European Management Journal xxx (xxxx) xxx

Contents lists available at ScienceDirect

European Management Journal

journal homepage: www.elsevier.com/locate/emj

Loner or team player: How firms allocate orchestrator tasks amongst ecosystem actors

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ARTICLE INFO

Keywords:
Ecosystem
Ecosystem alignment
Orchestrator
Multi-orchestrator

ABSTRACT

Ecosystems have become a major trend in research and practice alike. Within an ecosystem, the so-called orchestrator is considered to be one of the most important roles. However, extant research falls short of explaining how and why this orchestrator role and the resulting tasks of orchestration are allocated to specific ecosystem members. Based on a case study with eight cases, this paper aims to shed light on this crucial question. Our results revealed three basic patterns of ecosystem orchestration: single-, double-, and multi-orchestration ecosystems. These were determined by two key contingencies: production related knowledge and consumption related knowledge. This discovery yields several contributions to research and managerial practice. We show whether, and under which circumstances, orchestrators might include other ecosystem participants in the key tasks of orchestration. We demonstrate how orchestrators allocate these tasks to specific participants in the ecosystem. Furthermore, our results shed light on how orchestrators manage their ecosystem partners and secure their position within the ecosystem. And finally, we introduce a new view on the role of the orchestrator.

1. Introduction

The ecosystem as a new and distinct organizational form (Adner, 2017; Jacobides, Cennamo, & Gawer, 2018; also see Moore, 1993) has recently gained significance both in managerial research (Adner & Kapoor, 2016; Frishammar, Richtnér, Brattström, Magnusson, & Björk, 2019; Kindermann et al., 2020) and industry practice (Atluri, Dietz, & Henke, 2017; Fuller, Jacobides, & Reeves, 2019). New technologies and the digital transformation are fundamentally changing the rules of competition through the emergence of ecosystems (Denicolai, Magnani, & Vidal, 2020; Peppard & Rylander, 2006). This concept departs from viewing the individual corporation as the sole unit of analysis and instead takes an overarching perspective of inter-firm collaboration (Baldwin, 2012; Javalgi, Cutler, & Todd, 2004). The ecosystem perspective includes the transformation from cultivating internal ideas into implementation to an open and distributed process that combines product/service development and an extended use of external innovation ecosystem stakeholders (Frishammar et al., 2019).

This resulting inter-firm collaboration provides companies with a wide range of opportunities that a single company would not be able to provide, such as access to new markets, development of new technologies, products, or markets, and access to resources and skills (Adner, 2006; Kahney, 2004; Moore, 1996). As such, an ecosystem functions as a group of organisations that jointly create a value proposition for the customer that a single firm could not offer on its own (Adner, 2017; Moore, 1993). Since all organisations involved in an ecosystem are pursuing their individual agendas and expect a sufficient return on their contributions, a focal firm, the orchestrator,[1] needs to align the ecosystem actors towards the joint value proposition (Adner, 2017; Jacobides et al., 2018). For this alignment, the orchestrator must implement appropriate ecosystem-coordinative mechanisms and design a thorough organizational network (Kapoor, 2018; Kindermann et al., 2020; Müller, Buliga, & Voigt, 2020). On a more detailed level, Moore already described several key tasks that an orchestrator needs to fulfil (1993).

Despite this early description of the orchestrator's key tasks, the role of orchestrators has remained vague (Jacobides et al., 2018). Previous studies have addressed organizational structures or even coordinative

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[1] In this paper, we use the term "orchestrator" and do not distinguish between other terms used in the existing literature, e.g. orchestrator (Altman & Tushman, 2017; Leten, Vanhaverbeke, Roijakkers, Clerix, & Van Helleputte, 2013), keystone (Iansiti & Levien, 2004), hub firm (Jacobides et al., 2018), focal actor (Adner, 2010, 2016, 2017), or ecosystem leader (Moore, 1996; Teece, 2016).

https://doi.org/10.1016/j.emj.2021.09.001
Received 26 November 2020; Received in revised form 18 July 2021; Accepted 2 September 2021
Available online 13 September 2021
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mechanisms in ecosystems, but focused on the context of digital infrastructures and platform interactions (e.g. Ceccagnoli, Forman, Huang, & Wu, 2012; Hanseth & Lyytinen, 2010; Kindermann et al., 2020; McIntyre & Srinivasan, 2017; Tiwana, Konsynski, & Bush, 2010; Wareham, Fox, & Cano Giner, 2014). In particular, the management of actors in the ecosystem and distribution of tasks amongst them has remained a black box (Denicolai et al., 2020), as reflected in the recent call of Jacobides et al. (2018) that we need "a clearer sense of how ecosystems are structured and governed". This lack of understanding becomes even more crucial considering the fact that in some ecosystems several players can act as orchestrators (Lingens, Miehé, & Gassmann, 2021). However, whether and under which circumstances several players might perform the tasks of an orchestrator has remained unclear (Adner, 2017; Altman & Tushman, 2017; Iansiti & Levien, 2004; Jacobides et al., 2018; Moore, 1996). This raises the question of how firms allocate these orchestrator tasks to specific participants in the ecosystem.

Despite its great significance for research on ecosystems, this question has not been answered sufficiently. In order to address this gap, our paper applies a qualitative multiple-case study with eight cases and develops a framework that shows how firms allocate the key tasks of an orchestrator amongst ecosystem actors. It has to be noted that even though some of our ecosystem cases involve non-firm actors as well, we do not have a single case with such actor being an orchestrator. Thus, we are merely focusing on firms taking over tasks of orchestration. In doing so, our paper intends to contribute to the ecosystem concept (Adner, 2017; Jacobides et al., 2018) in at least three ways. First and foremost, we show whether, and under which circumstances, orchestrators might include other ecosystem participants in the key tasks of orchestration. Second, our study demonstrates how orchestrators allocate these tasks to specific participants in the ecosystem. This leads to an important contribution by showing that an existing notion in literature on ecosystems needs an overhaul: The orchestrator is not necessarily a distinct player within the ecosystem. Rather, it can be described by one or several firms taking over tasks of orchestration. Third, the results shed light on how orchestrators manage their ecosystem partners and secure their positions within an ecosystem.

2. Literature review

2.1. Key characteristics of the ecosystem concept

The ultimate purpose of an ecosystem is the realization of a common value proposition by several actors. This cannot be achieved by the individual performance of these actors alone (Adner, 2017; Adner & Kapoor, 2010; Kathleen M. Eisenhardt & Galunic, 2000; Frishammar et al., 2019; Hannah & Eisenhardt, 2018; Jacobides et al., 2018; Moore, 1993). The basic prerequisite is that it must be possible to break down the value contribution into independent modules that can be produced by the actors involved (Baldwin & Clark, 2000; Jacobides et al., 2018). Either a so-called supermodularity is created, in which the complementary modules increase their individual values (Milgrom & Roberts, 1990; Topkis, 1978, 1998), or the modules are not able to function without each other (Teece, 1986). For this reason, the individual partners must create new modules specifically for the ecosystem or at least adapt their existing modules so that they fit in with the modules provided by the other actors (Baldwin & Clark, 2000; Jacobides et al., 2018; Nambisan, Wright, & Feldman, 2019). This is why the various partners must be oriented towards the common value proposition and need to engage in effective coordination processes (Adner, 2017; Kindermann et al., 2020). In principle, this alignment is multilateral in nature, which means that, in order to ensure that all modules fit together and achieve the full potential of complementarity, the links between actors cannot be set out in bilateral agreements (Adner, 2017; Jacobides et al., 2018).

Since mutual adaptation of the modules results in high adaptation costs, this implies a strong interdependency between the partners (Adner, 2017; Jacobides et al., 2018). Furthermore, this means that the failure or withdrawal from the ecosystem of a single partner poses a major threat to the whole structure of the ecosystem. As each partner remains an independent economic actor with its own individual agenda and objectives (Dattée, Alexy, & Autio, 2018; Moore, 1996), it is of utter importance to secure the engagement of all of the ecosystem partners. This requires improved understanding of what other stakeholders in the ecosystem want, what they do and do not do, their individual contributions, and so forth (Frishammar et al., 2019). Hence the need for an orchestrator, a focal firm responsible for the involvement and coordination of the partners, leading them to new opportunities and ensuring fair value sharing and appropriate value creation (Altman & Tushman, 2017; Iansiti & Levien, 2004; Moore, 1996). Orchestration in an ecosystem is challenging and different than governance in other forms of inter-firm collaboration in the sense that the actors provide unique and complementary modules. Unlike supply chains, an ecosystem is neither fully hierarchical nor contractually managed and cannot be broken down into bilateral relationships (Adner, 2017; Jacobides et al., 2018). Thus it requires an ecosystem orchestrator to provide stability, display compliance, and ensure conformity (Iansiti & Levien, 2004).

2.2. Key characteristics of ecosystem orchestration

In this section, we illuminate the actual tasks of orchestration and delve deeper into what has been written before about that topic. As described above, an ecosystem is defined by the alignment of partners towards a joint value proposition by an orchestrator. Based on this definition, we can define four key tasks that an orchestrator must fulfill. The ecosystem's (and thus the orchestrator's) primary role is the materialization of a joint value proposition (Adner, 2017; Jacobides et al., 2018). In this paper, we split this key role into two tasks. In order to materialize a value proposition, someone must first define it. Thus, we define the first part of this task as *define value proposition.* The second part of this task – the actual materialization – is called *implement value proposition.* Further, alignment requires "actors' consistent construal of the configuration of activities" (Adner, 2017, p. 42). We call this third task *coordinate suppliers and partners* and include the coordinative efforts and information exchange amongst actors within this task (Adner, 2017; Kindermann et al., 2020). Lastly, ecosystems are dynamic and not static, and the interdependencies between the actors or even the value proposition might change over time (Aarikka-Stenroos & Ritala, 2017; Moore, 1993). In order to adjust and scale the value proposition, the actors must contribute new ideas to the existing ecosystem (Frishammar et al., 2019; Moore, 1993). In this paper, we refer to this fourth task as *bring new ideas.* Thus, the four key tasks we derived from the definition of ecosystems are *define value proposition, implement value proposition, coordinate suppliers and partners*, and *bring new ideas.* These tasks might seem to occur in a delineated sequence, however "in reality, of course, the evolutionary stages blur, and the managerial challenges of one stage often crop up in another" (Moore, 1993, p. 76). Thus, an orchestrator might not address these tasks in a linear order, but rather might tackle them simultaneously (since bringing new ideas, for example, could be beneficial throughout the life cycle of an ecosystem). Beyond these four key tasks, several other minor tasks might be relevant for the orchestration of ecosystems. In this paper, however, we focus on these four tasks since they are at the very heart of the ecosystem concept (Adner, 2017; Jacobides et al., 2018). Despite an early description of an orchestrator's key challenges in Moore's seminal work on ecosystems (1993), the existing literature has not elaborated on these distinct tasks an orchestrator needs to fulfil. A noteworthy exception is the study by Brusoni and Prencipe (2013), which mentioned the terms "strategic and operational" to describe the tasks of the orchestrator but did not go into more detail.

Despite the agreement within previous literature that the existence of an orchestrator is one of the key characteristics of an ecosystem (e.g. Alexy, George, & Salter, 2013; Baldwin, 2012), the role of orchestrators

is still a largely under-researched topic. First, it is still not sufficiently understood how the orchestrator steers the partners and whether ecosystems are usually steered by a single orchestrator or several firms together (Jacobides et al., 2018). What we know is that the orchestrator (s) need a clear "protovision" of the future ecosystem to convince partners to join (Dateé et al., 2018). Second, the existing literature has addressed these multi-orchestrator ecosystems rudimentarily, but the important question of whether, and under which circumstances, several players might act as an orchestrator has remained vague (Altman & Tushman, 2017; Iansiti & Levien, 2004; Jacobides et al., 2018). One of the few works on that topic, Lingens et al. (2021), has provided an important finding: If an initial orchestrator possesses the knowledge and network to understand the ecosystem's target market, it will define the value proposition and partners in isolation, thus acting as a single orchestrator. In case of a lack of network and knowledge, however, the initial orchestrator will involve other firms to fulfil these strategic orchestration tasks. However, Lingens et al. (2021) focus on strategic aspects of orchestration in the context of ecosystem structures, without shedding light to all tasks of orchestration as described above. But this work demonstrates the importance of the orchestrator's knowledge as a prerequisite for ecosystem orchestration.

2.3. Initial conceptual model

The section above highlights both the importance of orchestration and the lack of research on that topic. And it summarises the few existing findings. In this section, we are using these inputs to develop an initial conceptual model as a foundation for our subsequent qualitative analysis, following the idea of a flexible pattern matching approach (Bouncken, Qiu, Sinkovics, & Kürsten, 2021; Bouncken, Qiu, & García, 2021; Sinkovics, 2018).

Lingens et al. (2021) show that knowledge is a key prerequisite for taking over the role of an orchestrator. According to Jacobides et al. (2018), an orchestrator has to manage ecosystems both in terms of the consumption (i.e., market and customer) and production (i.e., partners and product development). Bringing both findings together, one can assume that taking over the tasks of defining the value proposition and bringing new ideas require consumption related knowledge whilst the tasks of implementing the value proposition and coordinating suppliers and partners require production related knowledge. Thus, following the logic introduced by Lingens et al. (2021), if one firm does not possess knowledge related to both domains, we can expect several orchestrators to manage the ecosystem and take over the different tasks of orchestration.

This raises the question of how to define the word "orchestrator". Extant research on ecosystems has usually (explicitly or implicitly) referred to "the orchestrator" (e.g., Altman & Tushman, 2017; Adner, 2016; 2017; Iansiti & Levien, 2004; Moore, 1996), which implicitly points towards the orchestrator being a distinct role within the ecosystem, comparable to the role of a specific manager in a firm (e.g., CEO, CFO, innovation manager). However, if we assume that orchestration is rather defined by taking over tasks of orchestration and that one or several firms can be assigned to such tasks, we need a more nuanced definition: Initially, the ecosystem is driven by one or several firm(s) since ecosystems usually do not emerge self-propelled (Jacobides et al., 2018). We will furtherly refer to this/these firm(s) as the "initial orchestrator(s)". Based on the question whether they possess the necessary consumption- or production-related knowledge, we expect the initial orchestrator(s) to delegate tasks of orchestration to other firms in the ecosystem, if needed. Such delegation would lead to settings with several firms fulfilling tasks of orchestration and, accordingly, more coordination efforts. In this paper, for the sake of simplicity, we will refer to all firms taking over orchestrator tasks as orchestrators but, whenever necessary, we will distinguish between orchestrators in general and the initial orchestrator(s).

These thoughts are summarised in our initial conceptual model, displayed by Fig. 1. Following the logic of a flexible pattern matching approach (Bouncken, Qiu, Sinkovics, & Kürsten, 2021; Sinkovics, 2018), this initial theorising guided our subsequent qualitative study. In the following methods section, we will explain how our findings deepened and enriched those initial conceptual considerations.

3. Methods

We apply a flexible pattern matching approach (Bouncken, Qiu, Sinkovics, & Kürsten, 2021; Sinkovics, 2018) in order to guide our multiple-case study (Kathleen M. Eisenhardt, 1989; Ozcan & Eisenhardt, 2009). This is a suitable methodological approach for several reasons. First, the concept of ecosystems, and orchestration in particular, is still incomplete and fragmented, which calls for a qualitative study. However, the existing findings in this field allow for an initial theorising, which makes a purely inductive approach less suitable than an inductive/deductive one. In this sense, we use the initial conceptual model to guide our analysis and use our empirical data to enrich and extent the initial theorising (Sinkovics, 2018; also see Bouncken & Barwinski, 2021). Second, it is a preferred research strategy for examining complex social phenomena, such as the dynamics of inter-firm relationships (Duan, 2012). Third, the rich empirical insights gathered through this approach strengthens the external validity of a case study (Gibbert, Ruigrok, & Wicki, 2008; Yin, 2018), which might be of particular value to understand this growing phenomenon of the ecosystem (Kathleen M. Eisenhardt, 1989; Ozcan & Eisenhardt, 2009). In general, as with many case studies, we aim to generate analytical generalization, i.e., we want to shed light on theoretical principles and concepts, rather than providing statistically valid results (Yin, 2018).

3.1. Data sampling

After building our initial conceptual model, we used several sampling criteria for our final eight cases. First, all ecosystems we studied needed to correspond to the ecosystem view being used in this paper (Adner, 2017; Jacobides et al., 2018). Applying this lens, we can identify the boundaries of an ecosystem and, thus, whether firms are part of the ecosystem or not. Accordingly, firms are only ecosystem participants if they offer a unique and complementary contribution to the joint value proposition. Second, we chose cases with great diversity in terms of value propositions and with "understanding of where there was likely to be variation and where there was not" (Ott, Eisenhardt, & Bingham, 2017, p. 86). Despite this variation, industry specifics are less likely to distort our results since ecosystems usually involve partners from different industries (Adner, 2017; Jacobides et al., 2018). Third, these sampling techniques followed the approach of previous studies on ecosystems and related subjects (e.g. Chatman & Jehn, 1994; Dedehayir & Mäkinen, 2013; Schoenecker & Cooper, 1998). Such an approach provides a comprehensive overview, while ensuring that results are not distorted by cross-industry differences (Kathleen M. Eisenhardt, 1989; Ozcan & Eisenhardt, 2009). Table 1 shows our final sample of cases and provides a short description as well as some facts on the ecosystems.

3.2. Data collection

Our data collection started with the initial orchestrator, which we determined based upon our prior, external analysis of the ecosystems. As explained in the literature review (section 2.3), we define the initial orchestrator as the firm taking over tasks such as defining the value proposition, involving other partners and orchestrators or updating the value proposition, if needed. We started our data collection with the firm we expected to be the main driver behind the ecosystem. During the initial interview (please, see Table V for the respective questionnaire), we were seeking to find out who performed the tasks the initial orchestrator is defined upon without asking directly who was regarded to take over that role. In the course of the subsequent rounds of

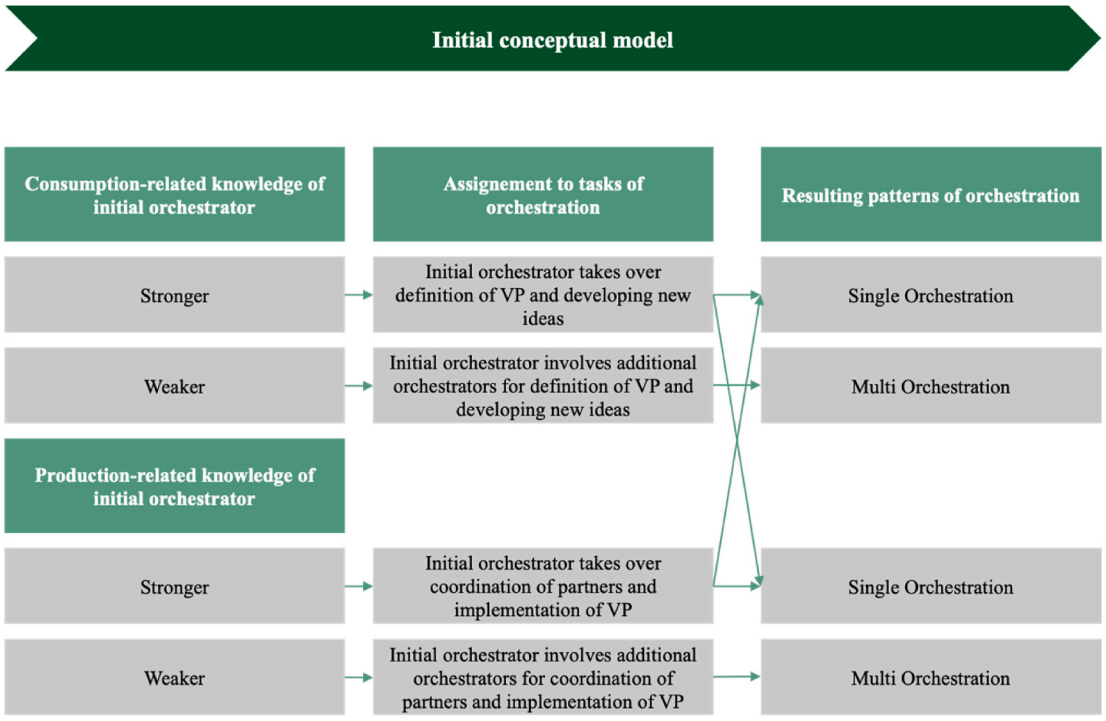


Fig. 1. Initial conceptual model.

interviews, we furtherly triangulated and validated our perception. In all cases studied, the question of who the initial orchestrator was/is could be answered very clearly and there was no discourse between respondents in this regard. Also, the initial orchestrator always turned out to be the firm we initially expected to be the driving force behind the ecosystems. The initial orchestrator was a fruitful starting point since this firm is in charge of defining the partners' activities (Adner, 2017; Moore, 1993; Teece, 2007, 2016) and can be considered the actor with the most extensive overall view of the ecosystem (Adner, 2017; Jacobides et al., 2018; Moore, 1993).

We also made detailed notes during the interviews and, together with our interviewees, sketched the graphical representation of the ecosystems (Dattée et al., 2018). In addition, we have used extensive supplementary data consisting of external and (orchestrator) internal documents. In addition, third party documents were used, which consist of documents about the ecosystem and other aspects that were addressed in the original questionnaire. These documents included press releases, media reports, homepages, annual reports, and internal presentations and reports. In particular, these helped us to gain an understanding of the formal cooperation agreements, which enabled us to enrich, validate, and triangulate insights gained from our initial interviews (Jick, 1979).

During the triangulation, we asked for additional information by e-mail and short follow-up calls. We also conducted additional interviews with other employees of the (initial) orchestrators. This helped us to further deepen our existing knowledge and to avoid possible inconsistencies or misunderstandings. We ensured that we also talked to at least one person responsible for strategic control and one other person responsible for day-to-day business, whenever this was possible. In addition to our interviews with the (initial) orchestrators, we also conducted complementary interviews with other actors in the ecosystems. Throughout the various rounds of interviews, we did not reveal any information from previous rounds, which gave us the change to triangulate the respondents' statements with those having been made in other interviews. In the very same way, we used the secondary data. We tried to get as many as possible (internally and externally) not because we wanted to use it as a main source of information but to check for any inconsistencies with statements made in the interviews and to get more background knowledge on the cases. This was used as a foundation for the following round of interviews – typically to address any inconsistencies or questions arising out of these background studies. Thus, all key information stems from the interviews with the secondary sources mainly serving as a means of triangulation and extension of our interview questionnaire. Table 2 gives an overview of our data sources per case.

3.3. Data analysis

We used a flexible pattern matching approach along three rounds of analysis, which was guided by our initial conceptual model (Sinkovics, 2018; also see Bouncken & Barwinski, 2021) as shown in Fig. 1. Thus grounded, we developed an initial set of patterns that guided our subsequent analysis (Sinkovics, 2018) – Please, see Table 3.

Throughout the analysis, we used drawings, tables, and other forms of visualisation to detect patterns in our data more easily (Miles & Huberman, 1994; Yin, 2018). For the same reason, we paired cases in order to understand similarities and differences between the cases (Ozcan & Eisenhardt, 2009). On this basis we developed constructs in a recursive manner, going back-and forth between data and existing/emerging conceptual findings (Eisenhardt & Graebner, 2007). In the course of our coding approach (Strauss & Corbin, 1998), we searched for key words in our data referring to the management of partners and the other key aspects of the orchestration under consideration.

In the first round of pattern matching, we were focusing on the aspect being described in our initial framework (Bouncken & Barwinski, 2021; Sinkovics, 2018). We investigated which firms executed the different tasks of orchestration and why. The initial findings confirmed the single orchestrator pattern. However, other than suggested by the initial model (which differentiates just single- and multi-orchestration), we found that multi orchestration settings need to be distinguished in setting with just two or more than two orchestrators given the very different rules and principles. Thus, in a second round of analysis, we were focusing on those cases only, which had two or more orchestrators. Please, see Table 4 for an overview of our cases and their classification into the

Table 1
Overall description of our cases.

Case	Foundation Orchestrator	Orchestrator origin	Nr. Of core actors Ecosystem	No. employees Orchestrator	Case Description
Digital Access	2006	Germany	5	<50	The value proposition in the Digital Access Case lies in a digital solution that allows customers to open doors of rooms, buildings, cars etc. by using a temporarily valid smartphone code. One of the most important use cases (in addition to some others for which the orchestrator has different employees and partners) provides keyless digital access to rental cars. In order to unlock cars via a smartphone, the car rental company technically modified its cars for the new system and developed a mobile app for the end customers. Further hardware and software solutions had to be implemented in the fleet of cars by the other ecosystem partners.
Drone Delivery	1849	Switzerland	5	ca. 60.000	In the Drone Delivery Case, the ecosystem provides delivery of goods executed by an autonomous drone. The original key partners that developed this value proposition were a logistics company, a flight cargo company (which later left the ecosystem), and a drone technology provider. Furthermore, a hospital provided the use case as well as a test ground, knowledge, and experience on logistics. Lastly, governmental authorities created a legal foundation for the autonomous flying drones. The current focus of the ecosystem lies on the transport of sensitive and high value medical objects (e.g. organs, blood, etc.) from one hospital to another.
Autonomous Mobility	1906	Switzerland	5	ca. 40.000	The Autonomous Mobility Case ecosystem provides an autonomous self-driving bus in pedestrian zones. A public transport provider contributed knowledge and experience, particularly pertaining to the processes of public transportation. University 1 provided expertise regarding Big Data and introductions to several start-ups specialized in the areas of autonomous driving (e.g. a fleet management programmer or a manufacturer of Autonomous Mobilities) and data analytics towards a fleet management programmer. University 2 brought in market knowledge and a network, as well as market research. In addition to these players, a city provided the test ground and a Canton dealt with the federal authority for regulations. Governmental authorities established regulations for the bus manufacturers and self-driving public transportation.
Customized Relocation Case	2014	Switzerland	7	<50	In the Customized Relocation Case, the value proposition is a personally tailored relocation process for the end customer. Specifically, the ecosystem addresses all aspects around relocation and provides a solution in which customers are no longer required to deal individually with each of the companies involved in the process. This relocation process encompasses the actual move and cleaning, as well as the transportation and sales process for furniture etc. Furthermore, customers receive additional benefits, such as free and tailor-made insurance service for the household, provided by an insurance partner. Through the implementation of a platform, coordination between the key partners became largely automated. Core players that contribute to the value proposition – business development partners and a moving and cleaning company – and customers are all interlinked through a relocator platform. An insurance company insures the customer for any insurance cases that can occur during the moving phase. Software provider 1 forms an interface with the insurance company, while software provider 2 is responsible for building the relocator platform.
Connected City	1974	Germany/ Switzerland	16	ca. 400	In the Connected City Case, the value proposition refers to the overall customer mobility journey for commuters in cities and suburbs. The initiator of the ecosystem is a European car manufacturer. Other co-orchestrators include a global consulting firm that provides the management skills and a network of contacts, and a world-leading software company that contributes communication skills and data-processing technologies. In the process of further developing the ecosystem, other partners (e.g. city administrations) are involved in order to improve and expand the services offered.
SME Factoring Case	2016	Switzerland	6	ca. 15	The SME Factoring Case provides a factoring service for Swiss Small and Medium Enterprises (SME) operating in developing countries. In this business environment, the payment deadlines are very long (often up to 180 days), which can be a severe issue for the liquidity of these companies. Regular factoring addresses this problem but is usually only granted to SMEs that have an adequate level of liquidity. Other companies, however, are excluded from factoring and thus have difficulties operating in these developing countries. This problem is solved by a FinTech company, which provides a tailor-made factoring solution specifically for SMEs with low liquidity and poor credit ratings.
Disease Detection	2012	Switzerland	5	<50	The value proposition in this case lies in the detection of disease and pest control in viticulture. This is done by data analysis from a customer-specific hyperspectral camera. Through frequent multilateral and bilateral exchanges between the partners of an agriculture data company, an application-oriented research institute and the viticulture institute, a

(*continued on next page*)

Table 1 (*continued*)

Case	Foundation Orchestrator	Orchestrator origin	Nr. Of core actors Ecosystem	No. employees Orchestrator	Case Description
					solution is jointly developed. Furthermore, the employees of the respective partners were physically present in the winery several times.
Connectivity Services Case	2012	Switzerland	8	<50	The value proposition is an innovation platform with the open source concept, which connects partners across industries. Agricultural machines, sensors, and algorithms are combined by the respective partners by connecting specific interfaces (e.g. satellites, platforms, machines, stables, milking robots, or cameras). This also ensures that a farmer can decide very flexibly which machine is combined with which sensor and which data analysis platform. Furthermore, there are several use cases for the performance product, e.g. automated irrigation for monitoring plant stress, disease detection in viticulture, or the detection of the nervousness level of animals. To ensure technical connectivity, the partners built technical interfaces between their modules.

Table 2
Case and data overview.

Case	Field of business	# Interviews	*Interviewee position* IO = Initial Orchestrator O2 = Further Orchestrator O = Orchestrator C = Complementor company	*Interviewee letter-number code*	*Interview duration (min)*	Additional data
Digital Access	Security	6	1. CEO	A1[a]	67 + 21+63	Company website documents (internal)
			2. Chief Sales Officer (O)	A2	81	
			3. Head Ecosystems & Venturing (C)	A3	65	Blog posts & online articles (external)
			4. Venture Fund Manager (C)	A4	21	
SME Factoring	Finance	8	1. Head of Sales & Marketing (O)	F1	139 + 32+37 + 81+23 + 27+22	Company website documents (internal)
			2. Innovation Manager (C)	F2	36	Online articles about the orchestrator (external)
Drone Delivery	Logistics	8	1. Head of Autonomous Delivery (IO)	D1	36 + 60+60	Company website documents (internal)
			2. Head of Open Innovation (IO)	D2	53	Expert board final report (internal)
			3. Program Manager (IO)	D3	36	Blog posts & online articles
			4. Head Global Business Strategy (O2)	D4	55	(external)
			5. Chief Physician (C)	D5	28	
			6. CEO (C)	D6	39	
Autonomous Mobility	Public transportation	7	1. Head of Open Innovation (IO)	M1	52	Company website documents (internal)
			2. Head of the Project Lab (IO)	M2	75 + 48	Technical report (internal)
			3. Lab Coordinator (IO)	M3	45 + 13	Newspaper, online articles & TV
			4. Head of Strategy & Innovation (C)	M4	57	reports (external)
			5. Operational Director (C)	M5	26	
Customized Relocation	Home	9	1. Key Account Manager (O)	R1	9 + 66	Company website documents (internal)
			2. Business Development Manager (O)	R2	85 + 75	Participant observation in workshop (internal)
			3. Founder & CEO (O)	R3	66 + 61	
			4. Head of Business Development (O)	R4	26 + 24	Online & magazine articles (external)
			5. Innovation Manager (C)	R5	40	Newspaper articles (external)
Disease detection	Agriculture	8	1. CEO & Co-Founder (O)	H1	74 + 33+49	Company website documents (external)
			2. Chairman & Co-Founder (O)	H2	39	
			3. CEO (C)	H3	39 + 36	Blog post & online articles (external)
			4. Project Leader (C + O)	H4	18 + 23	Data Tools (internal)
						Research Publications (external)
Connectivity Services	Agriculture	9	1. CEO & Co-Founder (O)	C1	74 + 33+49	Company website documents (external)
			2. Chairman & Co-Founder (O)	C2	39	
			3. Project Leader (C + O)	C3	18 + 23	Blog post & online articles (external)
			4. Alliance Manager Europe (C)	C4	27	
			5. Electronic Markets Lead (C)	C5	24 + 21	Data Tools (internal)
Connected City	Mobility	2	Head Ecosystem Initiative (O)	B1	52 + 34	Company website documents (internal)
		3	Team Member Ecosystem Initiative (O)	B2	90 + 52+32	Internal Company presentation (internal)
		1	Head Innovation (C)	B3	60	
		1	Principal Innovation (O2)	B4	117	
Total		***62***			***2906***	

[a] The letter-number codes (in parentheses) identify individuals by firm (abbreviated pseudonym) and by an assigned number.

Table 3
Initial template.

Type of knowledge of initial orchestrator	Operationalisation	Resulting pattern	Implications
Consumption-related	Stronger	Single Orchestrator	• Initial Orchestrator is the architect of the ecosystem, driving its development • Relatively simple structure of ecosystem with less complexity and coordination effort
	Weaker	Multi Orchestrator	• Ecosystem is led and driven by several orchestrators; Value proposition and protovision of ecosystem needs to suit all orchestrators • Less hierarchical structure amongst multi-orchestrators • Higher complexity and coordination effort for orchestrator (s)
Production-related	Stronger	Single Orchestrator	• Orchestrator with stronger position and stronger hierarchy towards partners • Less complexity and coordination effort due to simple structure (one orchestrator leads all partners) • Orchestrator acquires knowledge and experience in both strategic and operational fields
	Weaker	Multi Orchestrator	• Strong dependency and lack of hierarchy between strategic and operational orchestrator • More complexity and coordination effort for orchestrator(s) • Separation of operational and strategic activities leads to distinct learning and experience for the strategic vs. operational orchestrator(s)

different patterns. However, our initial analysis showed another finding related to the tasks of "bringing new ideas", which was not expected based on our initial model: We detected a sub-pattern of orchestration for those ecosystems, which are growing based on ideas being not related to its previous activities. Thus, we conducted a third round of analysis, in which we were investigating specifically on the last task of orchestration (bring new ideas) and focusing on those ecosystems only that were growing into unrelated fields (please, see Table 4 for an overview on these cases).

Our subsequent emergent results section is structured along four steps, according to these three rounds of analysis: In the first three parts, we show our findings related to single-, double-, and multi-orchestration, which is guided by and a deepening of our initial model (first two rounds of analysis). Throughout all of our cases, it appeared that these different modi of orchestration are path-dependent, which pointed towards a structure for the findings section divided accordingly. Three parts of the findings are dealing with the first three tasks of orchestration (define value proposition, implement value proposition, coordinate partners). In the fourth part, we focus on the different patterns of conducting the task of bringing new ideas, which emerged inductively out of our analysis (third round of analysis). The results of our pattern matching and data analysis are displayed by Fig. 2 and will be explained in detail in our findings section.

4. Emergent results

4.1. Single orchestrator

As suggested by our initial conceptual model, an initial orchestrator will conduct the tasks of orchestration alone if the firm possesses the production and consumption related knowledge. This becomes evident in regard to the first key task of orchestration, defining a new customer value proposition. In these cases (Digital Access, SME Factoring, Customized Relocation, Disease Detection), a single orchestrator defined the value proposition. One interviewee justified this as follows:

> "We simply had what was certain to be our strength in Switzerland, we know the market, we know the local conditions and we have contact with the customers." **D2**

This is a nice illustration of how an individual orchestrator must have adequate knowledge of potential customers to define the value proposition on its own. The need to have consumption related knowledge was also evident in the analysis of the other case studies representing that pattern. Regarding the building of an ecosystem using the single-orchestrator approach, the case analysis showed that an ecosystem is built by a partner developing a use case and then finding the necessary partners, as well as the clients. In addition, another interviewee described how they developed the value proposition themselves based on the identified needs of the customers:

> "Very much from the Pain Points of our customers, […]and then from there we developed our value proposition […] In this respect it can be clearly said that the value proposition came from us." **F1**

The next tasks, implementation of the value proposition, demands production related knowledge, which appeared to be the decisive factor determining the allocation of this orchestrator task in the cases we analyzed. In the single orchestrator cases, the firm that defined the value proposition steers the development of technical components as well, since it also possesses the production related knowledge. For instance, the orchestrator of the Digital Access case was able to contribute the technical know-how from its experience as a tech company. Hence, it could establish a functional system by bringing together the technological components that provided the basis to implement the value proposition. As the CEO in the Digital Access case put it:

> "Some of our partners do not have a great competence or at least not as deep a competence as we do, especially in the area of virtual reality." **A1**

The same logic applies for the third key task of orchestrators – the coordination of suppliers and partners in the ecosystem. Here, the orchestrator needs to understand the agendas of the other actors and steer the operational activities in the ecosystem.

In our single-orchestration ecosystems, this setting was a deliberate choice by the single orchestrator in order to maintain control over the ecosystem and all the partners. The Head of Sales & Marketing in the SME Factoring case explains this strategy as follows:

Table 4
Classification of cases.

Single-Orchestration		Double-Orchestration		Multi-Orchestration	
Consumption related knowledge initial orchestrator	*Yes*	Consumption related knowledge initial orchestrator	*Yes*	Consumption related knowledge initial orchestrator	*No*
Production related knowledge initial orchestrator	*Yes*	Production related knowledge initial orchestrator	*No*	Production related knowledge initial orchestrator	*No*
Define value proposition	*Orchestrator*	Define value proposition	*Initial Orchestrator*	Define value proposition	*All Orchestrators*
Implement value proposition	*Orchestrator*	Implement value proposition	*Operative Orchestrator*	Implement value proposition	*All Orchestrators*
Coordinate suppliers and partners	*Orchestrator*	Coordinate suppliers and partners	*Both Orchestrators*	Coordinate suppliers and partners	*All Orchestrators*
Bring new ideas	*Orchestrator*	Bring new ideas	*Both Orchestrators*	Bring new ideas	*All Orchestrators*
Development of value proposition	*Related (R) or unrelated (UR) Fields*	Development of value proposition	*Unrelated Fields*	Development of value proposition	*Unrelated Fields*
Cases	**Digital Access (R)** **SME Factoring (R)** **Customized Relocation (UR)** **Disease Detection (R)**	**Cases**	**Drone Delivery**	**Cases**	**Autonomous Mobility Connectivity Services** **Connected City**

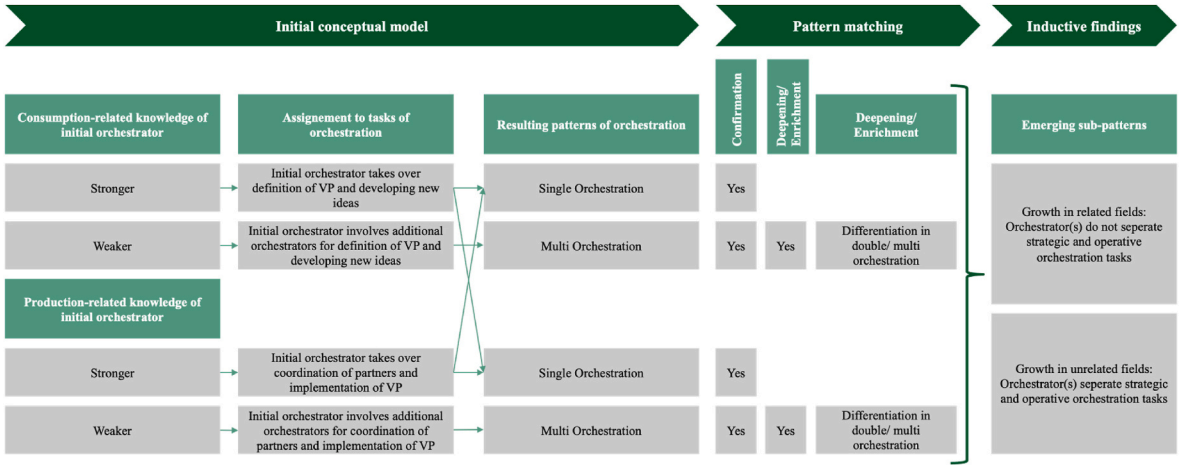


Fig. 2. Results of data analysis.

> "We manage the ecosystem […]. We want to try to sit like a spider in a web and keep the interactions of others to a minimum […] We are the bottleneck in each other's interactions, the puppet coordinator, so to say." **F1**

Taken together, as suggested by our initial conceptual model, a single orchestrator took over the tasks of orchestration if that firms possessed both consumption and production related knowledge. As nicely shown by the statement above (F1), the initial orchestrators are preferring a single orchestration setting, because it allows for greater control. On top of this, arguably, further orchestrators might always try to receive a larger share of the earnings as a compensation for their orchestration efforts and contribution to the ecosystem. Thus, we can expect the initial orchestrator to remain a single orchestrator whenever it is possible, i.e., whenever they possess the production and consumption related knowledge to do so.

4.2. Double orchestration

In the second pattern of orchestration, the initial orchestrator possesses the consumption related knowledge to define the value proposition. However, it is lacking profound production related knowledge and therefore delegates the implementation role to a co-orchestrator. For instance, the logistics company developed the use case but then a drone technology provider was selected to implement the drone delivery system on site. Once the ecosystem was established, the logistics company made the drone technology provider responsible for the day-to-day business and communication with the client. As the Head of Autonomous Delivery explained:

> "The drone technology provider has spent most of the resources or time. I would say the contribution is probably about 50 percent by the drone technology provider. […] our role is more that of an enabler." **D1**

Same logic applied to the coordination of partners, in which we observed an interesting sharing of this role between the drone technology provider and the logistics company as well. Since the drone technology provider is responsible for the day-to-day business, the initial orchestrator mainly steers the operational activities within the ecosystem and communicates with the partners in this way. However, when difficulties occur, the transportation company intervenes on behalf of the drone technology provider and facilitates exchange when necessary. D2 explains that the two companies share this coordination role because the management at the transportation company has a more extensive network of contacts, in particular at the regulator, than the executives at the other partner firms.

> "Since our management knows the people at the [regulator], we can escalate quite well if necessary. […] we have escalated once or twice when our CEO directly went to the head of [regulator]." **D2**

Taken together, the double orchestration is closely related to the single orchestration pattern. However, since the initial orchestrator is lacking the production related knowledge, it delegates all tasks that require such knowledge (coordinate suppliers and partners as well as implement value proposition) to a second firm within the ecosystem. Double orchestration, thus, refers to a setting, in which strategic and operative tasks of ecosystem orchestration are assigned to different firms involved in the ecosystem. However, the delegation of the operative tasks as well as role as the overarching, strategic, orchestrator remains with the initial orchestrator.

4.3. Multi orchestrator

When looking at the three other cases (Autonomous Mobility, Connected City, and Connectivity Services), more than one player was involved in the task of defining a value proposition. It appears that in the absence of consumption related knowledge of an individual actor, a multi-orchestrator approach was used to define a value proposition. This is, because only by working together could the partners retrieve enough consumption related knowledge to define a value proposition. One exemplary interviewee explains this necessary collaboration as follows:

> "There would have been far too much knowledge missing and from the network point of view there would have been too much missing (…)" **B1**

In order to be able to cooperate effectively, the co-orchestrators in both the Autonomous Mobility and Connected City cases formed an overarching committee. In this committee the partners collaboratively developed a use case and defined the value proposition. Therefore, to summarize, consumption related knowledge is the key contingency in our cases regarding the task *define value proposition*. If a single partner had enough consumption related knowledge, it was able to define the value proposition on its own and therefore followed a single-orchestrator approach. However, if one partner did not have enough consumption related knowledge to define the value proposition, it involved additional partners as co-orchestrators.

The multi-orchestrator ecosystem cases revealed that the co-orchestrators have to develop production related knowledge to conduct the operative tasks of orchestration. This is done by working in close coordination. Implementation of the value proposition and steering of partners requires the respective core competencies and know-how of all the partners, as described by the Head of the Project Lab:

> "The know-how must also be developed, not only with us, but they must also develop some know-how themselves. This is a process." **M2**

This is, since the development of the value proposition required several orchestrators already. Involving additional firms into the operative tasks of orchestration would increase the complexity of orchestration even more and create a situation, in which there are more leaders than followers. Thus, as nicely shown by the quote above, the initial orchestrators would even accept to "waste" time in building-up production related knowledge by themselves then delegating operative tasks to additional firms.

In order to do so, the multi orchestrators assigned an employee of one firm as a project leader, who steers the partners in the inter-organizational project team. If necessary, the project leader brings problems to the attention of the overarching committee formed by the multi orchestrators. This allowed the partners to maintain a close exchange between the people involved in the operational and strategic tasks of orchestration, as well as between the different actors involved. Thus, some employees who are responsible for or affected by these projects are also members of this committee and exchange information accordingly.

4.4. The task of bringing new ideas leads to a sub-pattern of orchestration

As explained in our data analysis section, the last major orchestration task (introduction of new ideas to the existing ecosystem, which refers to further developing or expanding the ecosystem's existing value proposition) showed interesting sub-patterns, which emerged out of our data. In this regard, we observed two patterns throughout all of our cases. In the first pattern (i.e., SME Factoring, Digital Access), the actors who brought in new ideas were the ones who were mainly responsible for the implementation of the value proposition and the coordination of the partners (i.e., the ones contributing production-related knowledge). This means that these people or firms were mainly occupied with operational tasks and acquired knowledge in this area. The intended result was that the value proposition developed was path-dependent and in fields related to their existing business in which the partner had prior knowledge.

> "Our growth strategy is […] to develop further in the value chain rather than in the value proposition." **A1**

In the second pattern, new ideas deliberately came from actors who were not involved in the day-to-day business. An excellent example is the Customized Relocation case. After creating the platform and implementing the first value proposition, the founder and CEO deliberately created a new and independent business development department. When the Head of Business Development joined, he was capable of exploring new opportunities for the business without being pre-occupied by the operational necessities:

> "When I joined, […] I started to write lists, what might the customer need, what is he interested in when he moves. And that's just how we expanded it, we just thought about, well, what other topics are interesting?" **R4**

As a result, the orchestrator was able to broaden its perspective into previously unrelated fields. This led to the integration of entirely different modules beyond the core service of the move and expanded the value proposition with new aspects, such as partnerships with furniture stores and insurance companies. Therefore, if the orchestrator intends to develop the value proposition beyond path-dependency in related fields, it needs input from people outside of the operational core business.

The multi-orchestrators in our cases Autonomous Mobility, Connected City, and Connectivity Services were also aware of this connection and created opportunities for external ideas. This is nicely explained by M2:

> "There are three levels where new ideas can emerge. […] First, […] the [logistics company] itself brings ideas, [second] ecosystem-internally, [third] that you bring in third parties for creation workshops." **M2**

In the double orchestrator cases, such separation does automatically happen given the separation in strategic and operative orchestration.

5. Discussion

Our results contribute to research on the ecosystem concept and shed light on the largely under-researched topic of how firms allocate orchestrator tasks to specific participants in an ecosystem. Thus, we address the recent call by Jacobides et al. (2018) that the steering of partners is not sufficiently understood. With our results, summarised in Fig. 3, we open this black box and illustrate three patterns and two sub-patterns of actor management approaches.

These findings result in several contributions to literature: The separation of strategic tasks (those that define the value proposition and bring new ideas) and operational tasks (those that implement the value proposition and coordinate suppliers and partners) might lead to an asymmetry of power between orchestrators. The orchestrator of

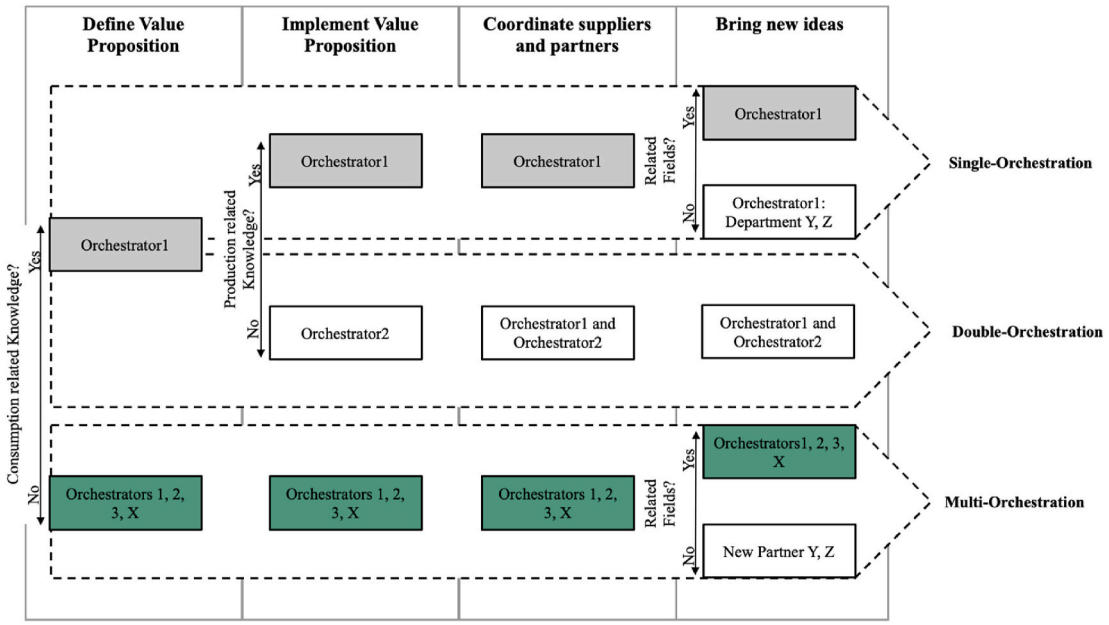


Fig. 3. Overall framework of our findings.

strategic tasks is only relevant in the context of the ecosystem as long as it provides an important module, such as its network or financial or political standing. At first glance, it might be tempting for an initial orchestrator to delegate the operational tasks of orchestration to another partner, since it reduces the firm's effort and opens new fields. However, this might lead to a situation in which the initial orchestrator becomes irrelevant. This is a particularly crucial problem in ecosystems, since the actors in this type of structure are not coordinated in a fully hierarchically way and firms need to bring value to the other stakeholders in the ecosystem (Frishammar et al., 2019; Jacobides et al., 2018). Therefore, an orchestrator must make sure it provides a crucial module to be firmly anchored within the ecosystem – otherwise it might be forced to leave it.

Furthermore, we observed that the three patterns – single-, double-, and multi-orchestrator ecosystems – did not change, but were strictly path-dependent in our cases. Thus, a firm must be aware that the chosen orchestrator setting is not easy to change: Once an operative orchestrator is crucial for the implementation of the value proposition or the coordination of partners, it is firmly anchored in the ecosystem. Although our cases revealed this strict path-dependency, ecosystems are generally dynamic rather than static (Moore, 1993). Thus, in theory, it might be possible that certain disruptive events could lead to a change in orchestration pattern, such as the strategic withdrawal or bankruptcy of a co-orchestrator. Thus, the firms would need a strong reason for this change of setting in an established ecosystem structure. This raises the interesting question of the circumstances under which these potential transitions between the three patterns single-, double-, or multi-orchestrator ecosystems could occur, and how firms could manage them. An exploration of highly dynamic environments could help to discover some of these transitions. This would provide orchestrators with a better understanding of how to take account of or even anticipate these transitions and how to leave the path-dependency of their orchestration patterns.

We also address the hitherto vague understanding of whether and under which circumstances several players might act as an orchestrator (Adner, 2017; Altman & Tushman, 2017; Iansiti & Levien, 2004; Jacobides et al., 2018; Moore, 1996). According to our cases, the market and technological knowledge of the prospective orchestrator are the key contingencies that determine if co-orchestrators are involved in the ecosystem. These findings extend the insights provided by Lingens et al. (2021) that strategic orchestration tasks are assigned to just one or to several orchestrators, depending on the network and knowledge of the initial orchestrator. This leads to another core contribution of this paper: Existing works on ecosystems (Adner, 2017; Altman & Tushman, 2017; Iansiti & Levien, 2004; Jacobides et al., 2018; Moore, 1996) have implicitly or explicitly framed the orchestrator as a role within the ecosystem – The manager of the ecosystem. And if a firm is not an orchestrator it is, thus, a complementor. However, our findings show that the orchestrator is rather a firm taking over tasks of orchestration and that these tasks can be distributed amongst several companies. Thus, there is not a strict differentiation between complementor and orchestrator firm. There might be one firm taking over all tasks of orchestration, which would represent the exiting notion in previous literature as this firm being THE orchestrator. But there are also situations in which several firms are just taking over one or two tasks of orchestration, thus being somewhere between an orchestrator and a complementor.

At the individual level, each firm must consider an important trade-off, which we observed in multi-orchestrator ecosystems. The degree of innovation in an ecosystem is arguably higher in a setting with diverse orchestrators, since the various firms contribute knowledge in diverse fields. For this reason, we only observed multi-orchestrator structures in ecosystems with highly innovative value propositions that required know-how in different fields. On the other hand, coordination between these co-orchestrators was far more challenging and protracted than coordination in ecosystems with only one orchestrator that solely coordinated the suppliers and the complementors. These observations suggest a trade-off between innovation and coordination effort between the partners. However, given the purely qualitative nature of our analysis, we would like to encourage future research to empirically measure and prove that observation.

Our results and the differentiation of the four orchestrator tasks in single-, double-, or multi-orchestrator ecosystems open several further research questions to better understand the phenomenon. Of particular interest are questions regarding the coexistence of more than one orchestrator in double- or multi-orchestrator ecosystems. How do these orchestrators cooperate? And how do they manage their potentially conflicting agendas? Answering these questions would shed light on the modes of interaction between ecosystem partners as well as on the management of the trade-off between innovation and coordination

effort between the partners. Firms could use this understanding to design successful ecosystem cooperation mechanisms. Also of interest is the question of how orchestrators and their relationships with each other evolve over time. A deeper exploration of this question could provide a better understanding of the inter-orchestrator dynamics in an ecosystem and help firms anticipate or even steer these dynamics. And, finally, in several of our cases, non-firm actors (such as governmental organisations) are collaborating with firms. However, they are not taking over tasks of orchestration. This raises the question whether non-firm actors are able to act as ecosystem orchestrators. And if so, how are they doing so? Is their different structure, culture, and organization influencing the way how they are orchestrating ecosystems? And are they more or less suitable to take over the role as an orchestrator? Such research would also create insights on new potential roles of governmental organisations to directly work with the private sector.

6. Managerial implications

Our results in Fig. 3 and the display of our three patterns of single-orchestration, double-orchestration, and multi-orchestration provide important insights for practitioners. Beyond the implications that arise directly from our framework, our results provide three additional important learnings for managers of organisations interested in the topic of ecosystems.

First, the potential of asymmetric power evolving between orchestrators over time, and the threat of irrelevance. means that these firms must make sure to always be firmly anchored in the ecosystem. Managers of orchestrator firms should therefore ensure that they provide an indispensable contribution, such as know-how, financial funding, or an exclusive network in situations when they are not firmly anchored within the ecosystem due to the chosen orchestration setup. Second, the path-dependency of the orchestration forces managers of orchestrators to consider all implications of the chosen pattern from the beginning. Therefore, before initiating an ecosystem, they need a comprehensive strategic planning and must carefully design the most suitable orchestration pattern. Third, the trade-off between innovation and coordination effort between the partners poses an additional challenge for each manager. A manager who is interested in innovation opportunities might opt for a multi-orchestrator approach for their firm. This approach likely requires a higher coordination effort and more resources, but also a higher degree of innovation. In contrast, another manager who is primarily interested in the quick implementation of a specific solution without a high degree of innovation might prefer a single- or double-orchestrator approach.

6.1. Limitations

This study is not without limitations. Beyond those that come with any case study, we would like to mention three in particular.

First, our study did not reveal which orchestrator setting is most efficient. Since ecosystems are coordination structures that fall between being hierarchy- and market-based (Jacobides et al., 2018), the inter-dependency between the co-orchestrators requires considerable coordination effort. Thus, it remains an open question if whether it is more efficient to be the only firm to orchestrate the partners (as our cases suggest) or if involving additional co-orchestrators in these tasks is more efficient. Future research could address this question and examine which pattern of orchestration truly is most efficient.

Second, based on our cases, we have only superficially truncated the important trade-off between the degree of innovation and the coordination effort. It is possible that the higher coordination effort also prevents innovation since the co-orchestrators must find a common denominator and waste a lot of energy on coordination and political sensitivities. Future studies should examine whether the degree of innovation is truly higher in multi-orchestrator ecosystems.

Third, our study did cover slow-paced environments that do not change the customer value proposition. Since ecosystems are dynamic structures and follow a life cycle (Moore, 1993), this would have important implications for firms. Orchestrators must be more agile in fast-paced environments than in slow-paced ones. Thus, it remains unclear whether the allocation of orchestrator tasks must be different in these fast-paced environments than in our rather slow-paced environments. In addition, these environments might be less path-dependent in their orchestrator-pattern and might reveal a more dynamic allocation of orchestrator tasks between the partners.

In general, given the qualitative nature of our research approach and our mere aim for analytical rather than statistical generalisation, we would like to encourage future research that might enrich and validate our findings. And, most of all, we hope that this paper demonstrates that ecosystem orchestration is not a distinct task taken over by the orchestrator. Rather, orchestration can involve various sub-tasks being divided amongst multiple firms in a continuum somewhere between the role of an orchestrator and the role of a complementor. We hope that future research provides more insights on that intriguing aspect!

Funding

This research did not receive any specific grants from funding agencies in the public, commercial, or not-for-profit sectors.

Declaration of competing interest

None.

Appendix

Table V
Initial interview questionnaire

Initial interview questions for the initial orchestrator
• What is the value proposition of the ecosystem towards the end customer?
• Please sketch the selected ecosystem by drawing and explaining the partners, their roles, benefits, contributions, and relationships needed for this value proposition to come to fruition.
• How is the value creation generated and distributed within the ecosystem? What are the activities of the respective partners?
• How are the partners linked with each other? How rigid or flexible are the respective positions?
• What are the features, strength, weaknesses, and contributions of the partners involved?
• How is the ecosystem governed?
• Who came up with the idea of the ecosystem (company, organization)?
• How were potential partners found and selected (selection, contact)?
• What was the communication like with potential partners?

(*continued on next page*)

Table V (*continued*)

Initial interview questions for the initial orchestrator
• How did the initiator approach the partners? o In what order were all parties involved? oWere all parties involved in the discussion at the same time? oWhen you had the idea, did you meet with each partner individually or were there meetings where everyone was involved? • Who was in the lead? • How were the other partners involved? • What were the communication channels? • Which people from the other companies were involved? • Which aspects were most frequently discussed with the partners? • Has the communication in strategic questions changed compared to the initial phase? • How is the operational exchange between the partners managed? • Do you communicate individually with each partner or do you meet in groups of partners? • Are the participants predominantly from one module or cross-module? • Which communication channels are there? Do they differ from the communication channels in strategic questions? • Do you know whether partners communicate with each other when you're not there?

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