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Orchestrating innovation networks: Alignment and orchestration profile approach

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ABSTRACT

This conceptual paper organizes and advances existing knowledge on the management practices of inter-organizational innovation networks by developing an *orchestration profile approach*. We utilize the principle of alignment to connect orchestration practices with the management requirements of different types of innovation networks. We explain that while goals and underlying value-creation logics differ in different types of innovation networks and, consequently, practices vary from network to network, generally applicable dimensions of orchestration can be identified that provide a useful analytical tool. By addressing the network types and orchestration dimensions simultaneously, we propose three innovation-network orchestration profiles, which we label *translative*, *transformative*, and *transcending*. These profiles are suggested to be generic and, as such, provide managerial heuristics for creating effective orchestration solutions for various innovation networks.

1. Introduction

1.1. Background and reasoning for conceptual research

The shift of the locus of value creation from individual organizations to networks, ecosystems, and platforms has challenged the processes and practices of approaching, constructing, and managing networks (Adner, 2017; Ahuja, Soda, & Zaheer, 2012; Dagnino, Levanti, & Mocciaro Li Destri, 2016; Henneberg, Naudé, & Mouzas, 2010; Jacobides, Cennamo, & Gawer, 2018; Möller & Halinen, 2017). The view that interfirm networks primarily emerge (often incidentally) from dyadic interactions has been complemented by the recognition that organizations purposefully create and coordinate various network organizations to achieve specific purposes, including innovation.

The various innovation networks impose different requirements on management (Adner, 2017; Adner & Kapoor, 2010; Dagnino et al., 2016; Hagedoorn & Duysters, 2002; Hou, Cui, & Shi, 2020; Möller & Svahn, 2009; Raab & Kenis, 2009; Reypens, Lievens, & Blazevic, 2021; Sydow, Windeler, Schubert, & Möllering, 2012), and recently, network orchestration[1] has come to be accepted as a useful construct when addressing related approaches (Dagnino et al., 2016; Dessaigne & Pardo, 2020; Paquin & Howard-Grenville, 2013). In this conceptual paper we define

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[1] We have chosen the term *orchestration* for the following reasons. Because of a persisting debate concerning to what extent networks can be managed (Nordin et al., 2018), several authors have introduced concepts that reflect the fact that network organizations are generally composed of independent actors who cannot be managed by ownership or fiat. Suggested terms include *coordination* (e.g., Gardet & Fraiha, 2012), *facilitation* (e.g., Mueller, 2021), *governance* (e.g., Dagnino et al., 2016), and *orchestration* (e.g., Dhanaraj & Parkhe, 2006). Coordination, however, represents only one aspect of *network management*, as do the facilitation and governance terms. We decided to use *orchestration* because (i) it has a broad scope (it can be argued to include governance, coordination, and other network management activities, such as actor mobilization and motivation, creation of joint culture, etc.), (ii) it reflects the distinction between management based on ownership and orchestration of actions of independent actors, and (iii) it has been increasingly adopted by the scholars examining intentionally constructed and orchestrated networks, and more recently business/innovation ecosystems (see e.g., Autio & Thomas, 2014; Hurmelinna-Laukkanen & Nätti, 2018; Möller & Halinen, 2017; Müller-Seitz, 2012; Reypens et al., 2021). As a network management concept, *orchestration* started to appear in business papers and academic articles from the turn of the millennium. As for its academic provenance, the earliest mention we have found comes from Bensaou (1997). This article does not, however, use the term in its broader meaning and applies to primarily dyadic relationships. Möller and Svahn (2003), coming from the industrial or business network theory, apply the *orchestration* term to refer to the capabilities involved in influencing emerging innovation networks. Dhanaraj and Parkhe's work (2006) enhanced a fast increase of research on the mechanisms and practices of a hub firm to orchestrate innovation networks.

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orchestration as deliberate, purposeful actions undertaken by a focal actor (or set of actors) to initiate and manage the construction of and collaboration in an innovation network (Batterink, Wubben, Klerkx, & Omta, 2010; Dhanaraj & Parkhe, 2006). There is already a reasonably extensive literature base that covers various aspects of innovation-network orchestration (Blasco-Arcas et al., 2020; Dagnino et al., 2016; Lingens, Miehé, & Gassmann, 2020; Reypens et al., 2021; Yaghmaie & Vanhaverbeke, 2019). Scholars have employed various research perspectives, ranging from organization theory, management studies, and strategy research to industrial network theory. Several theoretical and empirical studies discuss individual aspects of innovation-network orchestration, selectively focusing on relevant dimensions (i.e., areas of orchestration), capabilities, practices (i.e., specific orchestration activities), or forms of governance (e.g., Dhanaraj & Parkhe, 2006; Heidenreich, Landsperger, & Spieth, 2016; Hurmelinna-Laukkanen, Nätti, & Pikkarainen, 2021; Landsperger, Spieth, & Heidenreich, 2012; Reypens et al., 2021; Lütjen, Schultz, Tietze, & Urmetzer, 2019).

Nevertheless, the knowledge base remains fragmented (Dagnino et al., 2016; Jacobides et al., 2018; Möller & Halinen, 2017) and gaps can be identified. Only a few studies try to understand specific (types of) innovation networks beyond providing descriptions of the study contexts (Aarikka-Stenroos, Sandberg, & Lehtimäki, 2014; Chesbrough, Lettl, & Ritter, 2019; Hurmelinna-Laukkanen & Nätti, 2018; Landsperger & Spieth, 2011; Leten, Vanhaverbeke, Roijakkers, Clerix, & Van Helleputte, 2013; Leven, Holmstrom, & Mathiassen, 2014; Möller & Rajala, 2007; Sydow et al., 2012), and the analytical consideration of the links between the type of networks and orchestration practices is still limited. This research domain would benefit from integrative conceptual research providing a template for grounding individual studies and their detailed empirical findings (see Narayanan, Yang, & Zahra, 2009; Jarzabkowski, Balogun, & Seidl, 2007). To quote Dagnino et al. (2016, 369), "…we recognize that a long way needs yet to be travelled to forge a fully-fledged dynamic theory of whole network governance." To understand the benefits of advancing a common and coherent framework, it is useful to briefly examine the key limitations and advances in the current research.[2]

1.2. Limitations and insights of existing research

Examining literature reviews on innovation networks or ecosystems and their orchestration reveals that a more integrated approach is needed. Yaghmaie and Vanhaverbeke (2019), for example, suggest that while research has focused on the behavior of actors in the ecosystem from a social network perspective, previous studies have missed the full variety in approaches and orchestration strategies. Relatively recent conceptual studies (see, e.g., Dagnino et al., 2016), while providing highly valuable information on network orchestration, point to similar limitations in combining different views. The majority of network orchestration literature driven by organization theory and strategy research is silent on the research carried out within business and innovation-network management in business marketing (Aramo-Immonen et al., 2020). The research streams still seem to develop in silos, and complexities arise from varying underlying assumptions regarding the manageability of networks and innovation, the relevance of various orchestration practices in specific innovation networks, and/or the development of networks (see, e.g., Dagnino et al., 2016; Paquin & Howard-Grenville, 2013, Möller & Rajala, 2007). By adopting a network management perspective, we aim to integrate the knowledge available in organization theory, management and strategy literatures, and business networks approach to advance our understanding of the orchestration of innovation networks.

Empirical work on innovation-network orchestration can function as a further indicator of the state of research and reflects the same fragmentation. Empirical studies have addressed single innovation cases from the process perspective (Müller-Seitz, 2012; Paquin & Howard-Grenville, 2013; Reypens et al., 2021), compared two types of innovations at most (Aarikka-Stenroos, Jaakkola, Harrison, & Mäkitalo-Keinonen, 2017), or based conclusions on limited case evidence or illustrative material (Möller & Rajala, 2007; Möller & Svahn, 2009). Most of the empirical cases were not selected on a theoretical basis but based on availability. Exceptions are rare but include the work of Aarikka-Stenroos et al. (2017) comparing two cases differing in the level of complexity and determination, and a Müller-Seitz and Sydow (2012) study distinguishing hierarchical and heterarchical networks. Prior empirical studies have not addressed the orchestration of any greater set of innovation networks differing in their goals and properties. Consequently, to the best of our knowledge, there is no comprehensive framework available covering both innovation-network properties and orchestration dimensions.

Despite the recognized limitations, previous research provides a starting point for combining the different insights. There is reasonable, albeit quite scattered, evidence in the extant literature on how the different elements might align. First, studies that address the orchestration of specific types of innovation networks indicate that management practices connect with network features. Reypens et al. (2021) find that the number of network actors or their diversity can be an influencing factor explaining orchestration modes. Heidenreich et al. (2016) examine the need for and usefulness of a network *conductor* in both high and low complexity settings, and Roijakkers, Leten, Vanhaverbeke, Clerix, and Van Helleputte (2013) and Hurmelinna-Laukkanen and Nätti (2018) suggest that different *orchestrators* have different positions which relate to different ways to orchestrate networks. Müller-Seitz and Sydow (Müller-Seitz & Sydow, 2012; Müller-Seitz, 2012) discuss orchestration between hierarchical and heterarchical networks. Möller and colleagues (Möller & Rajala, 2007; Möller & Svahn, 2009) suggest that network orchestration varies for innovations having different value-creation logics linked to levels of determination, ranging from the highly specified to the less specified (Aarikka-Stenroos et al., 2017).

Second, several studies indicate that network orchestration practices change over time along the innovation trajectory from mobilizing an embryonic network toward a more mature and implementation-oriented phase (Aarikka-Stenroos et al., 2017; Möller & Svahn, 2009; Paquin & Howard-Grenville, 2013). Reypens et al. (2021) show that orchestration can shift between the so-called dominant mode (orchestration led) and the consensus mode and argue that multiple forms of orchestration can co-exist. The same authors label the phenomenon *hybrid orchestration*. Similar issues are addressed by Mitrega, Forkmann, Ramos, and Henneberg (2012), who refer to the need to have different capabilities at different phases of network evolution. As a compilation of the views on differences across network types and over time, Dagnino et al. (2016) introduce findings concerning the network capabilities employed in what they classify as *formal tie* and *informal tie* networks, and address network governance in the network formation and growth stage in comparison to the later stages. Network changes seem to induce

[2] In this study, we are not aiming for a full-fledged state-of-the art review of the extensive literatures on interorganizational networks covering more than half a century (cf. Borgatti & Foster, 2003; Provan et al., 2007). Instead, we carry out a more directed, integrative literature analysis focusing on research addressing the managerial practices involved in the construction and orchestration of intentionally designed business networks, especially innovation networks (see Snyder, 2019). The key domains for this kind of research include management research and strategy research, organizational theory, and business networks research. Considering studies on national and regional innovation systems (e.g., Chaminade, Lundvall, & Haneef, 2018; Lundvall, 2016; Niosi, 2010; Niosi & Banik, 2005) and research on the historical innovation patterns in and evolution of particular scientific and/or business fields (Murtha, Lenway, & Hart, 2002; Niosi & McKelvey, 2018), we have only selectively used insights from these literatures; our primary focus is on understanding the orchestration practices of various types of purposefully designed innovation networks, rather than on evolution of entire innovation systems or business fields.

orchestration adaptation and vice versa; this linkage supports the relevance of focusing on the alignment of network properties and orchestration practices.

The above notions suggest there may be higher-order logics directing the realization of innovation-network orchestration across varying network contexts. Factors such as the size and diversity of the network or the type of orchestrator seem to be influential regarding suitable orchestration solutions. However, we maintain that these factors connect to a latent factor, the underlying value-creation logic that the network follows. The value activities required to achieve the innovation goal(s) guide not only the type of potential orchestrators and network members required but also link intimately to the conjunction of activities within the network. This aspect will be elaborated on in the discussion below.

1.3. Goals and contributions

Building on the above observations, our goal is to bridge earlier knowledge and advance understanding of orchestration in inter-organizational innovation networks. To meet this goal, we develop and introduce *an integrative framework that utilizes the principle of alignment to combine orchestration practices with the management requirements of different types of innovation networks*. We argue that the effective orchestration of various types of purposefully designed innovation networks is achieved by utilizing an *orchestration profile approach* and describe how orchestration profiles refer to the specific ways in which orchestration approaches and practices align with the value-creating logic of the focal network.

The proposed conceptual approach makes several contributions. First, in prior research, alignment may be acknowledged (more or less explicitly, but not placed at the heart of the investigation). No comprehensive theoretical framework is offered concerning the principles and logics of the alignment of network characteristics and orchestration practices. By focusing on the aspect of alignment rather than variables, practices, or processes per se, a generally applicable, but still adequately detailed, conceptual framework can be constructed that facilitates the development of robust theory-based conclusions about innovation-network orchestration and its implications in different contexts.

Second, we introduce a theory-driven way to categorize different types of innovation networks that incorporates, but also expands on, earlier classifications that have mostly been dichotomic (Dagnino et al., 2016; Heidenreich et al., 2016; Leten et al., 2013; Müller-Seitz, 2012). Importantly, we show how different properties of the innovation networks align in different network types.

Third, we advance the emerging hybrid view of network orchestration (see Reypens et al., 2021) by proposing a set of orchestration dimensions derived from the existing literature (e.g., Dhanaraj & Parkhe, 2006; Nambisan & Sawhney, 2011; Möller & Halinen, 2017), and by illustrating how orchestration practices follow patterns of alignment across these higher aggregate level dimensions.

Finally, we suggest how different types of innovation networks require a differentiated utilization of orchestration practices and introduce three types of orchestration profiles that represent central alignment orientations. By cross-utilizing extant knowledge from both organization theory and strategy research and business network theory to do so (e.g. by relying on the ideas found in Ansari, Reinecke, & Spaan, 2014, Hurmelinna-Laukkanen and Nätti (2018), and Miterev, Jerbrant, and Feldmann (2020) referring to adaptation and alignment) we hope to advance more integrative theorizing across disciplinary boundaries, thereby also responding to the calls for theories with integrative and heuristic power (Corley & Gioia, 2011).

The framework we are proposing is generic. That is, we argue that it can be used for analyzing orchestration of all kinds of intentionally designed multiparty innovation networks. We suggest that the network orchestration dimensions are applicable to all kinds of innovation networks, but the actual practices (which constitute these dimensions) can vary between networks comprising different businesses and firms (e.g., large corporations vs start-ups, or commercial actors and non-profit organizations). The framework is not intended for the analysis of intra-organizational networks.

1.4. The methodological approach

The current conceptual work draws on the methodological approach presented first by Weick (1989). Accordingly, our approach involves the selection of relevant conceptualizations (in our case, aspects of the orchestration of innovation networks), constructing representations of the phenomena (profiles of network orchestration), and proposing a middle-range theory (with the focus on innovation-network orchestration) (see Weick, 1989). Another source of inspiration for our research design is the realist abstraction or theorizing process discussed by Sawyer (2001). In this view, abstractions (in our case, profiles of network orchestration) are not *idealizations* but devices to link structures to their characteristics and influencing mechanisms.

For practical execution of the study, we used the principles of a directed literature review that summarizes and categorizes varied perspectives on a phenomenon from the state-of-the-art literature (see, e.g., Baumeister & Leary, 1997; Torraco, 2005; Whittemore & Knafl, 2005). The difference in this approach compared to systematic literature review lies in the methodology's flexibility in addressing more complex issues (Kennedy, 2007; Snyder, 2019). Since we draw on multiple discussions that are not directly compatible, this approach provides the best tools.

In the following sections, we build the conceptual framework gradually. First, we utilized the existing literature to identify properties that permit distinguishing different types of innovation networks. This framing is based on the first round of the literature review in which we conducted keyword searches with varying strings (e.g., "[types of] innovation networks", "network characteristics", "network features", and "innovation network types"). We searched for relevant articles separately, obtaining a body of 242 articles. Reading the papers, we removed articles that merely referred to *types of networks* without explicating them or articles that focused on one type of network. When faced with overlapping papers that referred to earlier categorizations, we chose the most holistic one. We assessed the relevance of the papers to reduce their number. Eventually, we chose 12 illustrative papers (see Appendix 1). We separately compiled information on the classifications provided in earlier studies and on the characteristics that had been used to obtain those classifications and then compared our findings. We then jointly analyzed the key characteristics to identify the most relevant network properties and considered how those properties would combine to form the basis of understanding various innovation network types. The findings are discussed in the following sections.

Next, we analyzed orchestration dimensions: higher-order bundles of activities and practices commonly applied in varying innovation networks. Again, a search using keywords (such as "[innovation] network orchestration [activities/ processes/…]", "network management [activities/ practices]", and "network coordination [activities/ practices/ …]") was used to delimit the discourse on the activities of innovation network orchestration, yielding 128 papers. A similar process was applied for network types to combine the papers and our findings, leading us to focus on 28 articles (See Appendix 2). This search garnered a notable amount of orchestration practices that we started to organize according to the dimensions identified in the papers. The process revealed how the practices connected to specific network contexts and, accordingly, we refined our organizing method to capture the aspect of alignment.

Finally, we examined how the orchestration dimensions and network types align on an abstract level and determined the role of the more specific orchestration practices employed under different conditions. These considerations are addressed in the following sections.

2. Innovation network properties and types

2.1. Variety in innovation networks

An essential aspect of innovation networks is their notable variety (Chesbrough et al., 2019; Möller & Halinen, 2017). Generally, networks generating innovation can be defined as "a set of vertical and horizontal relationships established among various actors as a means to coordinate […] research and development processes" (Heidenreich et al., 2016, 49). In this study, we extend the scope of that definition to cover innovation networks that go beyond R&D, and toward application development and commercialization (Aarikka-Stenroos et al., 2014). Moreover, we focus on the orchestration of intentionally constructed networks, considering them as goal-oriented structures in line with the perspective of the strategic network (Möller & Rajala, 2007; Provan, Fish, & Sydow, 2007) and Adner (2017) view of specific ecosystems.

The adopted definition resonates with the properties of the networks scrutinized in this paper. Instead of starting from the number of actors, structure of the network, or diversity (Ahuja, 2000; Kijkuit & van den Ende, 2010; Lingens et al., 2020; Provan & Kenis, 2008; Reypens et al., 2021; Tatarynowicz, Sytch, & Gulati, 2016), we direct attention to the underlying drivers that distinguish innovation networks from each other. While the overarching aim of innovation networks is to develop and commercialize innovations, there is increasing evidence that innovation networks may take profoundly different forms depending on their specific end goals and underlying value-creation systems (Möller & Halinen, 2017; Möller & Svahn, 2009). For example, networks established to support scientific discoveries or to create breakthrough technologies differ significantly from those targeting the commercialization of innovative offerings (Aarikka-Stenroos et al., 2014; Paquin & Howard-Grenville, 2013), and the latter differ from strategic coalitions aimed at dominant designs and de facto standards (Jensen, Johnson, Lorenz, & Lundvall, 2007; Möller & Rajala, 2007; Powell & Grodal, 2006; Roijakkers et al., 2013; Srinivasan, Lilien, & Rangaswamy, 2006). We suggest that distinguishing between these types can be accomplished analytically by considering the alignment of carefully selected network properties.

2.2. The search for key innovation-network properties

The current study seeks to look past the labels placed on network types to identify the properties that make it possible to distinguish specific forms of innovation network. Existing literature (see Appendix 1) indicates the following network properties are key to defining the profound nature of intentional innovation networks.

The *type of interdependence* between network actors expresses how the network actors are related in a value system/network (de Man, 2004; Inkpen & Tsang, 2005; Möller & Rajala, 2007; Park, 1996; Thompson, 1967). In innovation networks, the actors not only share knowledge but also co-create new knowledge and innovative solutions, taking part to different extents at different times (Gulati, Puranam, & Tushman, 2012; Möller & Svahn, 2006; Ritala & Hurmelinna-Laukkanen, 2009).

While interdependence is inherently present in intentionally constructed innovation networks, its nature varies. Provan, Sydow, and Podsakoff (2017) suggested that perhaps not "all organizations interact with all others, but…all organizations share recognition that they are at least partially interdependent." This characteristic reflects the *level of structuration of the network* that Inkpen and Tsang (2005) and Powell and Grodal (2006) used to indicate the relative fluidity of network membership, as well as the *tightness or looseness* of the network (Orton & Weick, 1990; Weick, 1976). Similarly, it relates to the idea of the *openness* versus *closedness* of the network, which refers to the various levels of permeability of network boundaries (Appleyard & Chesbrough, 2017; Giudici, Reinmoeller, & Ravasi, 2018; Gulati et al., 2012; Pisano & Verganti, 2008). It is notable that quite different network forms may be suitable at different phases of the innovation process.

The *level of determinacy* as a relevant network property indicates the purposes or functions that network members expect the network to fulfill, and the nature of knowledge and value activities required by these functions (see Agranoff, 2007; de Man, 2004; Möller & Rajala, 2007). Literature recognizes networks are knowledge and value systems (Adner & Kapoor, 2010; Autio & Thomas, 2014; Gulati et al., 2012; Möller & Svahn, 2006), which suggests that network categorization can be based on the relevant network's primary goal(s) and on its underlying value-creating system, ranging from a high to a low level of determination.

A value system can be defined by identifying the set of activities performed by the actors constituting a network, and by distinguishing the resources and capabilities the actors employ during these value activities (Gulati et al., 2012; Möller, Rajala, & Svahn, 2005; Norman & Ramirez, 1993). This view highlights the availability of *tacit or explicit knowledge* in the value activities and the resources/capabilities they require (Möller & Svahn, 2006; Mouzas, 2006; Polanyi, 1966), and the continuum between *fuzzy and clear, explicit goals* and strategic action. As Provan et al. (2017, 7) suggested: "the goals may not be given but may themselves be an outcome of inter-organizational collaboration that offers unique opportunities for 'making aims' in the process." The issue of an accessible knowledge base is further linked to the relevance and range of new knowledge creation through *exploration* or alternatively *exploitation* (Bayne, Schepis, & Purchase, 2017; Jacobides et al., 2018; March, 1991; Möller & Svahn, 2006; Paquin & Howard-Grenville, 2013; Parmigiani & Rivera-Santos, 2011).

2.3. Innovation network types: Network properties aligning in action

Drawing on the above discussion, we suggest that examining the alignment of determinacy and interdependence provides the tools to analytically distinguish various innovation networks (see Fig. 1). One end of the continuum is characterized by a low level of value-system determination and loosely connected, yet interdependent actors. It is the domain of science and basic research-oriented networks offered as examples in earlier studies (see, e.g., Möller & Svahn, 2006; 2009; Kijkuit & van den Ende, 2010; Powell & Grodal, 2006). The other end, with a relatively high level of determination and well-specified roles and responsibilities of the actors, is occupied by application/commercialization networks and, in between, innovation communities and coalitions, and dominant design networks emerge as possible forms of innovation networks (as examples drawn from our review).

A review of the literature approached through these properties suggests that, in each of the network types, determinacy and interdependence follow specific patterns: Individual networks seem to exhibit a similar underlying nature and internal coherence in terms of determinacy and interdependence while illustrating differences in their properties when compared to other networks. First, *science networks* have become significant in planting the seeds for emerging technologies, new business fields, and social change (Lundvall, 2010; Powell, Packalen, & Whittington, 2010, Ch 13). Even if large corporations participate in these networks by involving their own researchers and by sponsoring research institutions (Boehm & Hogan, 2013; Powell & Sandholtz, 2012) and although governments are involved (Lundvall, 2010; Malerba & Nelson, 2012; Powell et al., 2010), the networks are predominantly professional, with a strong orientation toward exploration (see, e.g., Hagedoorn & Duysters, 2002; Koh, Koh, & Tschang, 2005), and they often grow from the bottom up. The networks may be intentionally initiated but exhibit considerable flexibility and self-organizing. Knowledge held within these networks may be accessible to researchers within the specific fields, but difficult to understand for those from other disciplines. The early science-based concepts, like those related to nanotechnology or artificial intelligence, for example, tend to be tacit, general, and ambiguous in terms of commercialization potential (Koh et al., 2005; Möller & Svahn, 2009; Yang, Chesbrough, &

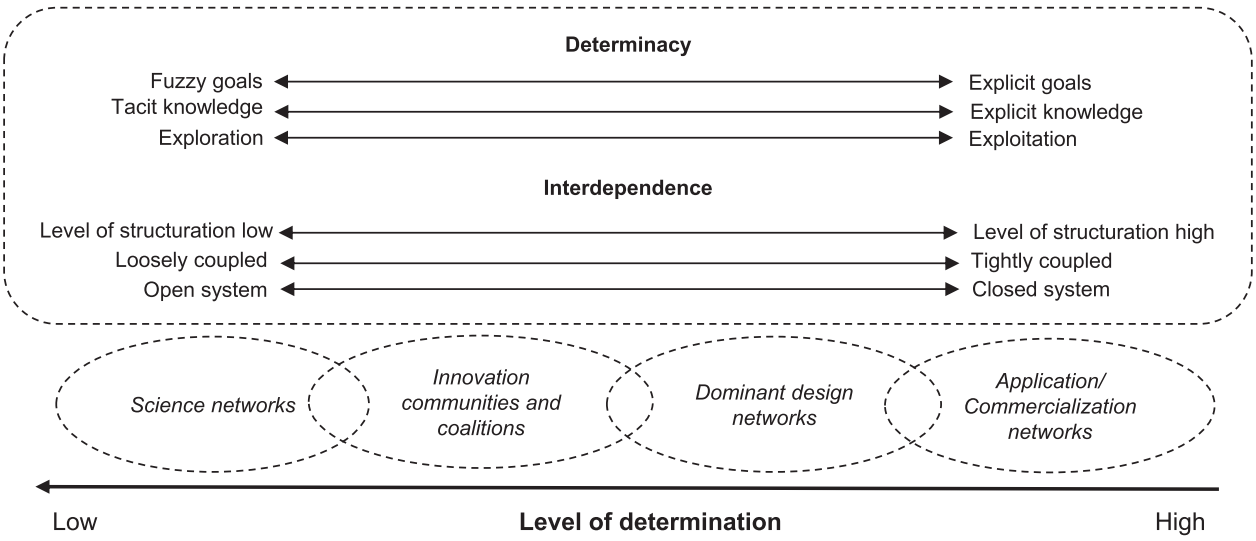

Fig. 1. Central network properties and illustrations of network types.

Hurmelinna-Laukkanen, 2021). An illustrative example of science-driven networks is found in the so-called excellence centers that gather industrial, public, and science partners (including universities and other research institutes) (see, e.g., Boehm & Hogan, 2013). These centers are very much research-oriented in their mission, while they hold a role as incubators of new innovations based on basic research in different areas. As another example, Reypens et al. (2021) discuss the European Medical Information Framework Project (EMIF) supported by the Innovative Medicines Initiative (IMI), a joint network of the European Commission and the European Federation of Pharmaceutical Industries and Associations, the mission of which is to address unmet medical needs. It consists of public and private partners, research institutions, and patient organizations. This kind of collaboration, with the aim of identifying research needs and forming related projects, is representative of front-end innovation activities.

Innovation communities and coalitions bridge what Powell and Grodal (2006) termed the *invisible college* type of science networks and the *dominant design networks* described by Möller and Rajala (2007). These are networks of purposive actors who, while bringing their special resources to the network, share a vision of how the innovation should proceed (see, e.g., von Hippel & von Krogh, 2003). Innovation coalitions transform science-driven breakthroughs into more applicable knowledge and technological platforms (Koh et al., 2005). They may have a hub firm such as Genentech that develops genetics and medical solutions (Depret & Hamdouch, 2000; Powell & Sandholtz, 2012). Another example is found in Powell and Grodal (2006), where a biotechnology network combines, for example, universities, pharmaceutical corporations, biotech firms, public research organizations, and financial actors. There may also be looser coalitions of actors that share an interest in developing the technological basis for the later commercialization of the innovation, as illustrated by, for example, semiconductor manufacturing technology consortiums (Sydow et al., 2012).

Dominant design networks are more systematically composed innovation networks. They are strategic, multiparty alignments that aim to establish a dominant technological design, often involving several standards and patents, in an emerging business field (Adner & Kapoor, 2010; Leiponen, 2008; Möller & Rajala, 2007; Srinivasan et al., 2006; Sydow & Müller-Seitz, 2020). Providing an illustrative example, Sydow and Müller-Seitz (2020) mention the International Technology Roadmap for Semiconductors network that copes with technological discontinuities and defines new technological paradigms. Dominant design networks reduce uncertainty and ambiguity in the technological field by creating a credible platform for new service offerings. Similarly, Gulati et al. (2012) describe how actors from different fields in the computer industry had to form a consensus over technological standards (e.g., communication protocols) to guarantee interoperability of their offerings. In dominant design networks, formal organization, in which at least the major coalition members are represented, is often established (Möller & Rajala, 2007). Generally, actual development work is carried out through working groups, and the members arrive at unidirectional decisions (Adler, Goldoftas, & Levine, 1999; Gardet & Fraiha, 2012). If successful, this leads to path formation that involves a lock-in that benefits the whole coalition (e.g., the Bluetooth coalition led by Ericsson and the Blu-ray coalition led by Sony) (Bluetooth Special Interest Group (2021), 2021: https://en.wikipedia.org/wiki/Bluetooth_Special_Interest_Group, 1.8.2021; Christ, Slowak, & Blu-Ray, 2009; Spencer, 2003; Sydow et al., 2012).

Finally, *application/commercialization networks* refer to the networked development and launch of early commercial applications (e.g., early mobile phones, iPods, flat-screen televisions) (Aarikka-Stenroos & Sandberg, 2012; Aarikka-Stenroos et al., 2014; Koh et al., 2005; Möller & Rajala, 2007; Ranganathan & Rosenkopf, 2014). Application networks may evolve from dominant design networks or innovation coalitions, but, unlike other forms, they are generally driven by a hub company and involve a web of complementary component producers and pilot customers. For example, mobile services are generally developed and launched in networks including operator, software producers, and providers (Möller & Rajala, 2007). Due to their focus on commercialization and market-competition, they do not generally involve the clear competitors that can be found in dominant design networks (Möller & Rajala, 2007). To a notable extent, the activities focus on innovation diffusion and transcending to a wider area through multiparty projects. That is, a central task of the network is to create an efficient marketing, distribution, and production system for the application (Aarikka-Stenroos et al., 2014).

The proposed view of innovation networks is abstract. We contend, however, that it synthesizes the fundamental differences of various innovation networks. When moving from the scientific and systemic innovation to networks emphasizing commercialization, the share of tacit knowledge decreases in favor of codified knowledge; the share of explorative behavior and learning gives way to a greater degree of exploitation of the actors' specialized and codified knowledge, and the organization of networks changes from being informal and fluid to being more tightly coupled and coordinated. In suggesting these generalizations, we do not assume clear-cut distinctions between the exemplary network types (see Orton & Weick, 1990). Instead, there are hybrid or mixed forms along a continuum (see also Reypens et al., 2019), as is illustrated by the overlapping ellipses in Fig. 1. Moreover, although we

do not focus on the evolution of a network as such, innovation networks are dynamic, complex, and able to transform (Lavie & Singh, 2012). Accordingly, science networks can morph into innovation coalitions, which may in turn transform into dominant design networks, and further into application networks (see Paquin & Howard-Grenville, 2013). Innovation networks can also have a nested character. Some parts of the network may resemble an innovation coalition, which may encompass a dominant design network, with some parts converting into a smaller and more tightly orchestrated commercialization coalition. However, our argument is that, due to their features, networks call for specified orchestration.

3. The dimensions of innovation network orchestration

3.1. Prior literature on innovation-network orchestration

As noted above, orchestration can be defined as deliberate, purposeful actions undertaken by a focal actor (or a set of actors) to initiate and manage the construction of an innovation network and collaboration within it (Batterink et al., 2010; Dhanaraj & Parkhe, 2006; Hurmelinna-Laukkanen & Nätti, 2018; Ritala, Hurmelinna-Laukkanen, & Nätti, 2012). This suggests that the orchestration of an innovation network is about influencing the actors in the network rather than about management under hierarchical governance or a focus on resource streams (Hurmelinna-Laukkanen et al., 2021; Müller-Seitz, 2012; Ritala et al., 2012). Generally, the existing literature (see Appendix 2) shows a range of relevant approaches to network governance and managerial capability requirements (Dagnino et al., 2016; Lütjen et al., 2019; Möller & Rajala, 2007; Powell & Grodal, 2006; Reypens et al., 2021). However, considering these aspects only in the context of individual innovation networks or some specific network type, or by focusing on specific activities, which tends to happen, captures only small fractions of the wider landscape of possible orchestration approaches (see, e.g., Hurmelinna-Laukkanen & Nätti, 2018; Mitrega et al., 2012; Reypens et al., 2021). Identifying generally relevant orchestration dimensions can provide tools to approach orchestration practices under varying conditions in a more analytical manner.

The literature that identifies central barriers to (radical) innovation and the managerial actions addressing them (e.g., Aarikka-Stenroos et al., 2017) highlights notions that are relevant in building and steering innovation networks—similar to the literature explicating the processes through which innovation networks unfold (Mason, Friesl, & Ford, 2017; Möller & Svahn, 2009; Paquin & Howard-Grenville, 2013; Planko, Chappin, Cramer, & Hekkert, 2017). Network governance studies describe arrangements used to coordinate the activities of the network members, including, for example, the informal–contractual continuum (Powell & Grodal, 2006), hierarchical–flat structures (Pisano & Verganti, 2008); heterarchical–hierarchical decision-making (Gulati et al., 2012; Müller-Seitz & Sydow, 2012), or dominant- versus consensus-based orchestration and hybrid orchestration (Reypens et al., 2021). Recently, discussion around coordination has increased (see, e.g., Perks, Kowalkowski, Witell, & Gustafsson, 2017; Möller & Halinen, 2017; Nordin, Ravald, Möller, & Mohr, 2018; Giudici et al., 2018) and has raised quite specific issues about orchestration in practice.

3.2. Orchestration of the construction and collaboration of innovation networks

There exists a considerable amount of literature on network management or orchestration addressing both principal dimensions of orchestration and more specific orchestration practices. As a detailed examination of them is beyond the scope of the current paper, we offer a condensed summary of these in Appendix 2 and focus on the key findings only.

Starting from the seminal work of Dhanaraj and Parkhe (2006) that explicitly defined three main dimensions of the orchestration of innovation networks—knowledge mobility, network stability, and innovation appropriability—a notable body of specific orchestration activities have been introduced, and even some general categorizations of them (that we call orchestration dimensions) have been presented (see, e.g., Nambisan & Sawhney, 2011; Müller-Seitz, 2012; Perks et al., 2017; Möller & Halinen, 2017; Reypens et al., 2021). Several studies refer to the capabilities and/or practices required to master the orchestration activities, thereby capturing orchestration dimensions from a different point of view (see, e.g., Dagnino et al., 2016; Hurmelinna-Laukkanen & Nätti, 2018; Mitrega et al., 2012; Forkmann, Henneberg, & Mitrega, 2018). We approached the identification of orchestration dimensions by comparing orchestration capabilities, activities, and practices, as well as their aggregations recognized in the literature, and by combining the overlapping ones. We conclude that the existing literature isolates six generally applicable orchestration dimensions, that is, areas of orchestration that are inherently present in some form in initiating and managing network construction and collaboration in innovation networks.

Particularly relevant to the **formation of innovation networks**, the *mobilization* of network actors refers to attracting and selecting relevant partners and motivating them to participate (Batterink et al., 2010; Dagnino et al., 2016; Dhanaraj & Parkhe, 2006; Paquin & Howard-Grenville, 2013). This mobilization dimension can comprise varying practices from letting relevant actors know about the possibilities available in the network to persuasion, active involvement, and the (selective) invitation of actors. As a related, but still distinct dimension, *agenda-setting* involves the creation and communication of a credible development agenda for innovation collaboration. It includes practices related to visioning, sense-making, and goal setting (with varying precision) (Aarikka-Stenroos et al., 2017; Mason et al., 2017; Möller, 2010; Müller-Seitz, 2012). *Network stabilization* refers to the co-creation of the identity of the network, its basic shared values, and beliefs which, depending on the lifespan of the network, are the underlying elements of the network culture. The dimension thereby emphasizes the meaning of consolidating and beneficial renewal of the network (Aarikka-Stenroos et al., 2017; Dagnino et al., 2016; Dessaigne & Pardo, 2020; Dhanaraj & Parkhe, 2006; Hibbert & Huxham, 2010; Möller & Halinen, 2017; Nordin et al., 2018).

Promotion of collaboration involves *ensuring knowledge mobility* that focuses on aspects related to knowledge creation and transfer both within the network and across its boundaries. The dimension involves establishing activities and structures through which network members can share their knowledge and co-create new knowledge (Blasco-Arcas et al., 2020; Dhanaraj & Parkhe, 2006; Nambisan & Sawhney, 2011; Sabatier, Mangematin, & Rousselle, 2010; Xie, Fang, & Zeng, 2016). As knowledge sharing is a balancing act in many innovation networks (Ritala & Hurmelinna-Laukkanen, 2009), *norming*, which refers to ensuring innovation appropriability and setting the rules for the use of shared knowledge, is also required. Norming covers practices related to establishing activities and structures through which network members can control unwanted and unintended knowledge flows regarding for example, both outsiders and between themselves (Dhanaraj & Parkhe, 2006; Ritala & Hurmelinna-Laukkanen, 2009). Finally, *administrative coordination* (Aarikka-Stenroos et al., 2017; Heidenreich et al., 2016; Müller-Seitz, 2012) involves establishing the operative rules of engagement and schedules underlying the achievement of innovation targets, organizing the distribution of responsibilities and work processes between the members, and the overall monitoring of the network.

Based on the combined insight from the assessed studies, we suggest that all these dimensions are necessary to encourage effective orchestration. In other words, a lack of managerial attention to any of these generic dimensions likely leads to a network failure of varying severity. Another important takeaway from the extant literature is acknowledging the multiple ways in which the identified generic orchestration dimensions occur in practice. Each orchestration dimension (e.g., mobilization or agenda-setting) can contain numerous concrete,

observable practices, and we argue that they form innovation-network-specific bundles that take their shape in accordance with the rules of alignment. These bundles that constitute the orchestration profiles resonate with the network properties and facilitate innovation-generating collaboration when they are employed.

4. Building the orchestration profiles

As noted above, the examination of the literature shows that individual orchestration practices are emphasized differently and take different forms in the various innovation networks (see, e.g., Aarikka-Stenroos et al., 2017; Dagnino et al., 2016; Hurmelinna-Laukkanen &

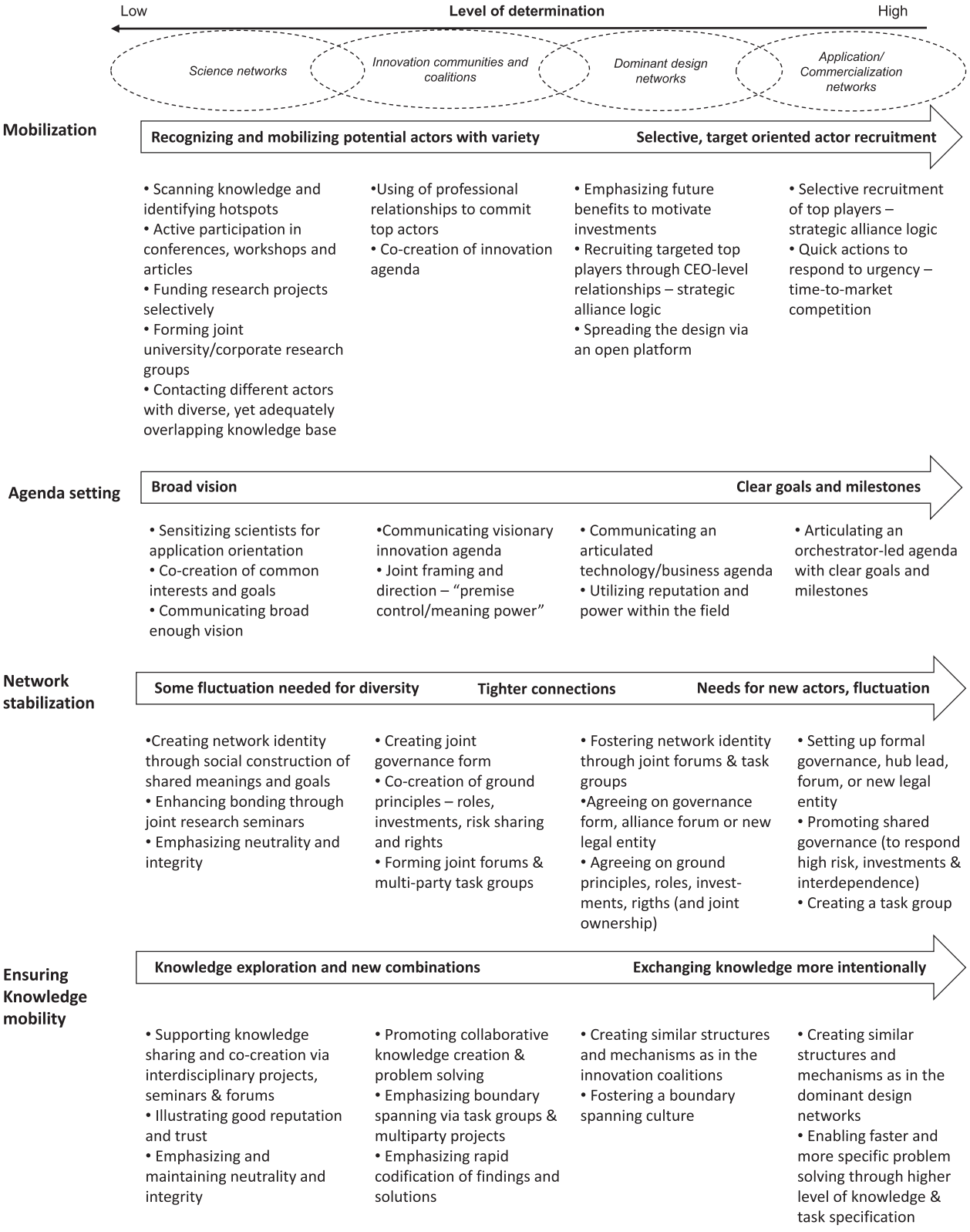

Fig. 2. Orchestration practices along orchestration dimensions and network properties.

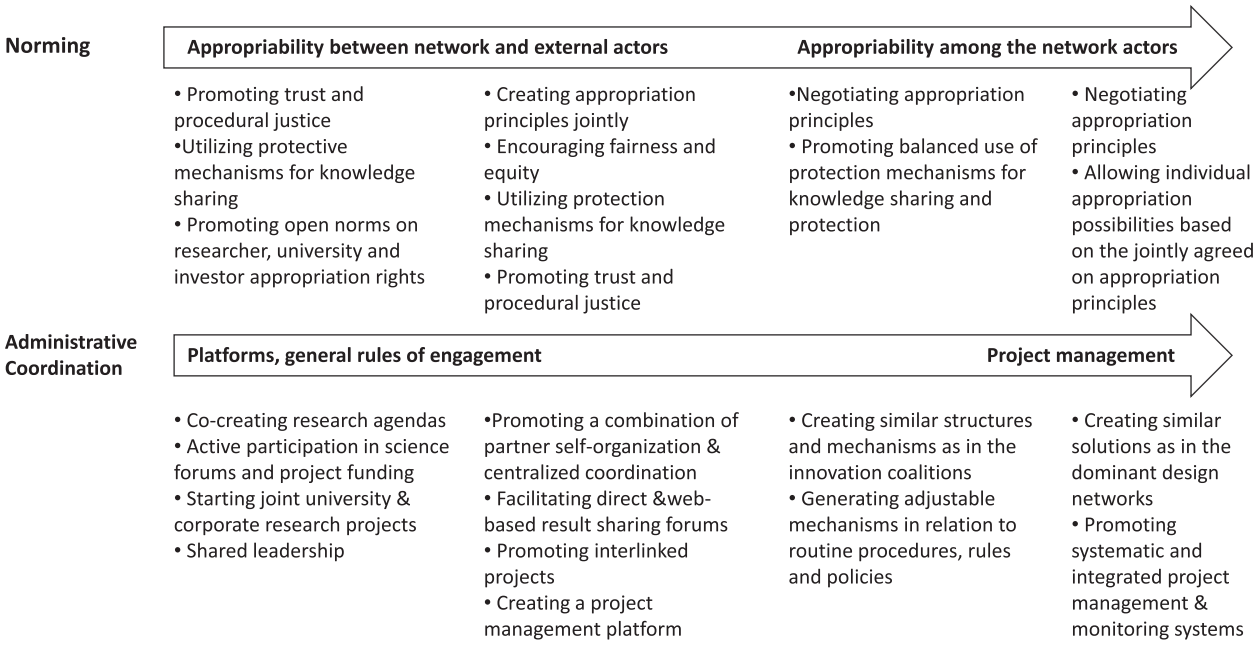

Fig. 2. (*continued*).

Nätti, 2018; Mitrega et al., 2012; Möller & Halinen, 2017; Reypens et al., 2021). Fig. 2 combines the findings from the existing literature to demonstrate that while each orchestration dimension is relevant in the different types of innovation networks, the underlying practices, which concretize the higher level and abstract dimensions, differ according to network type. This illustration shows in detail how practices within different orchestration dimensions vary following the shifts between low and high levels of determination. It reveals the nature of individual orchestration practices in the intersection of network types and orchestration dimensions in a way that enables an understanding of the impact of network properties on orchestration.

We view the variety of practices as a starting point. We argue that the value-system logic and the related interdependencies form an abstract but robust directing heuristic for the feasible, concrete orchestration practices along the key orchestration dimensions. Therefore, by adopting the idea that there is an underlying logic of alignment (see, e.g., Merkus, Willems, & Veenswijk, 2019; Miterev et al., 2020) of network properties and types, and orchestration dimensions and practices, we can construct a theory-driven framework that covers the entire spectrum of network orchestration cases and contexts. More specifically, while orchestration practices, network governance forms, network types, and network structures are relatively observable at each point in time, adopting the alignment perspective reveals how orchestration approaches and practices connect to the value-creating logic of the focal network in specific ways, showing the general innovation-network orchestration profiles.

First, when embryonic and fuzzy innovation networks (like the science networks at the left-hand side of our continuum) are considered, many activities and processes are simply about reacting to opportunities and making sense of what could be achieved and how (Dattée, Alexy, & Autio, 2018; Möller & Svahn, 2009). Generally, such situations are found in a dynamic environment where there are numerous possible development trajectories (Dattée et al., 2018; Möller, 2010). There are some pieces of information and some actors that could potentially generate something of new value if their visions and capabilities could be combined, but finding the starting points may be difficult (Scharmer, 2000). In these situations, the translative logic of orchestration—a ***translative orchestration profile***—emerges. The translative orchestration profile involves attempts to make sense of who the various actors are, understand their ideas, search for information on their potential role and the means of knowledge appropriability. The essential focus is on *translating* the primarily tacit knowledge and information into forms that facilitate an initial understanding of which actors might be needed (see Ritala, Heiman, & Hurmelinna-Laukkanen, 2016) and that enable the network actors to undertake their roles (Mason et al., 2017). The orchestration practices, as the concrete manifestation of this logic, emphasize mobilizing and connecting actors and knowledge and constructing common ground and an actionable agenda with an adequate promise for future value (Möller, 2010; Powell, Koput, & Smith-Doerr, 1996). In Fig. 3, the translative orchestration profile is depicted on the left-hand side, in between network properties and orchestration dimensions.

Innovation creation may also revolve around proactive and deliberate *transformation* of knowledge into new combinations and, relatedly, to transforming the composition and connections of relevant network members (Amin & Cohendet, 2004; Maurer & Ebers, 2006; Mitrega et al., 2012; van der Borgh, Cloodt, & Romme, 2012). Through practices that enable knowledge codification, internalization, and conversion, the network can transform the member-specific and collaborative learning and assimilated knowledge to a new level (Möller & Svahn, 2006; see also Merkus et al., 2019; Miterev et al., 2020). The ***transformative orchestration profile*** covers the orchestration of innovation networks where interdependence and determinacy are to some extent specified, but where considerable uncertainty remains. The number of actors included in the network and their diversity is justified by the need to be able to transform ideas into specified innovations, and the utilized orchestration practices serve this purpose along all dimensions of orchestration.

A similar pattern of alignment can be seen in the collaborative production and commercialization of specific innovation. The interaction of value-creation logic and orchestration entails the adoption of practices to alter the network composition and its pooled resources and capabilities to meet the demands of ramping up the production and commercializing the application, inherently extending from value creation to value capturing (Aarikka-Stenroos et al., 2014; Ansari et al., 2014; Merkus et al., 2019; Miterev et al., 2020; Möller & Svahn, 2009). This involves creating a system that *transcends* the innovation construction of the network by forming a network organization wherein flexibility is gained through distributing specific responsibilities to several key members, some of whom may be new in the network (see, e.g., Möller &

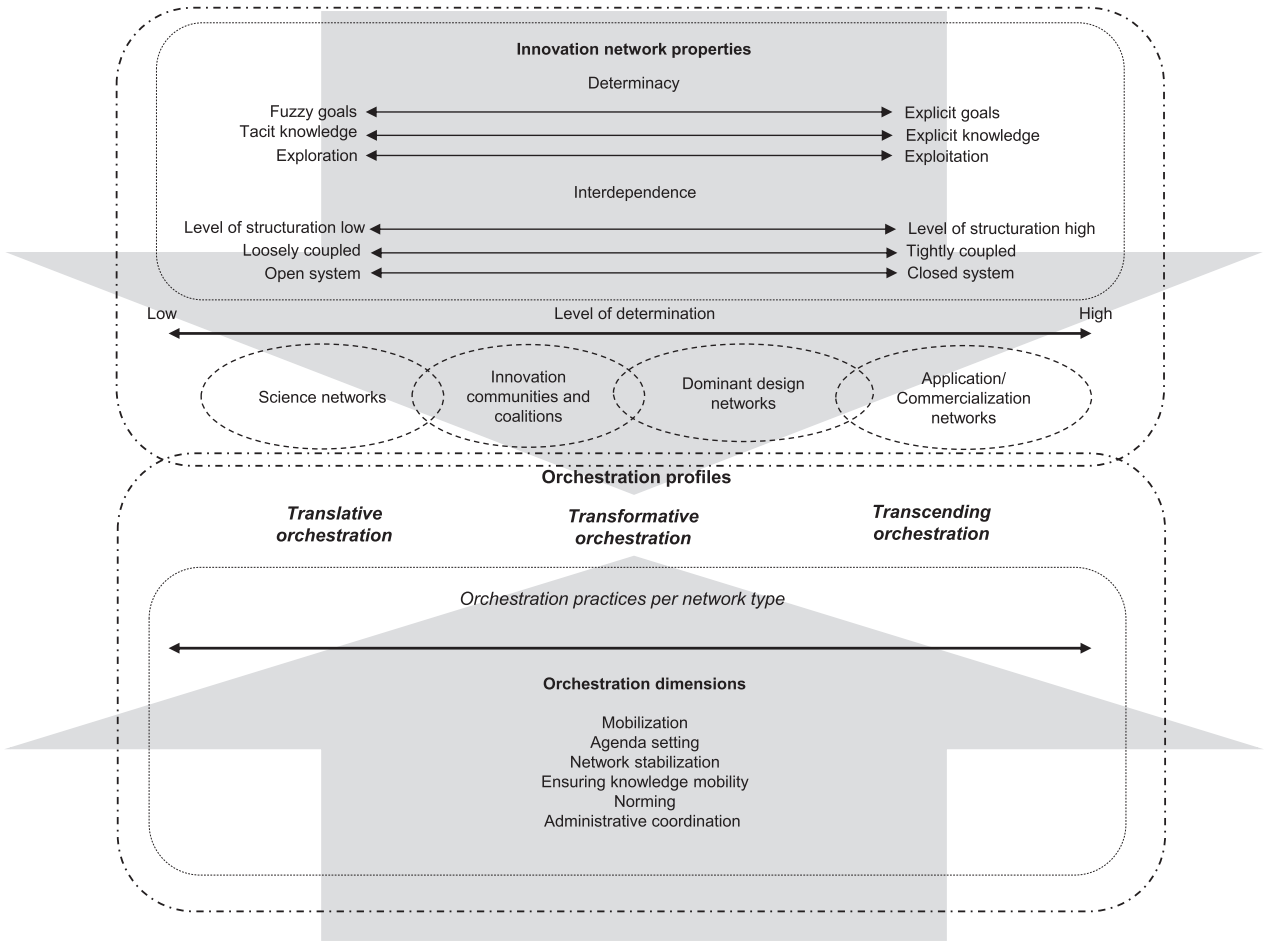

Fig. 3. The orchestration profiles at the intersection of network properties and types, and orchestration dimensions and practices.

Svahn, 2006; Perks et al., 2017; Reypens et al., 2021; Wang, Phillips, & Yang, 2021; Aarikka-Stenroos & Sandberg, 2012). We call this kind of network orchestration logic that contains well-specified member responsibilities, agreed governance structure, negotiated appropriation, and well-established coordination and controlling practices with regular monitoring, as ***transcending orchestration***.

Together, these three orchestration profiles—translative, transformative, and transcending—demonstrate the main alignment orientations. Each of these is constituted by the abstract orchestration dimensions and specific orchestration practices that are distinct to the innovation networks situated at the lower, middle, and high end of the level of determination of their value-creation systems and captures the logic of alignment. Therefore, any innovation network or orchestration practice or dimension can be placed into and considered with reference to the wider orchestration profile.

5. Concluding remarks

This paper was motivated by the observation that although a considerable amount of scholarly research on managing inter-organizational innovation activities exists, only the first steps have been taken to combine the views accumulated in different disciplines (see, e.g., Aramo-Immonen et al., 2020; Chesbrough et al., 2019; Dagnino et al., 2016; Möller & Halinen, 2017). Accordingly, our aim was to advance existing knowledge on the orchestration practices of inter-organizational innovation networks by developing a conceptual framework that introduces an orchestration profile approach. More specifically, we adopted an alignment perspective to capture the interactions between the network properties and the orchestration dimensions and practices. We suggest that each innovation network follows a specific, encompassing value-construction logic and that this logic connects to both the core network properties—laying the foundation for different innovation network types—and the orchestration dimensions and their more specific constitutive practices. Examining the nature of alignment between the network types and orchestration enables three main innovation-network orchestration profiles—translative, transformative, and transcending—to be identified.

5.1. Theoretical contributions

As we derived the elements for our framing from several streams of literature, our framework connects to multiple discussions and offers several contributions. First, with our specific focus on alignment means the study extends beyond the comparison perspective usually adopted to address differences between networks and their forms of orchestration. To date, the idea of fit, match, or alignment has been relatively implicit in research on business networks (e.g., Mitrega et al., 2012; Möller & Rajala, 2007), in studies outlining orchestration in individual networks (e.g. Nambisan & Sawhney, 2011; Rampersad, Quester, & Troshani, 2010; Leven et al., 2014; Oliveira & Lumineau, 2017), or in studies examining the question of what orchestrators (can) do in practice in different situations (Forkmann et al., 2018; Hurmelinna-Laukkanen & Nätti, 2018; Hurmelinna-Laukkanen et al., 2021). Instead of focusing on a specific case or only addressing the observable processes, practices, and contingencies, we turned our attention to the general patterns. Doing so provided an analytical approach and lens through which a variety of networks and orchestration practices became observable as part of a wider context.

Second, we advance innovation network classification by suggesting that network properties related to determinacy (of value creation activities and resources) and interdependency (of network members) can be used to distinguish and compare innovation network types. We suggest that these are the fundamental properties reflecting the value-creation logic of any innovation network, and affecting its size, density, structuring, and other such feature discussed in the existing literature. This proposition expands earlier work (e.g., Möller & Svahn, 2006; Möller & Rajala, 2007) by specifying the key network dimensions linked to the value-creating logic construct. Compared to such aspects as the number of network members or their diversity, or the characteristics and capabilities of the network leader, for example, which have also been identified as relevant in finding ways to manage specific networks (see, e.g., Hurmelinna-Laukkanen & Nätti, 2018; Leten et al., 2013; Mitrega et al., 2012; Reypens et al., 2021), we suggest that the value-creation logic-based proposition provides a more fundamental explanation of the empirical findings. By acknowledging the relevance of value activities and resources that a specific innovation requires, the orchestration profile directly determines what kinds of members (with specific resources, capabilities, and motivation) are needed, and the issues on which they need to collaborate. The value system line of thinking can advance future research considerably by, for example, facilitating informed choices on which elements the analysis of specific types of innovation networks should focus.

Third, we propose an integrative, theory-based conceptual framing for innovation-network orchestration. Drawing on state-of-the-art literature in various streams of literature, we identified several dimensions of network orchestration (see, e.g., Chesbrough et al., 2019; Dhanaraj & Parkhe, 2006; Möller & Halinen, 2017; Reypens et al., 2021). We used these to build a general framing of innovation-network orchestration based on six orchestration dimensions: mobilization, agenda-setting, network stabilization, ensuring knowledge mobility, norming, and administrative coordination. While these higher-order dimensions are necessary to encourage effective orchestration, they can emerge in different ways, as they may involve notably different orchestration practices. The orchestration practices vary notably in different contexts, not only in terms of their content, but also regarding their intensity or relevance; under specific circumstances, some practices can be completely absent, and others considered crucial. However, there should be practices that serve the purposes of mobilization, agenda-setting, network stabilization, ensuring knowledge mobility, norming, and administrative coordination. We suggest that modeling innovation-network orchestration as a multilevel construct containing the set of six generic orchestration dimensions, and their manifestations through concrete managerial practices, advances theorization on innovation-network management and orchestration as an activity.

Finally, we rely on the principle of alignment to combine the elements described above and introduce the orchestration profile approach. The three generic orchestration profiles—the translative, transformative, and transcending profiles—communicate the need to consider both the abstract, underlying logic of value creation and concrete, observable orchestration practices: one without the other may lead to over- or underestimating the relevance of certain practices in specific situations. Utilizing the orchestration profiles, it is possible to approach innovation-network orchestration holistically, pinpoint possible anomalies more easily, and track temporal changes (building on the idea that a new equilibrium and state of alignment likely follows from shifts and possible disturbances in the networks or their orchestration). The orchestration profile approach provides the tools for approaching innovation and innovation processes, networks, and orchestration in a theoretically meaningful combination.

5.2. Managerial implications

For managers, the orchestration profile approach provides an advanced tool for innovation network strategizing both when their organizations act as hub firms and when they are network members serving other roles. Being able to identify what type of innovation network they are involved in, and what logic the network follows, allows managers to identify the most viable practices for network orchestration. Fig. 2 provides a set of organized suggestions for concrete managerial actions. We see that identifying the logic and orchestration demands of innovation networks is particularly essential for large corporations that can have various roles simultaneously in several innovation networks.

While not highlighted in our present discussion, our framing also has managerial implications for the dynamics of innovation network development. Our analytical approach enables the detection of changes in the network—for example, moving from digital solutions development to platform construction—and thus helps managers adjust their orchestration practices to the emerging new demands. Adjusting one's capability base and orchestrating activities quickly as the innovation process proceeds can offer a significant competitive advantage in a setting where numerous networks compete against each other.

5.3. Limitations and future research suggestions

A conceptual paper building on integrative literature reviews inevitably has its limitations, no matter how carefully it is composed. The constructed conceptual framework and the related elements should be seen as theoretical propositions calling for extensive empirical validation. As existing empirical studies typically discuss network properties or orchestration, but not both in detail, the suggested orchestration profiles await a balanced and detailed empirical examination. We believe that comparative and longitudinal case designs, where carefully selected network types are observed and compared in terms of the alignment of their value-creation features and orchestration practices, are needed.

Apart from the validation issues, our study points toward specific topics to explore further, and to incorporate into our framing. While we did not address temporality and dynamism explicitly, change is present in our discussion on moving from one network type to another, and adaptation and change of practices, indicating that this element could be a valuable extension. More specifically, we believe that the examination of mechanisms of reaching new equilibrium and a state of alignment when moving between orchestration profiles would be a valuable research avenue. Another area to develop in a more detailed manner relates to the role and traits of the orchestrator. We only briefly refer to orchestrators and their capabilities in our discussion, but it is our view that, in the next phase, one can extend our framing to include various actor roles—especially with regard to attaining alignment according to changes emerging over time. The aspect of alignment and its effectiveness could be examined by considering what kinds of networks with specific profiles are successful in increasing value for the orchestrator and network members, and whether this success further contributes to wider innovation systems by enabling the creation of companies and local jobs and wealth.

Introducing the profile approach to innovation-network orchestration combines a notable amount of existing research and provides one framing and conceptualization that allows further theorizing on innovation-network orchestration. We hope that this framing can be utilized as a conceptual toolkit and analytical framework to conduct individual case and comparative studies.

CRediT authorship contribution statement

Pia Hurmelinna-Laukkanen: Conceptualization, Data curation, Writing – original draft, Writing – review & editing, Visualization, Investigation, Validation, Formal analysis, Methodology, Resources, Project administration. **Kristian Möller:** Conceptualization, Data curation, Writing – original draft, Writing – review & editing, Visualization, Investigation, Validation, Formal analysis, Methodology, Project

administration. **Satu Nätti:** Conceptualization, Data curation, Writing – original draft, Writing – review & editing, Visualization, Investigation, Validation, Formal analysis, Methodology, Supervision, Resources.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix 1. Examples of network types in the existing literature found while searching for network properties

Author(s)	Network classification—the characteristics used to make distinctions	Identified/postulated networks
Park (1996)	A two-dimensional matrix based on: • The type of *interdependence* between network members – vertical versus horizontal • The nature of network governance – bilateral, trilateral (multilateral)	Four network types are postulated: • **Vertical-trilateral networks**—relevant in the construction industry • **Vertical-bilateral networks**—generally involving long-term contracting like in franchising, licensing, joint ventures • **Horizontal-bilateral networks** are exemplified by R&D consortia and competition collusions and alliances • **Horizontal-trilateral networks**—trade associations, industry federations, some hospital consortia
de Man (2004)	• Primarily horizontal networks drawing on the complementary resources of a *limited set of member organizations* • Vertical networks, between suppliers and producers in *consecutive positions* within the value chain, aimed at increasing efficiency, *drawing on the specialized resources and competences of members* • Diagonal or multidimensional networks	• **Horizontal coalitions or alliance networks**, established to achieve market power and reach like the airline alliances • **Supply- or demand-driven vertical networks** between suppliers and producers in consecutive positions within the value chain, *aimed at increasing efficiency*, drawing on the specialized resources and competences of members; example networks: Dell and Toyota • **Solution networks** between the producers of complementary goods and services *aiming to serve a comprehensive customer-specific problem*; these are client activated and can involve both horizontal and diagonal partners—example networks: IT-offerings, Schwab financial services • **Technology oriented networks:** **- R&D networks** between companies *aiming to share risks, costs and/or competences in the development of new technologies*, pre-market competition, project-like cooperation that can involve both horizontal and diagonal partners; example networks: Microsoft Web TV, the Sematech consortium in the semiconductor research and business- **Standardization networks** between horizontal or diagonal partners often co-opt companies *aiming to set a dominant technology* in a product/service field and are market-development and competition oriented; example networks: the WAP Forum, the Symbian coalition (both in mobile telephony operating systems); example networks: the WAP Forum, the Symbian coalition.
Inkpen and Tsang (2005)	A two-dimensional matrix based on: • The vertical–horizontal dimension • The *structured–unstructured* dimension	• **Intracorporate networks** consisting of a group of organizations operating under a unified corporate identity with the headquarters of the network having a controlling ownership interest in its subsidiaries; *highly structured*—both vertical and horizontal units are possible • A **strategic alliance** is a group or network of firms entering into voluntary arrangements that involve the *exchange, sharing,* or *codevelopment* of products, technologies, or services. In the Inkpen and Tsai framework, strategic alliances are positioned in the middle in terms of the structured–unstructured dimension—they can have both vertical and horizontal members • **R&D consortium**—a network of primarily horizontal members that can be part of a more broad strategic alliance; *a medium level of structuredness* • **An industrial district** is "a network comprising independent firms operating in the same or related market segment and a shared geographic locality, benefiting from external economies of scale and scope from agglomeration" (Brown and Hendry, 1998: 133); it has an *unstructured character* and contains both vertical and horizontal members (in addition to these the study lists trade associations and franchising networks but does not specify them)
Pöyhönen and Smedlund (2004)	• Classifications are based on the role of and distinctive modes of knowledge (*tacit versus codified*)	• **Production networks** aim at efficiency and replication and function according to mechanistic system logic, focusing on the enactment of rules and regulations • **Development networks** aim at continuous incremental development and are most successful when adhering to an organic mode that emphasizes participation, *tacit knowledge* sharing, dialogue, and mutual adjustments • **Innovation networks** seek to produce new intangible assets benefit from a dynamic systems model wherein *entropy and spontaneous knowledge flows* form the basis for mastering radical change
Möller and Svahn (2003)		• **Current business nets** comprise a group of vertically related members, primarily exploiting their current resources and

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(*continued*)

Author(s)	Network classification—the characteristics used to make distinctions	Identified/postulated networks
	• The *level of determination of the value activities* and the actors forming the net, (i.e., the nature of the value creation system embraced by the net) • The role of knowledge in the value creation system—the *exploitation–exploration* distinction • The *goal of the strategic net* or its hub firm • The structure of the net, as described through the vertical and horizontal dimensions • The *type of knowledge*	capabilities for targeting increased efficiency and/or more competitive customer services; they have a relatively stable structure, are generally contractually-based; example nets: vertically oriented demand-supply networks driven by core companies such as Dell, Ikea, and Toyota • **Business renewal nets—**generally temporal networks of both vertical and horizontal actors which target incremental and local improvements and innovations to the current business networks (manufacturing and logistical processes, management systems, and end-offerings); most multi-actor R&D project nets involving lead suppliers and pilot customers, as well as project nets established for business-process modifications, can be characterized as *business renewal nets* • **Emerging new business networks—**multiparty, *fluid and relatively unstructured* networks involving both vertical and horizontal actors; these cover many technology development consortia and university-corporation research collaboration and are prominent in the fields of emerging science-based technologies with new technologies and radical innovations exemplifying the final aims of emergent networks and, in emerging value systems, an essential aspect is the *tacit and dispersed character of the knowledge* held by the actors in the emerging system
Powell and Grodal (2006)	A two dimensional matrix based on: • Network membership's embeddeness—varying from *fluid* to *closed* • Network governance varying from *informal* to *contractual*	• **Primordial networks**—relatively closed yet informal groups of actors related by their functional capabilities and social relationships; common in trade-based fields such as the film industry and diamond business and generally having a temporal or project character • **"Invisible college" networks**—*relatively fluid and informal* networks that are typical in research and development; effective for rapid information sharing and collaboration • **Supply chain networks**—contract-based *relatively closed* networks of primarily vertically related actors utilizing the specialization caused by the division of labor, typical in orchestrated multi-tier supply chain systems and conductive for incremental innovation • **Strategic networks—**contract-based yet *relatively fluid networks* of vertical and horizontal actors targeting *shared or negotiated goals*; R&D consortia and other kinds of intentionally created strategic alliances utilize the specialized capabilities of the partners
Möller and Rajala (2007) Extends the Möller and Svahn (2003) especially concerning innovation networks.	• *Network goals* • *The level of determination* of the value system underlying the net • *The exploitation–exploration* dimension	The study is based on the same three "generic" network modes or "value systems" suggested by Möller & Svahn (2003). The **emerging business network** category is, however, extended by three more detailed innovation network types: • **Innovation networks**—relatively loose science- and technology-based research networks involving universities, research institutions, and research organizations of major corporations; these are characterized by professional and social relationships and are not primarily business networks but are *guided by the ethos of scientific discovery* and *involve relative high uncertainty and exploratory behavior* • **Dominant design nets** are diagonal coalitions of partially competing and partially complementing companies that share a similar technological view and target the creation of a dominant technology or platform—the Symbian and Bluetooth coalitions within the mobile phone and services sector and the SEMATECH consortia in the semiconductor technology sector exemplify dominant design nets; besides corporate members, these nets often involve universities, research institutions, and governmental agencies • **Application nets** are intentionally formed nets of diagonal actors that support the race for achieving commercially viable business applications out of the evolving technology innovations; these may overlap with dominant design nets but they are generally mobilized and orchestrated by a hub company and involve a web of complementary partners
Agranoff (2007)	Classification is based on: • The extension of collaboration ranging from *information sharing to strategic action* • *The goal* of the network collaboration	Agranoff suggests four intentionally formed network types, ranging from more limited to more complex networks in terms of their *structure* and *goals*. A corresponding evolution path is postulated. • **Information networks—**primarily formed for *pooling the information* provided by the parties involved and managing it so that the members can make use of it as required. **Development networks—**which, in addition to operating as data centers, produce formative instruments that are useful for the requirements common to the parties involved

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Author(s)	Network classification—the characteristics used to make distinctions	Identified/postulated networks
		• **Outreach networks** are responsible for designing *strategic plans* and making them available to the parties so they implement them in a coordinated manner • **Action networks** are responsible for the *direct implementation* of programs and policies, and therefore call for more *structured governance* than the previous instances
Rometsch and Sydow (2007)	A two dimensional matrix based on: • The strength of the *network identity* • The strength of the *organizational identity* *Identity* is seen as a *structural* property "thatemerges from (inter-) organizational practices of network members when answering the question 'who are we as a network?'" (Rometsch & Sydow, 2007, p. 31).*Structural property* refers to the network as a whole, focusing first on the essence of the network (centrality) and second on the uniqueness in comparison to other networks (distinctiveness and a more or less enduring character continuity) (Rometsch & Sydow, 2007, p. 26).	• Strong network identity & weak organizational identity—example networks: franchising networks • Weak network identity & strong organizational identityexample networks: multiparty alliances between strong organizations (Renault and FinaElf) • Strong network identity & strong organizational identity—"balanced network" examples: airline alliances (StarAlliance, OneWorld)
Pisano and Verganti (2008)	A two dimensional matrix based on: • Network governance varying from *hierarchical* to *flat* • Mode of participation varying from *closed* to *open*	• **Innovation Mall—an open hierarchical network** wherein one company posts a problem and *anyone* can propose solutions, and the company chooses the solutions it likes best; although hierarchical, the network is relatively flat; example: InnoCentive.com website, where companies can post scientific problems. • **Elite Circle—a closed hierarchical network** where one *company selects the participants*, defines the problem, and chooses the solutions; example: Alessi's handpicked group of 200-plus design experts who develop new concepts for home products • **Innovation community—an open and flat (non-hierarchical) network** where *anybody* can propose problems, offer solutions, and decide which solutions to use; example: Linux open-source software community • **Consortium—a closed but relatively flat (non-hierarchical) network** with *participants jointly* selecting problems, deciding how to conduct work, and choosing solutions; example: IBM's partnerships with select companies to jointly develop semiconductor technologies
Gulati, Puranam, & Tushman (2012)	A two-dimensional matrix based on: • *The openness* of network boundaries • The level of network stratification related to network decision-making (heterarchical–hierarchical)	• **Closed community**: consortia, technical standards committees (closed boundaries – heterachical decision-making) • **Extended enterprise**: OEM supplier networks, franchising networks (closed boundaries–hierarchical decision-making) • **Open community**: Wikipedia, Opensource (open boundaries—heterarchical decision-making • **Managed ecosystem:** Android Operating System (open membership—hierarchical decision-making)
Möller and Halinen (2017)	Innovation networks studies focus on inter-organizational collaboration *aiming at innovation:* • An early innovation phase with *dispersed tacit knowledge* and resulting *uncertainty* calls for *open* and flexible network forms • A shifting balance between *exploratory and exploitative practices*	Innovation networks are not an all-purpose category but exhibit great variety, including the following: • **science-driven networks** • **technology coalitions** • **dominant design networks** • **platform constructing networks** • **new product nets** • **commercialization networks**

Appendix 2. Examples of orchestration activities in the existing literature found while searching for orchestration dimensions

Authors	Viewpoint on network management/ orchestration	Dimensions of orchestration—areas of influence	Orchestration practices
Agranoff and Mcguire (2001) (on public networks)	Defining four network management processes	• *Activation/deactivation* of members • Synthesizing conditions for coproduction • *Framing the work* • *Mobilizing* organizational resources (see also an application by Rethemeyer and Hatmaker, 2007)	• Guaranteeing participation of the right actors, • Facilitating relationship building • Motivating participants, • Building supporting structures for maintaining the collaboration
Dhanaraj and Parkhe (2006) (on innovation networks with a so-called commercial hub firm)	"Hub firms orchestrate network activities to ensure the creation and extraction of value, without the benefit of hierarchical authority" Network orchestration is defined as "the set of deliberate, purposeful actions undertaken by the hub firm as it seeks to create value (expand the pie) andextract value (gain a larger slice of the pie) from the network."	• *Knowledge mobility* • *Innovation appropriability* • *Network stability*	*Enhancing knowledge mobility*: • Knowledge absorption, • Network identification, • Interorganizational socialization • Exchange forums and formal and informal communication channels *Appropriability* ensured via: • Communicating clear, pre-established sanctions for trust violation

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Authors	Viewpoint on network management/ orchestration	Dimensions of orchestration—areas of influence	Orchestration practices
			• Procedural justice • Bilateral communications • The ability to refute decisions • A full account of the final decisions • Consistency in the decision-making process • Joint asset ownership • Equity joint ventures • Patent pooling *Increasing the network's stability* by: • Enhancing reputation • Lengthening the shadow of the future • Building multiplexity, e.g., additional joint projects
Agranoff (2007) (book) (on public networks)	The "how and what of organizing and managing networks"; whether "managing makes a difference"; it acknowledges differences between networks; it is nonhierarchical and self-organizing as such—structuring and operating requires managerial activity	• Activation • *Mobilizing* • *Framing* tasks and issues • Brokering • Facilitating interaction • *Synthesizing* the network • *Holding the network together* • *Coordination*—arranging interaction • *Guiding* processes • Dividing work • *Structuring*	• Negotiation • Enhancing trust (e.g., showing respect and fairness) • Forming structures • Soft guidance • Balancing social forces and interests • Setting up information systems • Organizing conferences, workshops • Mentoring
Möller and Rajala (2007) (business nets—their characteristics and management mechanisms)	The authors define business net types and the related management mechanisms	These are related to new business nets aiming at radical innovations variety of management mechanisms are defined	For example: • *Connecting* a variety of actors • Communicating and *agenda setting* • *Mobilizing* actors and coordinating activities • Facilitating common sense-making process • Project *coordination* activities
Ritala and Hurmelinna-Laukkanen (2009) (orchestrators facing the dynamics of coopetition)	"How innovation-related coopetition differs from cooperation between non-competitors in terms of value creation and value appropriation"	• *Harnessing a large, common knowledge base* • Considering the possibilities to *shape the institutional environment* with coopetition; how the nature of innovation influences these possibilities • *Managing and controlling knowledge creation and value capture* vis-à-vis outsiders and among collaborating participants • *Guaranteeing innovation appropriability* early on in the process	• Focusing on knowledge outside the ordinary industrial domain • Understanding how the nature of an innovation process (e.g., incremental vs. radical) influences the process and choice of orchestration tools used • Protection and *appropriation* mechanisms like contracts, patents, IPRs
Möller (2010) (the nodal actor trying to influence sense-making in the emerging business field)	The role and inner meaning of sense-making in emerging business fields characterized by radical innovation	Influencing sense-making and the consequent focus on activities and choices of participating companies by *agenda setting*	Creating and communicating a credible and attractive agenda, e.g., concretizing the future offering, customer groups, value systems, and actor roles Constructing a web of weak ties, creating positions to access variety of technological alternatives, developing a generative learning culture, generating a variety of forums for interaction for example
Batterink et al. (2010) (on innovation brokers and SMEs)	"how innovation brokers successfully orchestrate innovation networks of SMEs." (systems of innovation literature and management literature form the basis)	"Three network orchestration functions: • Innovation initiation • *Network composition* • *Innovation process management*" More specific practices: • Distinguishing between network design activities and ongoing network management activities and processes • *Attracting members to the innovation network and selecting them* • *Stabilizing the network* • Demand articulation	• *Knowledge* absorption, • *Network identification* • Reinforcing a shared identity • Inter-organizational socialization • Establishing exchange forums and *formal and informal communication channels* • Supporting trust, procedural justice and joint ownership • Preventing isolation, migration, cliques and attrition • Highlighting reputation • *Lengthening the shadow of the future and building multiplexity* • Handling conflicts • Enhancing transparency
Rampersad et al. (2010) (Australian biotech/nanotech and ICT industries and firms, and network orchestration within their networks)	The paper focuses on the causal model of factors influencing network effectiveness	• Power distribution • Trust • *Coordination* • Harmony • *Communication efficiency*	Fostering respect among players, avoiding abuses of power, implementing appropriate levels of coordination, encouraging harmonious practices, fostering an environment of trust in the networks,

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Authors	Viewpoint on network management/ orchestration	Dimensions of orchestration—areas of influence	Orchestration practices
		• R&D efficiency	improving communication efficiency, ensuring R&D efficiency (p. 801)
Sabatier et al. (2010) (on small hub firms coordinating networks)	"the coordination of networks can be specialised, with the emergence of Dedicated Coordinating Firms" *Network* refers "to different interrelated groups of actors (firms or other institutions such as universities) and their relations through agreements like joint-ventures, licensing, technological alliances and consortia"	• The activities and structures through which the network members *share and combine knowledge* • *Knowledge mobility* • *Innovation appropriability* • *Network stability* (Dhanaraj & Parkhe, 2006)	• Knowledge circulation • Overseeing the division of intellectual property, royalties etc. • Allowing the presence of each actor and preventing unstable linkages • Assuring the actors' loyalty, exclusive agreements • Providing high scientific experience
Nambisan & Sawhney (2011) (a focus on hub firm's orchestration activities)	The authors "describe the nature of a hub firm's orchestration processes in network-centric innovation"	• Managing innovation leverage • Managing innovation coherence • *Managing innovation appropriability*	For example: • Defining opportunities for asset leverage • The modularization of assets • *Creating infrastructure for asset leverage* • *Information dissemination* • Creating common frameworks • Task *coordination* • Enhancing trust • *IP rights management*, • Facilitating the transparency of activities
Landsberger et al. (2011, 2012) ("How network managers contribute to innovation network performance"; see also Heidenreich et al. (2016)	An analysis of network managers' core tasks and the related relational influence conducted by developing a conceptual framework based on a literature review and interviews	The "functions" of a network manager: • The selection function • The allocation function • The regulation function • The evaluation function	For example: • *Selecting and deselecting partners* • Developing network relationships • *Coordination* of activities • Ensuring transparent *communication* • Continuous evaluation of contributions
Gardet and Fraiha (2012)(SME project network coordination by a hub firm ["coordination modes"])	A longitudinal case in an SME network conducted to reveal coordination modes and change in them as an innovation project proceeded	Coordination modes influence: • *Communication* • Trust • The division of benefits • *Guarantees against opportunistic behavior* • Conflict resolution	First contracts, then the increasing role of trust create a framework for interactions, the equal division of benefits, facilitating discussions, persuasion
Hurmelinna-Laukkanen et al. (2012) (core actors managing and orchestrating innovation network throughout its development process)	How coordination mechanisms evolve as innovation process proceed	• *Communicating a vision* • Focusing on social capital to maintain stability • *Facilitating knowledge mobility* • *Securing appropriability* • *Coordinating*	Concrete roadmaps, close inter-firm relationships, open platforms for open discussions, contracts, NDAs, sharing responsibilities, defining concrete goals, organizing development events for example
Müller-Seitz (2012)	A literature review of leadership in networks. What is done "to make things happen."	Formal leadership outcomes: • Rules/*network structure* • *Knowledge transfer* • Measures/indicators Informal leadership outcomes: • *Network vision/agenda* • Trust • Capability/network strategy	Establishing operative rules, distributing responsibilities, developing knowledge-sharing routines (e.g., IT systems for *knowledge transfer*), monitoring, facilitating social mechanisms and trust development
Paquin & Howard-Grenville (2013) ("Network participants build valuable positions through their activities" [p. 1647]; the orchestration process conducted by an organization facilitating regional development)	The paper focuses on network orchestration, particularly the shifts in orchestration activities and the network over time, ranging from the developmental phase, through capturing value and on to strategic growth	The focuses of orchestration actions: • *Engagement* • *Connection* • Co-development	For example: • Developing a strategic view • Using existing relationships to build new ones • Facilitating intensifying *communication* between relevant firms • Creating new projects
Roijakkers et al. (2013) (on the governance of IP)	"While many authors within the ecosystem literature refer to the self-organizing characteristics of ecosystems a number of publications stress the important role of the leading firm or ecosystem orchestrator in the success of ecosystems"	• *Shaping the innovation ecosystem, stimulating cooperation* • *Setting and communicating the research agenda*, • Adding value through capacities	• Creating a *structure*, including an *IP model* that ensures value *appropriation* for all ecosystem partners • *Attracting partners* based on its specific technological expertise • Common research platform programs • Bilateral contract with clearly defined technical scope and deliverables • Partners send employees are to be part of the research teams as industrial residents
Levén et al. (2014) (the hub-driven innovation process with dedicated resources and the "representation of key stakeholders")	"Managing innovation networks in specific contexts that involve researchers in cross-industry collaboration"	Dhanaraj & Parkhe's (2006) model applied: • *Knowledge mobility* • *Innovation appropriability* • *Network stability*	• The *recruitment* of members, • Continuously *communicating* the idea, taking care of representation of all key stakeholders • Maintaining dialogue with all the stakeholders • Making agreements • Promoting open discussion around *appropriability*

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Authors	Viewpoint on network management/ orchestration	Dimensions of orchestration—areas of influence	Orchestration practices
			• *Communicating* success stories and continuously communicating the long-term value proposition
Dagnino et al. (2016) (intentional organization[s] elaborating their business idea)	Intentional governance of whole network ties (both formal and informal) in the early and later stages of network formation	Influencing network structure by: • *Identifying potential partners* • Attracting and *mobilizing* knowledge resources by supporting diverse knowledge processes • *Establishing legitimacy* • Supporting the network *visioning* • Supporting identity building • Supporting the development of common knowledge base and network language • Dealing with potential inertial tendencies and maintaining innovativeness: sensing and nurturing the change needed	• Arranging encounters • The renewal of the business idea in order to stay attractive • New influences are guaranteed by sufficient network variety (new knowledge bases) • Upgrading the network vision and identity when needed • Activating more distant bridging ties when needed • Abandonment of formal ties that are no longer valid
Perks et al. (2017) (platform leaders "shape their environments and orchestrate the network to further develop the value platform")	"How lead firms mobilize network relationships to support and build novel value platforms"	• Orchestration mechanisms defined: *envisioning the potential value* for participants • Inducing innovativeness: supporting innovativeness for value creation • Legitimizing the value platform • *Adjusting internal structures and routines*	For example: • *Envisioning* complementary value from network • Defining network roles • Freely *sharing knowledge* • The retention of knowledge • The assessment of capabilities and resources of NW members • Developing and communicating metrics • Demonstrating platform value • Seeking advice and verification for internal adjustments • Adapting resources and routines
Aarikka-Stenroos et al. (2017) (a focus on managing the full innovation process at its different stages by core actors)	Management activities in the innovation process from visioning to commercialization in radical vs. incremental innovation	• *Goal setting and refining* • Resourcing • *Motivating* • *Consolidating* • *Coordinating* • *Controlling* • *Leveraging*	For example: • Agreeing collectively on goal • Motivating participants by incentives • The results were discussed in meetings • Coordination roles were clearly defined
Möller and Halinen (2017)	As part of their general theory of network management, the authors suggest (based on a literature review) the "key dimensions of network management"	• *Visioning and sense making* • *Mobilizing* network actors and constellation creation • *Goal construction and organizing* • Effectiveness seeking • Efficiency seeking • *Network maintaining*	For example: • *Agenda development* and conceptualization • Envisioning of value-offering • Influencing and motivating • *Selecting partners* • Defining responsibilities and procedures • Negotiating *knowledge sharing* and *appropriability* issues • Market creation • *Coordination* and performance monitoring • Network renewal
Planko et al. (2017) (active orchestration by different actors in "collective system building")	Key dimensions of orchestrating new business field: "How to effectively manage networks for collective system building"	Key factors: • *Network composition* • Governance structure • *Managerial processes* • Relational factors	For example: • Actor diversity considered • Size of a network • Governance mode • Rules • Decision-making mechanisms • *Goal definition* • Task distribution • *Project management* and transparent *communication* • Trust • Harmony and commitment • Leadership style (see page 44)
Mason et al. (2017) ("Managing to make markets")	Defining how to conceptualize actor roles, markets, and goods in an emerging field	Conceptualizing actors' roles: • Identifying • Enrolling • *Mobilizing* Conceptualizing markets: • *Mapping* • Representing • Calculating Conceptualizing goods: • Bundling • Positioning • Valuing	For example: • *Identifying the most potential actors*, engaging those actors • Defining roles • *Organizing and coordinating* • *Circulating knowledge* needed for renewal • Mapping new forms of networking to understand new dynamics • *Visualizing* and assessing new ideas and transformation needed • Defining new forms of value to conceptualize goods etc.
Provan et al. (2017)		Organizational:	

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Authors	Viewpoint on network management/ orchestration	Dimensions of orchestration—areas of influence	Orchestration practices
	The antecedents of "network citizen behavior"	• Goal congruity • Reward system • Culture • Network position Network level: • Domain characteristics • Type of network governance • Network legitimacy • *Network configuration*	Harmonizing *goals*, creating incentives supporting collaborative behaviors, guaranteeing cultural compatibility of actors, creating shared norms and beliefs, tightening inter-organizational connections to *enhance knowledge flows*
Oliveira and Lumineau (2017)	Integrating and contract-related coordination mechanisms in interorganizational project networks	Connecting: • Monitoring • Liaising • *Engaging* Steering: • *Goal-setting* • Enforcing • Constraining action	Monitoring work processes and quality, decision chains, project milestones, target-setting, valuations, sanctions and rewards, *sharing and using information*
Giudici et al. (2018) (open system orchestration supporting entrepreneurial networks by bridging organizations [business incubators and the like])	Open system orchestration differs from closed-system orchestration; a detailed description of how open system orchestration influences network members is given	• "*Building* collaborative engagement and diffusing assumptions of mutual trustworthiness" (p. 1391) • *Making participants understand what they have to offer* to others so that complementary resources can be found (p. 1392) • "Fostering dispersed collaboration to promote positive emotional experiences" (p. 1393)	• Discussing norms and terms of participation, for example • Providing occasions where network members can reflect on their doings and basic assumptions. • *Organizing forums to match resources, supporting interactions* • Monitoring free-riding
Nordin et al. (2018) (the focal firm's leader seen as a core orchestrating actor)	Network management in emerging high-tech business field	Three capabilities: • Context handling • *Network construction* • Network position consolidation	Activities related to context handling: *visioning*, roadmapping, *communicating/ evangelizing*, navigating Activities related to network construction: *casting* (identifying actors), jamming (interacting with invited actors), framebreaking (changing mindsets) Activities related to network position consolidation: harvesting (leveraging information flows) , upgrading (building brand and credibility
Reypens et al. (2021)	Orchestration practices; "How do orchestrators in multi-stakeholder networks mobilize network members across organizational boundaries" (p. 2)	"Hybrid orchestration": domination and consensus-based orchestration can live side by side; orchestrators can simultaneously rely on both "Orchestration practices in three categories": • *Connecting* • *Facilitating* • *Governing*	Formulating the *vision*, developing the *project proposal*, assigning roles, showcasing the vision, stimulating encounters, bridging stakeholders, *motivating actors*, creating smaller teams, discussing differences, showcasing results, developing trust, monitoring progress, providing flexibility, stimulating bottom-up collaboration, facilitating relationships (p. 19)

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