we first need to convince our customers of this idea. (Case A_Respondent C) - The further you move from the core, the higher your process and alignment efforts within the bank will get. (Case A_Respondent D) - It's not something natural. So we have to educate our own sales personnel, our relationship managers. And this is also one of the challenges we have to make sure that today they are incentivized and that they understand also these kind of offerings, that they can talk to the customers about that. So all this takes time. (Case A_Respondent E) - Especially if it relates to beyond banking topics, the people are not really aligned when it comes to the strategy. (...) So it was not a very coordinated process, so that we were often just trying out things. (Case A_Respondent D)	Uncertainty in periphery

(Table continued on next page)

1 st order concepts and exemplifying quotations	2 nd order themes
5. Protecting core functionality - It's important, also for the partners, that the core product of your ecosystem is really solid and built with a long-term perspective, before you add any other products. The core product will always be financing, even once we add further products through the help of partners. And we need to make sure that our unique selling proposition is still focused on the financing product. (Case G_Respondent D) - With these core partners, we seldomly do pilots with them. These are well-established technologies that we can implement directly instead. (Case A_Respondent D) - And that [the ecosystem core] is where we want to have more influence on partners and on the development of the value proposition. We don't want that any bank is offered, we don't want that any insurance product is offered. (Case A_Respondent C) - If partners want to implement their products to our core dimension, they need to fulfill certain requirements in terms of data security, overall stability, data and service availability. (Case A_Respondent F)	Converging role (around the blueprint)
6. Creating supportive peripheral offering - The fact that we offer additional services on our platform increases the attractiveness. (Case G_Respondent D) - On the other hand, the other services, like cleaning service, relocation services, or even insurance – these are all services that add to the housing topic – the ecosystem. But if you are looking for a cleaning service, then you are not necessarily in need of a mortgage for your property. (Case G_Respondent A) - If you need to occupy a niche [in the customer journey], such as "I need a solar planner", then you need a specialized firm that develops the solar topic and delivers it to customers. But in terms of integration, this player is likely not deeply integrated [into the governance or the joint venture]. (Case E_Respondent B)	

(Table continued on next page)

Exemplifying Evidence (continued)

1 st order concepts and exemplifying quotations	2 nd order themes
7. Defining core functionality	
- Starting from the question of how to best position us for success, we concluded that there are some players in the market being [name of partners] that do have certain capabilities that could be really useful (...) which we needed as part of the proposition. (Case D_Respondent B) - When we talk about the build-up of an innovation ecosystem with partners, I have the implicit assumption that we don't just talk about the value proposition that we all see tomorrow, but about the longer journey that we want to do together (...) It's the vision that plays an important role in this regard, because you don't start with the endstate, but with a MVP that needs to be developed further. (Case E_Respondent A)	
8. Expansion of peripheral offering	
- The offerings in the beyond banking dimension are more at the beginning of their lifecycle, where you have some kind of idea or product and then you test it (...) It's far more iterative and there's a heatmap of potential topics, for potential products and services (...) (Case A_Respondent A) - We had various workshops. We actually came up with 13 use cases of how a corporate client using [this partner] might want to interact with the bank. (Case B_Respondent A) - In the event that we don't like a product anymore, we would just need to pull it from the range of offerings and replace it with a new partner. (Case A_Respondent F) - These light touch models [in periphery] are often a bit, I don't want to call it "trial and error", but where you can more easily establish a cooperation to see how it works (Case A_Respondent D) - Ecosystems, living, and the topic of leasing are currently being built up and we also make tests and pilots with partners to see what works and what does not. (...) We generally see these partners [house service partners] not as vendors but as long-term partners with whom we can mutually gain experience. (Case G_Respondent D) - The experience we made is that it's best to really start with a MVP: Does the customer use the additional offering? Does it make sense? Is it useful? Only then do we start to talk about a deeper integration. (Case G_Respondent D)	Explorative role (to resolve uncertainty in the blueprint)

(Table continued on next page)

1 st order concepts and exemplifying quotations		2 nd order themes
9. Formal access/vetting criteria		Differences in the use of formal governance mechanisms
- The higher the costs and the more data is exchanged, the closer we get to a full vendor management process. (Case B_Respondent C) - It really ends up with a very detailed list of questions, which we then discuss with potential partners, during the course of a Request for Interest or Request for Pricing process. And that's how the long-list of questions eventually gets shorter and shorter until we find the one partner that bet fits the requirements. (Case B_Respondent C) - It's a very long process. It's like when you are looking for a new vendor. The task is to evaluate the right partner for exactly this constellation. (Case B_Respondent B)		
10. Formal contracts and rules of conduct		
- These are completely different [contracts]. As I said, sixty versus six pages, if you are comparing a core banking versus beyond banking agreement for cooperation. (Case A_Respondent B) - The closer you are to a core banking service, the more closely you interact with the core products of the bank and the more likely you are to get a very bank-heavy, corporate driven agreement from our side. (Case A_Respondent B) - That [core and near banking agreements] is an SLA, so it's a service agreement, and if you move to the beyond banking dimension, it's a cooperation agreement. (Case A_Respondent B) - Depending on the dimension and the distance from the core banking dimension, the intensity in the exchange will be different. And this will affect the need for review and testing in the lifecycle of the cooperation. (Case A_Respondent B) - Mutual commitment and mutual plans lay the groundwork for everything else. That being said, everything that's agreed upon is also put into writing. But of course things can change and the situation develops further. And if that happens, it's important to talk to each other and discuss if there's a solution to the problem. (Case D_Respondent C)		

(Table continued on next page)

1 st order concepts and exemplifying quotations	2 nd order themes
11. Informal access/vetting criteria - When the chemistry with a partner is not right, I don't work with this partner. This is all the more true if we are talking about the build-up of ecosystems, because everything is closely related there. (Case G_Respondent B) - You have the coalition of the willing in an ecosystem and it's most often the people who get along well with each other and with whom you make detailed plans about the vision and first elements of the joint value proposition. (Case E_Respondent A) - It was literally just based on relationship. We knew [partner name], we both had common interests and we decided, let's go ahead and work together with them. (Case B_Respondent A)	
12. Cooperative social norms for collaboration - It's important to immediately talk with each other if someone does not agree. I personally believe that this is much, much more important than the formal moment when such things are officially agreed upon in meetings. (Case D_Respondent A) - To talk a lot is the name of the game, and being approachable. If there's really something not going the way it should, you need to give partners the feeling that you are listening to them, that there's a honest conversation and things are being dealt with, and solved. That's of course very important. (Case D_Respondent A) - We spent a relatively large amount of time discussing the mutual vision and alinging on the key success factors for the ecosystem. We spent a relatively large amount of time reaching mutual consent [with core partners]. (Case E_Respondent B) - Yes, it's basically a dialogue about the strategy where we give feedback about what we think would matter from a certain perspective. So it's simply a very open and transparent dialogue about how we can support them as a bank and how the startup [peripheral partner] could support us because we have an alignment of interest in the ideal case. (Case A_Respondent C)	Differences in the use of informal governance mechanisms

(Table continued on next page)

Exemplifying Evidence (continued)

1 st order concepts and exemplifying quotations	2 nd order themes
13. Equity investment - We always examine whether it makes sense to invest [in peripheral partners] or not. I just gives partners a better alignment of interest. (Case A_Respondent C) - It allows you to tie them [complementors] more closely to you. Because a contract can always be terminated and then you are being kicked out and replaced by a competitor that's paying a bit more, whereas when you have an equity stake, you're locked in. (Case G_Respondent A) - I think an investment into partners can make sense, although it's not always the right answer, but it creates a stronger commitment from both sides to act. (Case G_Respondent C)	
14. Shared ownership - In this case we thought that a joint venture was the best structure [i.e., organizational form] because we really wanted to have the mutual buy-in of all strategic partners and not just a common service agreement. So it's in our mutual interest to really make [the ecosystem] big. So really, in the interest of mutual value creation through the value of the company [i.e., the venture]. And, hence, to achieve a more long-term commitment and buy-in of the strategic partners, of course. (Case D_Respondent A) - That's why we set it up like this and said, "okay, both sides commit each other to this partnership based on shared ownership for the next three years in order to realize the plans we set for ourselves". (Case E_Respondent B) - Yeah, it all comes down to how to best position the initiative for success, and seeking control is not the purpose by itself. So, in our view, we basically structured the joint venture so that there's sufficient incentive for [partner name] and [partner name] to contribute and to deliver and to try to help to make [the ecosystem] a success. (Case D_Respondent B)	Differences in the use of organizational forms

(Table continued on next page)

Exemplifying Evidence (continued)

1 st order concepts and exemplifying quotations	2 nd order themes
15. Market-based remuneration - Everything [ecosystem name] needs from the realtors and also the other way around, everything that realtors need from [ecosystem name] can be achieved by a commercial collaboration. So, there's no incentive to also consider like an equity investment, or that those realtors also buy into [ecosystem name]. (Case D_Respondent B) - We aim to have an open and resilient network of [peripheral] partners. In other words, you want to keep the partners as loosely connected as possible and commit them through mutual interests and a win-win situation (...). And we firmly believe that this can be achieved without giving these partners ownership or a strategic say in our ecosystem. (Case E_Respondent B)	Differences in the use of organizational forms

Bibliography

- Adner, R. (2006). Match your innovation strategy to your innovation ecosystem. *Harvard Business Review*, 84(4), 98–107.
- Adner, R. (2017). Ecosystem as structure: An actionable construct for strategy. *Journal of Management*, 43(1), 39–58.
- Adner, R., & Feiler, D. (2019). Interdependence, perception, and investment choices: An experimental approach to decision making in innovation ecosystems. *Organization Science*, 30(1), 109–125.
- Adner, R., & Kapoor, R. (2010). Value creation in innovation ecosystems: How the structure of technological interdependence affects firm performance in new technology generations. *Strategic Management Journal*, 31(3), 306–333.
- Adner, R., & Kapoor, R. (2016). Innovation ecosystems and the pace of substitution: Re-examining technology S-curves. *Strategic Management Journal*, 127(1), 12–13.
- Adner, R., & Levinthal, D. A. (2004). What is not a real option: Considering boundaries for the application of real options to business strategy. *Academy of Management Review*, 29, 74–85.
- Afuah, A., & Tucci, C. (2012). Crowdsourcing as a solution to distant search. *Academy of Management Review*, 37, 355–375.
- Ahuja, G. (2000). The duality of collaboration: Inducements and opportunities in the formation of interfirm linkages. *Strategic Management Journal*, 21(3), 317–343.
- Ahuja, G., Lampert, C. M., & Tandon, V. (2008). Moving beyond Schumpeter: Management research on the determinants of technological innovation. *Academy of Management Annals*, 2(1), 1–98.
- Albers, S., Wohlgezogen, F., & Zajac, E. J. (2016). Strategic alliance structures: An organization design perspective. *Journal of Management*, 42(3), 582–614.
- Aldrich, H. E. (1979). *Organizations and environments*. Englewood Cliffs, NJ: Prentice-Hall.
- Alexy, O., George, G., & Salter, A. J. (2013). Cui bono? The selective revealing of knowledge and its implications. *Academy of Management Review*, 38(2), 270–291.
- Almirall, E., & Casadesus-Masanell, R. (2010). Open versus closed innovation: A model of discovery and divergence. *The Academy of Management Review*, 35(1), 27–47.
- Anderson, J. C., Hakansson, H., & Johanson, J. (1994). Dyadic business relationships within a business network context. *Journal of Marketing*, 58(1).

- Anderson, P., & Tushman, M. L. (2001). Organizational environments and industry exit: The effects of uncertainty, munificence and complexity. *Industrial and Corporate Change*, 10(3), 675–711.
- Andriopoulos, C., & Lewis, M. (2009). Exploitation-exploration tensions and organizational ambidexterity: Managing paradoxes of innovation. *Organization Science*, 20(4), 696–717.
- Ansari, S. S., Garud, R., & Kumaraswamy, A. (2016). The disruptor's dilemma: TiVo and the U.S. television ecosystem. *Strategic Management Journal*, 37, 1829–1853. <https://doi.org/10.1002/smj.2442>
- Arthur, W. B. (2009). The nature of technology: What it is and how it evolves. *Free Press*.
- Autio, E., & Thomas, L. D. W. (2014). Innovation ecosystems. In M. Dodgson, D. M. Gann, & P. Nelson (Eds.), *The Oxford Handbook of Innovation Management*. Oxford University Press.
- Autio, E., & Thomas, L. D. W. (2018). Tilting the playing field: Towards an endogenous strategic action theory of ecosystem creation. In S. Nambisan (Ed.), *Open innovation, ecosystems and entrepreneurship: Issues and perspectives* (pp. 111–140). New Jersey, NJ: World Scientific Publishing.
- Bakos, Y., & Katsamakos, E. (2008). Design and ownership of two-sided networks: Implications for internet platforms. *Journal of Management Information Systems*, 25(2), 171–202.
- Baldwin, C. Y. (2015). *Bottlenecks, modules and dynamic architectural capabilities* (Harvard Business School Working Paper, No. 15-028).
- Baldwin, C. Y., & Clark, K. B. (2000). *Design rules: The power of modularity Volume I*. Cambridge, MA: MIT Press.
- Baldwin, C. Y., & von Hippel, E. (2011). Modeling a paradigm shift: From producer innovation to user and open collaborative innovation. *Organization Science*, 22(6), 1399–1417.
- Baldwin, C. Y., & Woodard, C. J. (2007). *Competition in modular clusters* (Research Collection School Of Information Systems No. 08–042).
- Baldwin, C. Y., & Woodard, C. J. (2009). The architecture of platforms: A unified view. In A. Gawer (Ed.), *Platform, markets, and innovation* (pp. 19–44). Cheltenham, England: Edward Elgar.
- Beckman, C. M., Haunschild, P. R., & Phillips, D. J. (2004). Friends or strangers? Firm-specific uncertainty, mark uncertainty, and network partner selection. *Organization Science*, 15(3), 259–275.
- Benlian, A., Hilkert, D., & Hess, T. (2015). How open is this platform? The meaning and measurement of platform openness from the complementors' perspective. *Journal of Information Technology*, 30, 209–228.

- Benner, M. J., & Tushman, M. L. (2003). Exploitation, exploration, and process management: The productivity dilemma revisited. *Academy of Management Review*, 28, 238–256.
- Birkinshaw, J., & Lingblad, M. (2005). Intrafirm competition and charter evolution in the multibusiness firm. *Organization Science*, 16(6), 674–686.
- Blau, P. M. (1964). *Exchange and power in social life*. New York: Wiley.
- Blomqvist, K., Hurmelinna, P., & Seppänen, R. (2005). Playing the collaboration game right – balancing trust and contracting. *Technovation*, 25, 497–504.
- Bogers, M., Afuah, A., & Bastian, B. (2010). Users as innovators: A review, critique, and future research directions. *Journal of Management*, 36(4), 857–875.
- Bogers, M., Zobel, A., Afuah, A., Almirall, E., Dahlander, L., Frederiksen, L., ... Ter Wal, A. L. J. (2017). The open innovation research landscape: Established perspectives and emerging themes across different levels of analysis. *Industry and Innovation*, 24(1), 8–40.
- Bonaccorsi, A., Giannangeli, S., Rossi, C., & Giannangeli, S. (2006). Entry strategies under competing standards: Hybrid business models in the open source software industry. *Management Science*, 52(7), 1085–1098.
- Borys, B., & Jemison, D. (1989). Hybrid organizations as strategic alliances: theoretical issues in organizational combinations. *Academy of Management Review*, 14(1), 234–249.
- Boudreau, K. J. (2010). Open platform strategies and innovation: Granting access vs. devolving control. *Management Science*, 56(10), 1849–1872.
- Boudreau, K. J. (2012). Let a thousand flowers bloom? An early look at large numbers of software app developers and patterns of innovation. *Organization Science*, 23(5), 1409–1427.
- Boudreau, K. J., Lacetera, N., & Lakhani, K. R. (2011). Incentives and problem uncertainty in innovation contests: An empirical analysis. *Management Science*, 57(5), 843–863.
- Bourgeois, L. J., & Eisenhardt, K. M. (1988). Strategic decision process in high velocity environments: Four cases in the microcomputer industry. *Management Science*, 34(7), 816–835.
- Brandenburger, A. M., & Nalebuff, B. J. (1996). *Co-opetition: A revolutionary mindset that combines competition and cooperation in the marketplace*. Boston, MA: Harvard Business School Press.
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3, 77–101.
- Brusoni, S., & Prencipe, A. (2013). The organization of innovation in ecosystems: Problem framing, problem solving, and patterns of coupling. In R. Adner, J. E.

- Oxley, & B. S. Silverman (Eds.), *Collaboration and competition in business ecosystems* (pp. 167–194). Emerald Group Publishing Limited.
- Brusoni, S., Prencipe, A., & Pavitt, K. (2001). Knowledge specialization, organizational coupling, and the boundaries of the firm: Why do firms know more than they make? *Administrative Science Quarterly*, 46(4), 597–621.
- Buchanan, L. (1992). Vertical trade relationships: The role of dependence and symmetry in attaining organizational goals. *Journal of Marketing Research*, 29(1), 65–75.
- Burgelman, R. A. (1991). Intraorganizational ecology of strategy making and organizational adaptation: Theory and field research. *Organization Science*, 2, 239–262.
- Burgelman, R. A. (2002). Strategy as vector and the inertia of coevolutionary lock-in. *Administrative Science Quarterly*, 47, 325–357.
- Burgers, W. P., Hill, C. W. L., & Kim, W. C. (1993). A theory of global strategic alliances: The case of the global auto industry. *Strategic Management Journal*, 14(6), 419–432.
- Carson, S. J., Madhok, A., & Wu, T. (2006). Uncertainty, opportunism, and governance: The effects of volatility and ambiguity on formal and relational contracting. *Academy of Management Journal*, 49(5), 1058–1077.
- Casadesus-Masanell, R., & Yoffie, D. B. (2007). Wintel: Cooperation and conflict. *Management Science*, 53(4), 584–598.
- Ceccagnoli, M., Forman, C., Huang, P., & Wu, D. J. (2012). Cocreation of value in a platform ecosystem: The case of enterprise software. *MIS Quarterly*, 36(1), 263–290.
- Cennamo, C. (2018). Building the value of next-generation platforms: The paradox of diminishing returns. *Journal of Management*, 44(8), 3038–3069.
- Cennamo, C., & Santalo, J. (2013). Platform competition: Strategic trade-offs in platform markets. *Strategic Management Journal*, 34, 1331–1350.
<https://doi.org/10.1002/smj.2066>
- Cennamo, C., & Santaló, J. (2019). Generativity tension and value creation in platform ecosystems. *Organization Science*, 30(3), 617–641.
- Chandler, A. D. (1962). *Strategy and structure: Chapters in the history of the industrial enterprise*. Cambridge, Mass.: MIT Press.
- Chen, T., Qian, L., & Naranyan, V. (2017). Battle on the wrong field? Entrant type, dominant designs, and technology exit. *Strategic Management Journal*, 38, 2579–2598.
- Chesbrough, H. (2003a). *Open Innovation: The new imperative for creating and profiting from technology*. Boston, MA: Harvard Business School Press.

- Chesbrough, H. (2003b). The era of open innovation. *MIT Sloan Management Review*, 44(3), 35–41.
- Clarysse, B., Wright, M., Bruneel, J., & Mahajan, A. (2014). Creating value in ecosystems: Crossing the chasm between knowledge and business ecosystems. *Research Policy*, 43, 1164–1176.
- Coase, R. H. (1937). The nature of the firm. *Economica*, 4, 386–405.
- Cusumano, M. A., & Gawer, A. (2002). The elements of platform leadership. *Sloan Management Review*, 43(3), 51–58.
- Cusumano, M. A., Yoffie, D. B., & Gawer, A. (2019). *The business of platforms: Strategy in the age of digital competition, innovation, and power*. HarperCollins.
- Cutolo, D., & Kenney, M. (2020). Platform-dependent entrepreneurs: Power asymmetries, risks, and strategies in the platform economy. *Academy of Management Perspectives*.
- Cyert, R. M., & March, J. G. (1963). *A behavioral theory of the firm*. Englewood Cliffs, NJ: Prentice-Hall.
- Das, T. K., & Teng, B.-S. (1998). Between trust and control: Developing confidence in partner cooperation in alliances. *The Academy of Management Review*, 23(3), 491–512.
- Das, T. K., & Teng, B.-S. (2000). Instabilities of strategic alliances: An internal tensions perspective. *Organization Science*, 11(1), 77–101.
- Dattée, B., Alexy, O., & Autio, E. (2018). Maneuvering in poor visibility: How firms play the ecosystem game when uncertainty is high. *Academy of Management Journal*, 61(2), 466–498.
- Davis, G. F., & Cobb, J. A. (2010). Resource dependence theory: Past and future. *Research in the Sociology of Organizations*, 28, 21–42.
- de Figueiredo, J. M., & Silverman, B. S. (2017). On the genesis of interfirm relational contracts. *Strategy Science*, 2(4), 234–245.
- De Reuver, M., Sørensen, C., & Basole, R. C. (2018). The digital platform: A research agenda. *Journal of Information Technology*, 33, 124–135.
- De Silva, M., Howells, J., & Meyer, M. (2018). Innovation intermediaries and collaboration: Knowledge-based practices and internal value creation. *Research Policy*, 47(1), 70–87.
- Dess, G. G., & Beard, D. W. (1984). Dimensions of organizational task environments. *Administrative Science Quarterly*, 29(1), 52–73.
- Dhanaraj, C., & Parkhe, A. (2006). Innovation networks. *Academy of Management Review*, 31(3), 659–669.
- Diamond, S., Drury, N., Lipp, A., Marshall, A., Ramamurthy, S., & Wagle, L. (2019).

- The future of banking in the platform economy. *Strategy & Leadership*, 47(6), 34–42.
- Doz, Y. L. (1996). The evolution of cooperation in strategic alliances: Initial conditions or learning processes? *Strategic Management Journal*, 17, 55–83.
- Doz, Y. L., & Hamel, G. (1998). *Alliance advantage*. Boston, MA: Harvard Business School Press.
- Drees, J. M., & Heugens, P. P. M. A. R. (2013). Synthesizing and extending resource dependence theory: A meta-analysis. *Journal of Management*, 39(6), 1666–1698.
- Dyer, J. H., & Singh, H. (1998). The relational view: Cooperative strategy and sources of interorganizational competitive advantage. *The Academy of Management Review*, 23(4), 660–679.
- Eisenhardt, K. M. (1989). Building theories from case study research. *Academy of Management Review*, 14(4), 532–550.
- Eisenhardt, K. M. (1991). Better stories and better constructs: The case for rigor and comparative logic. *Academy of Management Perspectives*, 16(3), 620–627.
- Eisenhardt, K. M., & Graebner, M. E. (2007). Theory building from cases: Opportunities and challenges. *The Academy of Management Journal*, 50(1), 25–32.
- Eisenmann, T., Parker, G. G., & Van Alstyne, M. W. (2006). Strategies for two-sided markets. *Harvard Business Review*, 84(10), 92–101.
- Eisenmann, T., Parker, G. G., & Van Alstyne, M. W. (2011). Platform envelopment. *Strategic Management Journal*, 32(1), 1270–1285.
- Emerson, R. M. (1962). Power-dependence relations. *American Sociological Review*, 27(1), 31–41.
- Evans, D. S., Hagi, A., & Schmalensee, R. (2006). *Invisible engines: How software platforms drive innovation and transform industries*. Cambridge: MIT Press.
- Faems, D., Janssens, M., Madhok, A., & van Looy, B. (2008). Toward an integrative perspective on alliance governance: Connecting contract design, trust dynamics, and contract application. *Academy of Management Journal*, 51, 1053–1078.
- Farrow, G. (2020a). An application programming interface model for open banking ecosystems. *Journal of Payments Strategy & Systems*, 14(1), 75–91.
- Farrow, G. (2020b). Open banking: The rise of the cloud platform. *Journal of Payments Strategy & Systems*, 14(2), 128–146.
- Felin, T., & Zenger, T. R. (2014). Closed or open innovation? Problem solving and the governance choice. *Research Policy*, 43(5), 914–925.
- Flick, U. (2006). *An Introduction to Qualitative Research*. London: Sage.

- Foerderer, J., Kude, T., Schuetz, S., & Heinzl, A. (2014). Control vs. generativity: A complex adaptive systems perspective on service platforms. In *Proceedings of the International Conference on Information Systems (ICIS)*.
- Furr, N., & Shipilov, A. (2018). Building the right ecosystem for innovation. *MIT Sloan Management Review*, 59(4), 59–64.
- Galunic, D. C., & Eisenhardt, K. M. (2001). Architectural innovation and modular corporate forms. *Academy of Management Journal*, 44(6), 1229–1249.
- Gamba, A., & Fusari, N. (2009). Valuing modularity as a real option. *Management Science*, 55(11), 1877–1896.
- Ganco, M., Kapoor, R., & Lee, G. (2020). From rugged landscapes to rugged ecosystems: Structure of interdependencies and firms' innovative search. *Academy of Management Review*, 45(3), 646–674.
- Gawer, A. (2014). Bridging differing perspectives on technological platforms: Toward an integrative framework. *Research Policy*, 43(7), 1239–1249.
- Gawer, A., & Cusumano, M. A. (2002). *Platform leadership: How Intel, Microsoft, and Cisco drive industry innovation*. Harvard Business School Press.
- Gawer, A., & Cusumano, M. A. (2008). How companies become platform leaders. *MIT Sloan Management Review*, 49(2), 28–35.
- Gawer, A., & Henderson, R. (2007). Platform owner entry and innovation in complementary markets: Evidence from Intel. *Journal of Economics & Management Strategy*, 16(1), 1–34.
- Gawer, A., & Phillips, N. (2013). Institutional work as logics shift: The case of Intel's transformation to platform leader. *Organization Studies*.
- Gesing, J., Antons, D., Piening, E. P., Rese, M., & Salge, T. O. (2015). Joining forces or going it alone? On the interplay among external collaboration partner types, interfirm governance modes, and internal R&D. *Journal of Product Innovation Management*, 32(3), 424–440.
- Ghazawneh, A., & Henfridsson, O. (2013). Balancing platform control and external contribution in third-party development: The bound ary resources model. *Information Systems Journal*, 23(2), 173–192.
- Gianiodis, P. T., Ettlie, J. E., & Urbina, J. J. (2014). Open service innovation in the global banking industry: Inside-out versus outside-in strategies. *Academy of Management Perspectives*, 28(1), 76–91.
- Gibson, C. B., & Birkinshaw, J. (2004). The antecedents, consequences, and mediating role of organizational ambidexterity. *Academy of Management Journal*, 47(2), 209–226.
- Gilbert, C. (2005). Unbundling the structure of inertia: Resource versus routine rigidity. *Academy of Management Journal*, 48(5), 741–763.

- Gilbert, C., & Bower, J. L. (2002). Disruptive change: When trying harder is part of the problem. *Harvard Business Review*, 80(5), 94–101.
- Glaser, B., & Strauss, A. (1967). *The discovery of grounded theory: Strategies of qualitative research*. London: Wiedenfeld and Nicholson.
- Graebner, M. E. (2004). Momentum and serendipity: How acquired leaders create value in the integration of technology firms. *Strategic Management Journal*, 25, 751–777.
- Gruber, M., MacMillan, I. C., & Thompson, J. D. (2008). Look before you leap: Market opportunity identification in emerging technology firms. *Management Science*, 54, 1652–1665.
- Gulati, R. (1998). Alliances and networks. *Strategic Management Journal*, 19(4), 293–317.
- Gulati, R., & Garino, J. (2000). Get the right mix of bricks and clicks. *Harvard Business Review*, (May-June), 107–114.
- Gulati, R., Puranam, P., & Tushman, M. L. (2012). Meta-organizational design: Rethinking design in inter-organizational and community contexts. *Strategic Management Journal*, 33(6), 571–586.
- Gulati, R., & Singh, H. (1998). The architecture of cooperation: Managing coordination costs and appropriation concerns in strategic alliances. *Administrative Science Quarterly*, 43(4), 781–814.
- Gulati, R., & Sytch, M. (2007). Dependence asymmetry and joint dependence in interorganizational relationships: Effects of embeddedness on a manufacturer's performance in procurement relationships. *Administrative Science Quarterly*, 52(1), 32–69.
- Haeffliger, S., Jäger, P., & Krogh, G. Von. (2010). Under the radar: Industry entry by user entrepreneurs. *Research Policy*, 39(9), 1198–1213.
- Hagedoorn, J., & Hesen, G. (2007). Contract law and the governance of inter-firm technology partnerships. An analysis of different modes of partnering and their contractual implications. *Journal of Management Studies*, 44, 342–366.
- Hagiu, A. (2014). Strategic decisions for multisided platforms. *MIT Sloan Management Review*, 55(2).
- Hallen, B. L., Katila, R., & Rosenberger, J. D. (2014). How do social defenses work? A resource-dependence lens on technology ventures, venture capital investors, and corporate relationships. *Academy of Management Journal*, 57(4), 1078–1101.
- Hannah, D. P., & Eisenhardt, K. M. (2018). How firms navigate cooperation and competition in nascent ecosystems. *Strategic Management Journal*, (November 2015), 3163–3192.
- Hart, O., & Moore, J. (1990). Property rights and the nature of the firm. *Journal of*

- Political Economy*, 98(6), 1119–1158.
- Hayek, F. (1945). The use of knowledge in society. *American Economic Review*, 35(September), 519–530.
- Heide, J. B. (1994). Interorganizational governance in marketing channels. *Journal of Marketing*, 58(1), 71–85.
- Heide, J. B., & John, G. (1990). Alliances in industrial purchasing: The determinants of joint action in buyer-supplier relationships. *Journal of Marketing Research*, 27(1), 24–36.
- Helfat, C. E., & Campo-Rembado, M. A. (2016). Integrative capabilities, vertical integration, and innovation over successive technology lifecycles. *Organization Science*, 27(2), 249–264.
- Helfat, C. E., & Raubitschek, R. S. (2018). Dynamic and integrative capabilities for profiting from innovation in digital platform-based ecosystems. *Research Policy*, 47(8), 1391–1399.
- Hillman, A. J., Withers, M., & Collins, B. J. (2009). Resource dependence theory: A review. *Journal of Management*, 35(6), 1404–1427.
- Hoffmann, W. H. (2005). How to manage a portfolio of alliances. *Long Range Planning*, 38, 121–143.
- Holgersson, M., Granstrand, O., & Bogers, M. (2018). The evolution of intellectual property strategy in innovation ecosystems: Uncovering complementary and substitute appropriability regimes. *Long Range Planning*, 51(2), 303–319.
- Huber, G. P., & Power, D. J. (1985). Retrospective reports of strategic-level managers: Guidelines for increasing their accuracy. *Strategic Management Journal*, 6(2), 171–180.
- Iansiti, M., & Levien, R. (2004). Strategy as ecology. *Harvard Business Review*, 82(3), 68–78.
- Iansiti, M., McFarlan, F. W., & Westerman, G. (2003). Leveraging the incumbent's advantage. *Sloan Management Review*, 44(4), 58–65.
- Inkpen, A. C. (2001). Strategic alliances. In M. A. Hitt, E. Freeman, & J. S. Harrison (Eds.), *Handbook of strategic management*. Oxford, UK: Blackwell Publishers.
- Ireland, R. D., Hitt, M. A., & Vaidyanath, D. (2002). Alliance management as a source of competitive advantage. *Journal of Management*, 28(3), 413–446.
- Jacobides, M. G. (2019). In the ecosystem economy, what's your strategy? *Harvard Business Review*, (September-October), 128–138.
- Jacobides, M. G., Cennamo, C., & Gawer, A. (2018). Towards a theory of ecosystems. *Strategic Management Journal*, 39(8), 2255–2276.
- Jacobides, M. G., Knudsen, T., & Augier, M. (2006). Benefiting from innovation:

- Value creation, value appropriation and the role of industry architectures. *Research Policy*, 35, 1200–1221.
- Jacobides, M. G., & Kudina, A. (2013). How industry architectures shape firm success when expanding in emerging economies. *Global Strategy Journal*, 3(2), 150–170.
- Jansen, J. J. P., Tempelaar, M. P., van den Bosch, F. a. J., & Volberda, H. W. (2009). Structural differentiation and ambidexterity: The mediating role of integration mechanisms. *Organization Science*, 20(4), 797–811.
- Järvi, K., Almpnanopoulou, A., & Ritala, P. (2018). Organization of knowledge ecosystems: Prefigurative and partial forms. *Research Policy*, 47, 1523–1537.
- Jick, T. D. (1979). Mixing qualitative and quantitative methods: Triangulation in action. *Administrative Science Quarterly*, 24, 602–611.
- Joseph, J., & Gaba, V. (2020). Organizational structure, information processing, and decision-making: A retrospective and road map for research. *Academy of Management Annals*, 14(1), 267–302.
- Junghanns, H., & Niebudek, M. (2019). *Platform banking & digital ecosystems*. Retrieved from <https://www.pwc.de/de/finanzdienstleistungen/study-platform-banking-and-digital-ecosystems.pdf>
- Kale, P., Dyer, J. H., & Singh, H. (2002). Alliance capability, stock market response and long-term alliance success: The role of alliance functions. *Strategic Management Journal*, 23, 747–767.
- Kale, P., Singh, H., & Perlmutter, H. (2000). Learning and protection of proprietary assets in strategic alliances: Building relational capital. *Strategic Management Journal*, 21, 217–237.
- Kapoor, R. (2014). Collaborating with complementors: What do firms do? *Advances in Strategic Management*, 7(1), 63–83.
- Kapoor, R. (2018). Ecosystems: Broadening the locus of value creation. *Journal of Organization Design*, 7(12), 1–16.
- Kapoor, R., & Adner, R. (2012). What firms make vs. what they know: How firms' production and knowledge boundaries affect competitive advantage in the face of technological change. *Organization Science*, 23(5), 1213–1522.
- Kapoor, R., & Agarwal, S. (2017). Sustaining superior performance in business ecosystems: Evidence from application software developers in the iOS and Android smartphone ecosystems. *Organization Science*, 28(3), 531–551.
- Kapoor, R., & Furr, N. (2015). Complementarities and competition: Unpacking the drivers of entrants' technology choices in the solar photovoltaic industry. *Strategic Management Journal*, 36, 416–436.
- Kapoor, R., & Lee, J. M. (2013). Coordinating and competing in ecosystems: How organizational forms shape new technology investments. *Strategic Management*

Journal, 34, 274–296.

- Katila, R., & Mang, P. Y. (2003). Exploiting technological opportunities: The timing of collaborations. *Research Policy*, 32, 317–332.
- Katila, R., Rosenberger, J. D., & Eisenhardt, K. M. (2008). Swimming with sharks: Technology ventures, defense mechanisms and corporate relationships. *Administrative Science Quarterly*, 53, 295–332.
- Katz, M. L., & Shapiro, C. (1994). Systems competition and network effects. *Journal of Economic Perspectives*, 8, 93–105.
- Kauffman, S. A. (1993). *The origins of order: Self-organization and selection in evolution*. Oxford, UK: Oxford University Press.
- Kester, L., Griffin, A., Hultink, E. J., & Lauche, K. (2011). Exploring portfolio decision-making processes. *The Journal of Product Innovation Management*, 28, 641–661.
- Kirsch, L., Sambamurthy, V., Ko, D., & Purvis, R. (2002). Controlling information systems development projects: The view from the client. *Management Science*, 48(4), 484–498.
- Kogut, B. (2000). The network as knowledge: Generative rules and the emergence of structure. *Strategic Management Journal*, 21, 405–425.
- Kogut, B., & Zander, U. (1996). What firms do? Coordination, identity and learning. *Organization Science*, 7(5), 502–518.
- Kraatz, M. S. (1998). Learning by association? Interorganizational networks and adaptation to environmental change. *Academy of Management Journal*, 41, 621–643.
- Kumar, R., & Nti, K. O. (1998). Differential learning and interaction in alliance dynamics: A process and outcome discrepancy model. *Organization Science*, 9, 356–367.
- Lakhani, K. R., & Tushman, M. L. (2012). *Open innovation and organizational boundaries: Task decomposition, knowledge distribution and the locus of innovation* (Harvard Business School Working Paper, No. 12-057).
- Laursen, K., & Salter, A. J. (2006). Open for innovation: The role of openness in explaining innovation performance among U.K. manufacturing firms. *Strategic Management Journal*, 27(2), 131–150.
- Laursen, K., & Salter, A. J. (2014). The paradox of openness: Appropriability, external search and collaboration. *Research Policy*, 43(5), 867–878.
- Lavie, D., Stettner, U., & Tushman, M. L. (2010). Exploration and exploitation within and across organizations. *Academy of Management Annals*, 4(1), 109–155.
- Lawrence, P. R., & Lorsch, J. W. (1967). Differentiation and integration in complex

- organizations. *Administrative Science Quarterly*, 12(1), 1.
- Lechner, C., Frankenberger, K., & Floyd, S. (2010). Task contingencies in the curvilinear relationships between intergroup networks and initiative performance. *Academy of Management Journal*, 53(4), 865–889.
- Lee, J., & Berente, N. (2012). Digital innovation and the division of innovative labor: Digital controls in the automotive industry. *Organization Science*, 23(5), 1428–1477.
- Leiblein, M. J., & Macher, J. T. (2009). The problem solving perspective: A strategic approach to understanding environment and organization. *Advances in Strategic Management*, 26, 1–24.
- Leiblein, M. J., & Miller, D. J. (2003). An empirical examination of transaction- and firm-level influences on the vertical boundaries of the firm. *Strategic Management Journal*, 24(9), 839–859.
- Leiponen, A., & Helfat, C. E. (2010). Innovation objectives, knowledge sources, and the benefits of breadth. *Strategic Management Journal*, 31(2), 224–236.
- Lusch, R. F., & Nambisan, S. (2015). Service innovation: A service-dominant logic perspective. *Management Information Systems Quarterly*, 39, 155–175.
- Lynn, T., Rosati, P., & Cummins, M. (2020). Exploring open banking and banking-as-a-platform: Opportunities and risks for emerging markets. In *In: Klonowski D. (eds) Entrepreneurial finance in emerging markets*. (pp. 319–334). Palgrave Macmillan, Cham.
- Macaulay, S. (1963). Non-contractual relations in business: a preliminary study. *American Sociological Review*, 28, 1–19.
- Macher, J. T., & Boerner, C. (2012). Technological development at the boundaries of the firm: a knowledge-based examination of drug development. *Strategic Management Journal*, 33, 1016–1036.
- Macneil, I. R. (1978). Contracts: Adjustment of long-term economic relations under classical neoclassical, and relational contract law. *Northwestern University Law Review*, 72, 854–905.
- Markides, C. C. (2013). Business model innovation: What can the ambidexterity literature teach us? *Academy of Management Perspectives*, 27(4), 313–323.
- Markides, C. C., & Charitou, C. (2004). Competing with dual business models: A contingency approach. *Academy of Management Executive*, 18, 22– 36.
- Masucci, M., Brusoni, S., & Cennamo, C. (2020). Removing bottlenecks in business ecosystems: The strategic role of outbound open innovation. *Research Policy*, 49(1), 103823.
- Maxwell, J. A. (2005). *Qualitative research design: An interactive approach* (2nd. ed.). Thousand Oaks, CA: Sage Publications.

- McGrath, R. G., & MacMillan, I. C. (2000). *The entrepreneurial mindset: Strategies for continuously creating opportunity in an age of uncertainty*. Boston, MA: Harvard Business Press.
- McIntyre, D. P., & Srinivasan, A. (2017). Networks, platforms, and strategy: Emerging views and next steps. *Strategic Management Journal*, 38(1), 141–160.
- McIntyre, D. P., Srinivasan, A., Afuah, A., Gawer, A., & Kretschmer, T. (2020). Multi-sided platforms as new organizational forms. *Academy of Management Perspectives*.
- Miles, M. B., & Huberman, M. A. (1994). *Qualitative data analysis: An expanded sourcebook*. Beverley Hills, CA: Sage.
- Milgrom, P. R., & Roberts, J. (1988). An economic approach to influence activities in organizations. *American Journal of Sociology*, 94, 154–179.
- Milgrom, P. R., & Roberts, J. (1990). The economics of modern manufacturing: Technology, strategy, and organization. *American Economic Review*, 80, 511–528.
- Milgrom, P. R., & Roberts, J. (1992). *Economics, organization, and management*. Englewood Cliffs, NJ: Prentice Hall.
- Miller, C. C., Cardinal, L. B., & Glick, W. H. (1997). Retrospective reports in organizational research: A reexamination of recent evidence. *Academy of Management Journal*, 40(1), 189–204.
- Mintzberg, H. (1994). *The rise and fall of strategic planning*. Hemel Hempstead: Prentice Hall.
- Moore, J. F. (1993). Predators and prey: a new ecology of competition. *Harvard Business Review*, 71(3), 75–86.
- Mouzas, S., & Ford, D. (2009). The constitution of networks. *Industrial Marketing Management*, 38, 495–503.
- Moysan, Y., & Rudnicki, M. (2019). Open banking: Towards platform and modular banking. *Journal of Digital Banking*, 4(2), 131–143.
- Nambisan, S., & Sawhney, M. (2011). Orchestration process in network-centric innovation: Evidence form the field. *Academy of Management Perspectives*, 25(3), 40–57.
- Nambisan, S., Wright, M., & Feldman, M. (2019). The digital transformation of innovation and entrepreneurship: Progress, challenges and key themes. *Research Policy*, 48(8), 1–9.
- Nickerson, J. A., & Zenger, T. R. (2004). A knowledge-based theory of the firm — The problem-solving perspective. *Organization Science*, 15(6), 617–632.
- Nooteboom, B. (1999). *Inter-firm alliances: Analysis and design*. London: Routledge.

- O'Reilly, C. A., & Tushman, M. L. (2004). The ambidextrous organization. *Harvard Business Review*, April, 74–83.
- O'Reilly, C. A., & Tushman, M. L. (2008). Ambidexterity as a dynamic capability: Resolving the innovator's dilemma. *Research in Organizational Behavior*, 28, 185–206.
- O'Reilly, C. A., & Tushman, M. L. (2013). Organizational ambidexterity: Past, present, and future. *The Academy of Management Perspectives*, 27(4), 324–338.
- Ozalp, H., Cennamo, C., & Gawer, A. (2018). Disruption in platform-based ecosystems. *Journal of Management Studies*, 55(5), 1203–1242.
- Ozcan, P., & Eisenhardt, K. M. (2009). Origin of alliance portfolios: Entrepreneurs, network strategies, and firm performance. *Academy of Management Journal*, 52(2), 246–279.
- Ozcan, P., & Santos, F. M. (2015). The market that never was: Turf wars and failed alliances in mobile payments. *Strategic Management Journal*, 36, 1486–1512.
- Park, N. K., & Mezias, J. M. (2005). Before and after the technology sector crash: The effect of environmental munificence on stock market response to alliances of e-commerce firms. *Strategic Management Journal*, 26(11), 987–1007.
- Parker, G. G., Van Alstyne, M. W., & Choudary, S. P. (2016). *Platform revolution: How networked markets are transforming the economy and how to make them work for you*. New York: W.W. Norton.
- Parker, G. G., Van Alstyne, M. W., & Jiang, X. (2017). Platform ecosystems: How developers invert the firm. *Management Information Systems Quarterly*, 41(1), 255–266.
- Parkhe, A. (1993). Strategic alliance structuring—a game-theoretic and transaction cost examination of interfirm cooperation. *Academy of Management Journal*, 36, 794–829.
- Perrons, R. K. (2009). The open kimono : How Intel balances trust and power to maintain platform leadership. *Research Policy*, 38, 1300–1312.
- Pfeffer, J. (1972). Merger as a response to organizational interdependence. *Administrative Science Quarterly*, 17(3), 382–394.
- Pfeffer, J. (1987). A resource dependence perspective on intercorporate relations. In M. S. Mizuchi & M. Schwartz (Eds.), *Intercorporate relations: The structural analysis of business* (pp. 25–55). Cambridge, UK: Cambridge University Press.
- Pfeffer, J., & Leong, A. (1977). Resource allocations in united funds: Examination of power and dependence. *Social Forces*, 55(3), 775–790.
- Pfeffer, J., & Nowak, P. (1976). Joint ventures and interorganizational interdependence. *Administrative Science Quarterly*, 21(3), 398–418.

- Pfeffer, J., & Salancik, G. (1978). *The external control of organizations: A resource dependence perspective*. New York: Harper & Row Publishers.
- Phelps, C. C. (2010). A longitudinal study of the influence of alliance network structure and composition on firm exploratory innovation. *The Academy of Management Journal*, 53(4), 890–913.
- Pierce, L. (2009). Big losses in ecosystem niches: How core firm decisions drive complementary product shakeouts. *Strategic Management Journal*, 30(3), 323–347.
- Pisano, G. P., & Teece, D. J. (2007). How to capture value from innovation: Shaping intellectual property and industry architecture. *California Management Review*, 55, 278–296.
- Piskorski, M. J., & Casciaro, T. (2005). Power imbalance, mutual dependence, and constraint absorption: A closer look at resource dependence theory. *Administrative Science Quarterly*, 50, 167–199.
- Podolny, J. M. (1994). Market uncertainty and the social character of economic exchange. *Administrative Science Quarterly*, 39(3), 458–483.
- Poppo, L., & Zenger, T. (2002). Do formal contracts and relational governance function as substitutes or complements? *Strategic Management Journal*, 23(May), 707–725.
- Powell, W. W. (1990). Neither market nor hierarchy: Network forms of organization. In B. M. Staw & L. L. Cummings (Eds.), *Research in organizational behavior* (p. Vol. 12: 295–336). Greenwich, CT: JAI Press.
- Puranam, P., Alexy, O., & Reitzig, M. (2014). What’s “new” about new forms of organizing? *Academy of Management Review*, 39, 162–180.
- Quinn, J. B., & Hilmer, F. G. (1994). Strategic outsourcing. *Sloan Management Review*, 35(4), 43–56.
- Raisch, S., & Birkinshaw, J. (2008). Organizational ambidexterity: Antecedents, outcomes, and moderators. *Journal of Management*, 34(3), 375–409.
- Reuer, J. J., & Arino, A. (2007). Strategic alliance contracts: Dimensions and determinants of contractual complexity. *Strategic Management Journal*, 28, 313–330.
- Rietveld, J., Ploog, J. N., & Nieborg, D. B. (2020). The coevolution of platform dominance and governance strategies: Effects on complementor performance outcomes. *Academy of Management Discoveries*.
- Rigby, D., & Zook, C. (2002). Open-market innovation. *Harvard Business Review*, 80, 80–93.
- Rohrbeck, R., Hölzle, K., & Gemünden, H. G. (2009). Opening up for competitive advantage: How Deutsche Telekom creates an open innovation ecosystem. *R&D*

Management, 39(4), 420–430.

- Saadatmand, F., Lindgren, R., & Schultze, U. (2019). Configurations of platform organizations: Implications for complementor engagement. *Research Policy*, 48(8), 103770.
- Salge, T. O., Farchi, T., Barrett, M. I., & Dopson, S. (2013). When does search openness really matter? A contingency study of health-care innovation projects. *Journal of Product Innovation Management*, 30(4), 659–676.
- Santos, F. M., & Eisenhardt, K. M. (2005). Organizational boundaries and theories of organization. *Organization Science*, 16(5), 491–508.
- Schilling, M. A. (2002). Technology success and failure in winner-take-all markets: The impact of learning orientation, timing, and network externalities. *Academy of Management Journal*, 45(2), 387–398.
- Schilling, M. A., & Steensma, H. K. (2002). Disentangling the theories of firm boundaries: A path model and empirical test. *Organization Science*, 13(4), 387–401.
- Schumpeter, J. A. (1947). *Capitalism, socialism, and democracy* (2nd ed.). New York: Harper & Brothers.
- Schweisfurth, T. G., & Herstatt, C. (2014). How internal users contribute to corporate product innovation: The case of embedded users. *R&D Management*, 46(1).
- Scott, W. R. (1992). *Organizations: Rational, natural, and open system*. Englewood Cliffs, NJ: Prentice-Hall.
- Shipilov, A., & Gawer, A. (2020). Integrating research on inter-organizational networks and ecosystems. *Academy of Management Annals*, 14(1), 92–121.
- Siggelkow, N. (2007). Persuasion with case studies. *Academy of Management Journal*, 50(1), 20–24.
- Simon, H. A. (1973). The structure of ill-structured problems. *Artificial Intelligence*, 4(3), 181–191.
- Simon, Herbert A. (1962). The architecture of complexity. *Proceedings of the American Philosophical Society*, 106(6), 467–482.
- Smith, W., & Tushman, M. (2005). Managing strategic contradictions: A top management model for managing innovation streams. *Organization Science*, 16(5), 522–536.
- Somaya, D. (2012). Patent strategy and management. *Journal of Management*, 38(4), 1084–1114.
- Spanjol, J., Qualls, W. J., & Rosa, J. A. (2011). How many and what kind? The role of strategic orientation in new product ideation. *Journal of Product Innovation Management*, 28(2), 236–250.

- Stearns, T. M., Hoffman, A. N., & Heide, J. B. (1987). Performance of commercial television stations as an outcome of interorganizational linkages and environmental conditions. *Academy of Management Journal*, 30(1), 71–90.
- Strauss, A., & Corbin, J. (1990). *Basics of qualitative research: Grounded theory procedures and techniques*. Newbury Park, CA: Sage.
- Sutcliffe, K. M., & Zaheer, A. (1998). Uncertainty in the transaction environment: An empirical test. *Strategic Management Journal*, 19(1), 1–23.
- Tanskanen, K., Ahola, T., Amino, A., Bragge, J., & Kaipia, R. (2017). Towards evidence-based management of external resources: Developing design propositions and future research avenues through research synthesis. *Research Policy*, 46(6), 1087–1105.
- Teece, D. J. (1986). Profiting from technological innovation: Implications for integration, collaboration, licensing and public policy. *Research Policy*, 15(6), 285–205.
- Teece, D. J. (1996). Firm organization, industrial structure, and technological innovation. *Journal of Economic Behavior and Organization*, 31, 193–224.
- Teece, D. J. (2007). Explicating dynamic capabilities: The nature and microfoundations of (sustainable) enterprise performance. *Strategic Management Journal*, 28(13), 1319–1350.
- Teece, D. J. (2014). The foundations of enterprise performance: Dynamic and ordinary capabilities in an (economic) theory of firms. *Academy of Management Perspectives*, 28(4), 328–352.
- Teece, D. J. (2018). Profiting from innovation in the digital economy: Enabling technologies, standards, and licensing models in the wireless world. *Research Policy*, 47(1), 58–73.
- Teece, D. J., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategy management. *Strategic Management Journal*, 18, 509–553.
- Thomas, L. D. W., & Autio, E. (2012). *Modeling the ecosystem: A meta-synthesis of ecosystem and related literatures* (DRUID Society Conference, Copenhagen, Denmark, 19–21 June, 2012).
- Thomas, L. D. W., & Autio, E. (2014). *The fifth facet: The ecosystem as an organizational field* (DRUID Society Conference, Copenhagen, Denmark, 16–18 June 2014).
- Thomas, L. D. W., & Autio, E. (2020). Innovation ecosystems in management: An organizing typology. In *Oxford Encyclopedia of Business and Management*. Oxford: Oxford University Press.
- Thomas, L. D. W., Autio, E., & Gann, D. M. (2014). Architectural leverage: Putting platforms in context. *The Academy of Management Perspectives*, 28(2), 198–219.

- Thompson, J. D. (1967). *Organizations in Action: Social science bases of administrative theory*. New York: McGraw-Hill.
- Tilson, D., Lyytinen, K., & Sørensen, C. (2010). Digital infrastructures: The missing IS research agenda. *Information Systems Research*, 21(4), 748–759.
- Tiwana, A. (2008). Do bridging ties complement strong ties? An empirical examination of alliance ambidexterity. *Strategic Management Journal*, 29(3), 251–272.
- Tiwana, A. (2014). *Platform Ecosystems: Aligning Architecture, Governance, and Strategy*. Morgan Kaufmann.
- Tiwana, A. (2015). Evolutionary competition in platform ecosystems. *Information Systems Research*, 26(2), 266–281.
- Tiwana, A., Konsynski, B., & Bush, A. A. (2010). Platform evolution: Coevolution of platform architecture, governance, and environmental dynamics. *Information Systems Research*, 21(4), 675–687.
- Todeva, E., & Knoke, D. (2005). Strategic alliances and models of collaboration. *Management Decision*, 43, 123–148.
- Tsai, W., & Ghoshal, S. (1998). Social capital and value creation: The role of intrafirm networks. *Academy of Management Journal*, 41(4), 464–476.
- Tushman, M. L., & O'Reilly, C. A. (1996). Ambidextrous organizations. *California Management Review*, 38(4), 8–30.
- Ulrich, D., & Barney, J. B. (1984). Perspectives in organizations: Resource dependence, efficiency, and population. *Academy of Management Review*, 9(3), 471–481.
- Uzzi, B. (1996). The sources and consequences of embeddedness for economic performance of organizations: The network effect. *American Sociological Review*, 61(4), 674–698.
- Valkokari, K. (2015). Business, innovation, and knowledge ecosystems: how they differ and how to survive and thrive within them. *Technology Innovation Management Review*, 5(8), 17–24.
- Van Alstyne, M. W., Parker, G. G., & Choudary, S. P. (2016). Pipelines, platforms, and the new rules of strategy. *Harvard Business Review*, 94(4), 54–62.
- Van de Vrande, V., Vanhaverbeke, W., & Duysters, G. (2009). External technology sourcing: The effect of uncertainty on governance mode choice. *Journal of Business Venturing*, 24(1), 62–80.
- Van de Vrande, V., Vanhaverbeke, W., & Gassmann, O. (2010). Broadening the scope of open innovation: Past research, current state and future directions. *International Journal of Technology Management*, 52, 221–235.

- van der Borgh, M., Cloudt, M., & Romme, A. G. L. (2012). Value creation by knowledge-based evidence from a field study. *R&D Management*, 42, 150–169.
- Vlaar, P. W. L., Van Den Bosch, F. A. J., & Volberda, H. W. (2007). On the evolution of trust, distrust, and formal coordination and control in interorganizational relationships: Toward an integrative framework. *Group and Organization Management*, 32(4), 407–428.
- Wadhwa, A., Bodas Freitas, I. M., & Sarkar, M. B. (2017). The paradox of openness and value capture protection strategies: Effect of extramural R&D on innovative performance. *Organization Science*, 28(5), 873–893.
- Wareham, J., Fox, P. B., & Cano Giner, J. L. (2014). Technology ecosystem governance. *Organization Science*, 25(4), 1195–1215.
- Wen, W., & Zhu, F. (2019). Threat of platform-owner entry and complementor responses: Evidence from the mobile app market. *Strategic Management Journal*, 40, 1336–1367.
- West, J. (2003). How open is open enough?: Melding proprietary and open source platform strategies. *Research Policy*, 32(7), 1259–1285.
- West, J., & Bogers, M. (2014). Leveraging external sources of innovation: A review of research on open innovation. *Journal of Product Innovation Management*, 31(4), 814–831.
- West, J., & Wood, D. (2013). Evolving an open ecosystem: The rise and fall of the Symbian platform. *Advances in Strategic Management*, 30, 27–67.
- Westerman, G., McFarlan, F. W., & Iansiti, M. (2006). Organization design and effectiveness over the innovation life cycle. *Organization Science*, 17(2), 230–238.
- Williamson, O. E. (1981). The economics of organizations: The transaction cost approach. *American Journal of Sociology*, 87, 548–577.
- Williamson, O. E. (1983). Credible commitments: Using hostages to support exchange. *The American Economic Review*, 73(4), 519–540.
- Williamson, O. E. (1985). *The economic institutions of capitalism*. New York: Free Press.
- Williamson, O. E. (1986). *Economic organization: Firms, markets, and policy control*. New York, NY: New York University Press.
- Williamson, O. E. (1991). Comparative economic organization: The analysis of discrete structural alternatives. *Administrative Science Quarterly*, 36, 269–296.
- Williamson, P. J., & De Meyer, A. (2012). Ecosystem advantage: How to successfully harness the power of partners. *California Management Review*, 55(1), 24–46.
- Wry, T., Cobb, J. A., & Aldrich, H. E. (2013). More than a metaphor: Assessing the

- historical legacy of resource dependence and its contemporary promise as a theory of environmental complexity. *The Academy of Management Annals*, 7(1), 441–488.
- Yin, R. K. (2010). *Qualitative research from start to finish*. New York: Guilford Press.
- Yin, R. K. (2018). *Case study research and applications: Design and methods* (6th ed.). Thousand Oaks: Sage Publications.
- Yoffie, D. B., & Kwak, M. (2006). With friends like these: The art of managing complementers. *Harvard Business Review*, 36, 89–98.
- Yoo, Y., Boland, R. J., Lyytinen, K., & Majchrzak, A. (2012). Organizing for innovation in the digitized world. *Organization Science*, 23(5), 1398–1408.
- Yoo, Y., Henfridsson, O., & Lyytinen, K. (2010). Research commentary — The new organizing logic of digital innovation: An agenda for information systems research. *Information Systems Journal*, 21(4), 724–735.
- Zachariadis, M., & Ozcan, P. (2017). *The API economy and digital transformation in financial services: The case of open banking*. (No. 2016–001).
- Zaheer, A., & Venkatraman, N. (1995). Relational governance as an interorganizational strategy: An empirical test of the role of trust in economic exchange. *Strategic Management Journal*, 16(5), 373–392.
- Zenger, T. R., Felin, T., & Bigelow, L. (2011). Theories of the firm – market boundary. *The Academy of Management Annals*, 5, 89–133.
- Zhu, F., & Furr, N. (2016). Products to platforms: Making the leap. *Harvard Business Review*, 94(4), 72–78.
- Zhu, F., & Liu, Q. (2018). Competing with complementors: An empirical look at Amazon.com. *Strategic Management Journal*, 39, 2618–2642. <https://doi.org/f>
- Zobel, A.-K., & Hagedoorn, J. (2020). Implications of open innovation for organizational boundaries and the governance of contractual relations. *Academy of Management Perspectives*, 34(3), 400–423.

Curriculum Vitae

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- 2018 – Present **University of St.Gallen, St.Gallen, Switzerland**
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- 2015 – 2016 **London Business School, London, United Kingdom**
 Masters of Science in Management (M.Sc.) with Distinction
- 2011 – 2014 **Vienna University of Economics and Business, Vienna, Austria**
 Bachelor of Science in Business, Economics and Social Sciences
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Business Experience

- Oct 2016 – **McKinsey & Company, Germany & Austria**
 Oct 2018 Consultant, Full-time
- Sep 2014 – **Ernst & Young, Austria**
 Mar 2015 Risk Advisory, Internship
- Sep 2013 – **OMV Solutions GmbH, Austria**
 Oct 2013 Accounting, Internship
- Jul 2013 – **Österreichische Volksbank AG, Austria**
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Publications

- Published papers/articles - Frankenberger, K., Mayer, H., Reiter, A., Schmidt, M. (2019).
 The Transformer's Dilemma. *Harvard Business Review*,
 November 12, 2019: <https://hbr.org/2019/11/the-transformers-dilemma>

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| Books/book chapters | <ul style="list-style-type: none"> - Frankenberger, K., Mayer, H., Reiter, A., Schmidt, M. (2021). Digital Transformer's Dilemma: Innovate Twice to Survive. In O. Gassmann, F. Ferrandina (Eds.), <i>Connected Business. Create Value in a Networked Economy</i> (p. 157-173). Springer. - Frankenberger, K., Mayer, H., Reiter, A., Schmidt, M. (2020). <i>The Digital Transformer's Dilemma: How to Energize Your Core Business While Building Disruptive Products and Services</i>. Hoboken, NJ: Wiley. - Frankenberger, K., Mayer, H., Reiter, A., Schmidt, M. (2020). Pandemic Meets Digital Transformation. In <i>Transforming Beyond the Crisis</i>. Thinkers50. - Frankenberger, K., Mayer, H., Reiter, A., Schmidt, M. (2020). Transformation Towards an Ecosystem: How to Establish an Ecosystem Business While Sustaining Success in the Core Business. In <i>Ecosystem Inc.</i>. Thinkers50. - Frankenberger, K., Mayer, H., Reiter, A., Schmidt, M. (2019). The Digital Transformer's Dilemma: How to Sustain Continued Success in the Core Business While Establishing a New Digital Business. In <i>The Transformation Playbook</i>. Thinkers50. |
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Miscellaneous

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