

Managing business and innovation networks—
From strategic nets to business fields and ecosystems

By

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Highlights

- Assessment of the key contributions by network management research from 2000 onwards.
- Clarification of the differences between business fields, ecosystems and platforms and revealing the role of network management in these domains.
- Proposing a general theory of network management that consolidates our fragmented knowledge and covers all types of innovation and business networks.
- Analyzing how three contextual layers (environment, network, actor) influence network management activities.
- Identifying a set of generic network management activities, and prototypical configurations of these for different contexts.

Managing business and innovation networks— From strategic nets to business fields and ecosystems

ABSTRACT

This article introduces the *Special Issue of Managing Business and Innovation Networks* and makes an independent contribution to the advancement of network management research. The study has three ambitious goals. First, it evaluates the main developments in network management research from 2000 to 2016, focusing on disciplinary openings. Second, it specifies the contributions of recent domain extensions (business fields, ecosystems, platform networks) to network management, and clarifies the role of networks and network management in these domains. Third, it proposes a general theory of network management based on the past 20 years of research in the field and the contributions of SI articles. The theory explains how the factors at three contextual levels – environment, network and actor – influence network management activities, forming patterns of management based on activity configurations. The framework consolidates our fragmented knowledge on network management and paves the way for more advanced research and management. We conclude with suggestions for future research.

Keywords: business network, strategic network, innovation network, ecosystem, business field, management

1. Introduction

This article introduces the *Special Issue of Managing Business and Innovation Networks*. The theme in the call for papers was the creation and management of intentionally designed business and innovation networks that we specified as strategic networks or value nets constructed for attaining specific business purposes and goals.

As guest editors, we looked for empirical and theoretical contributions relevant to this broad theme and were open to the application of different theoretical perspectives, as long as they advanced the development of business network management theory and praxis. The CFP resulted in 37 submissions, of which eight outstanding papers are published in this issue. Our selection process emphasized ambitious, and even provocative contributions pertaining to neglected but central issues in network management, and the elaboration of new domain extensions to network management: business fields, ecosystems and value platforms. We are most thankful to the authors of these papers and to the more than 50 reviewers for their invaluable support. Their efforts were instrumental in bringing this special issue to fruition.

Besides serving as an editorial, this article makes an independent contribution to the advancement of network management research. Research in this field began only in 1999, when we had the privilege of editing the first *IMP Conference Special Issue in Industrial Marketing Management* on this topic (Möller & Halinen, 1999). Since then, research has extended vastly in terms of perspectives applied (e.g., “Cognition and Management in Networks,” Henneberg, Naudé, & Mouzas, 2010; “Managing creativity in business market relationships,” Andersen & Kragh, 2013; “Innovations and Networks,” Freytag & Young, 2014) as well as in the sheer number of published studies. A dozen of special issues on network management have been published in the *IMM* alone (see Möller & Halinen, in press) and the individual contributions across business marketing, strategy and management studies, innovation and technology research, and supply chain management exceed a thousand. At this point, it is thus valuable to evaluate the evolution and the

current state of knowledge in network management research. Before presenting more detailed goals we offer a brief background discussion.

1.1. New research streams and domain extensions

Two major development trends – as seen in the contents of this special issue – can be discerned. The first is a steady emergence of new research streams which include the strategic networks or value-nets perspective, addressing managerial solutions and capabilities customized to various kinds of nets (Möller & Svahn, 2003; Möller & Rajala, 2007; Nordin et al., in press), the cognitive view of network management, examining how managers construct and use “network pictures” (Henneberg, Mouzas, & Naudé, 2006; Ramos & Ford, 2011), and the institutional perspective employing both network and institutional theory in studying network mobilization (Ritvala & Salmi, 2010; 2011) or change of industrial logic (Matthyssens, Vandenbempt, & Van Bockhaven, 2013). These openings hold a strong promise concerning the possibilities of network management, enriching the basic network theory notions of actors, resources, and activities, their relationships and configurations (Snehota & Håkansson, 1995). The second trend is the extension of network management research to new application domains. The network approach has been extended to study the construction and commercialization of innovations (Aarikka-Stenroos, Sandberg, & Lehtimäki, 2014; Dawson et al., 2014; Rampersad, Quester, & Troshani, 2010), business ecosystems and new business fields (Adner & Kapoor, 2010; Möller & Svahn, 2009; Wilkinson & Young, 2013), and service systems and various multi-actor platforms (Edvardsson et al., 2014; Gawer & Cusumano, 2014).

There is also new interest in exploring the theoretical basis of the network approach and especially the gap between theory and praxis. Addressed themes include the debate over network management between core IMP researchers and more strategy-oriented scholars (Håkansson & Waluszewski, 2016; Möller, 2013), and whether business networks can be addressed as partially

closed sub-systems. This stance has been posited by Möller and colleagues (2005) and more recently explored by Prenkert (2017) from a system ontology perspective. Raab, Mannak and Cambré (2015) suggest that network management should be examined from a configurational perspective – combining structure, governance and context with network effectiveness. These treatises offer new ways of viewing network management, thereby advancing the development of the field.

The number of novel themes the articles in this special issue raise is indicative of the vitality of the research field and accentuates the need for new openings and extensions to sustain the validity of network management research for the changing business landscape. In the last decade, the use of network-oriented collaborative forms for various kinds of value creation increased significantly. These include regional innovation agencies and networks, public-private entrepreneurial incubators, complex service systems involving various authorities and NGOs, and internet-enabled logistical systems and technology platforms. Such collaborations call for new kinds of management roles, the creation of shared actor-based goals, and extended social and institutional understanding. Although these new forms are not necessarily called networks, they require management of collaborative efforts among firms and organizations, in other words, networks of relationships. The changing business landscape poses both new opportunities and new challenges for network management, and new issues for researchers to investigate.

All this suggests that we live in a promising era for the continued development of business network management research. Several new research streams are enriching the original network management notions and the network management perspective is being applied to widening new research domains. On the flipside of these developments is the theoretical fragmentation that leads to conceptual confusion and overlapping partial theories and research streams. These challenges inhibit efficient disciplinary development and the formation of managerially relevant guidelines.

1.2. Goals and outline

We pose three ambitious goals in this paper to advance the research in network management. First, we describe the major developments in network research from 2000 to the present, emphasizing the most recent developments. The purpose of this chronological mapping is to illustrate how the disciplinary openings add to network management.

Second, based on the eight published articles in this special issue, we examine the nature and contributions of newly offered domain extensions to network management and clarify the distinctions between the growing number of labels that originate from nearby research domains (e.g., “business field,” “ecosystem,” “platform network”). At the same time, we specify the significance of networks and network management for these domain extensions.

Third, drawing on the analysis of the research and the contributions of the articles in this issue we propose a general theory of network management. The theory describes the contextual levels of environment, network, and actors that influence network management activities, and the adopted configurational view on management activities. The constructed framework will consolidate our fragmented knowledge and pave the way for more advanced and theoretically rigorous research.

We base our analysis on the major developments in the research field over the last 20 years and the novel contributions provided in the articles published in this special issue. The article will proceed from the description of the major developments of the field, to the network extensions and contributions on their management offered by the SI articles. Based on these analyses, we present the general theory of network management, and in conclusion, some suggestions for future research.

2. Evolution of business network management research: 2000 – 2016

Since the late 1990s, research on network management has evolved, both in terms of publication volume and in the new perspectives. To cover the developments of almost 20 years as

concisely as possible, we adopt a few guidelines. We focus our analysis on the research streams that we view as the most influential, and describe their main goals and conceptualizations with a few exemplary articles. Figure 1 depicts the evolution of the research domain in terms of these openings.

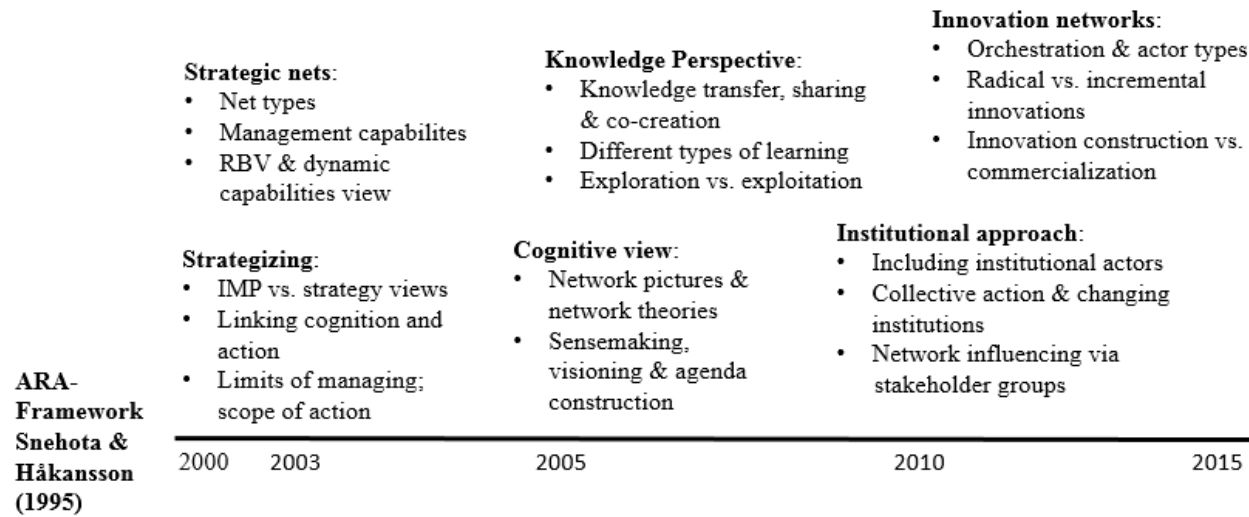


Figure 1. Major research streams in network management 2000–2016.

2.1. Research streams in network management research

2.1.1. Strategic nets perspective – enabling network management

The strategic nets perspective was introduced by Möller and colleagues between 2003 and 2007 (Möller & Svahn, 2003; Möller, Rajala, & Svahn, 2005; and Möller & Rajala, 2007). The use of the term “net” instead of “network” refers to an effort to distinguish these purposefully designed network organizations ontologically from the emergent (and borderless) view of business networks dominating the IMP research (Ritter, Wilkinson, & Johnston, 2004). Strategic nets are formed by a few actors pursuing specified mutual goal(s) and having jointly agreed and contractually defined roles and responsibilities. Actors relinquish part of their autonomy to the net to achieve goals beyond their individual resources.

By drawing on the resource-based view and the dynamic capabilities perspective, and on network research in strategy and organization theory the strategic nets approach proposes that business nets can be analyzed and classified based on their goals and the determination of their underlying value-creating systems (Parolini, 1999). Using these propositions, Möller and colleagues (Möller, Rajala, & Svahn, 2005; Möller & Rajala, 2007) constructed a value-system continuum and posited three types of strategic nets: current business nets, business renewal nets, and emerging business networks.

Current business nets are clearly specified and stable value systems. The actors producing and delivering specific offerings, and their activities, resources and capabilities, as well as business processes are known, indicating a high level of determination. Typical examples are multi-tiered demand-supply networks that are customary in the electronics and automobile industry.

Business renewal nets, in the middle of the value continuum, describe value systems which

are based on current value-creation systems and as such are well determined, but that are being modified by actors through incremental and local innovation activities, operationalized via multiparty projects, and targeting to improve current value systems (business and logistical processes, offerings, technologies, and actor interaction) (see examples in Möller & Rajala, 2007).

Finally, *emerging business networks* concern the network constellations through which new technologies, business concepts or even business fields are being created. In this sense, this domain concerns radical, discontinuous and system-wide change as illustrated by the birth of commercial internet or gene technology. It is characterized by dispersed and vaguely identifiable ideas about the future involving great uncertainty concerning the actors, activities, and resources necessary for their realization. Möller and Rajala (2007) identify three sub-types of emergent networks: innovation or science-driven, dominant design nets, and application nets, presented in diminishing order of value-system uncertainty.

The key point in the strategic nets approach is that because of the different ontological properties of each generic net type (and of the sub-types each subsume) it is possible to derive propositions concerning the management of these nets comprising specified suggestions of the suitable capabilities (Möller & Svahn, 2003), and mechanisms and organization (Möller & Rajala, 2007). In fact, the strategic nets approach offers a rare context-based management theory for business networks research providing an extensive set of empirically verifiable propositions.

2.1.2. Strategizing in business networks – drawing the limits to network management

Drawing strongly on the IMP business network view, the strategizing perspective is founded on efforts examining the nature of strategy or strategic behavior in the network context (Gadde, Huemer, & Håkansson, 2003; Holmen & Pedersen, 2003; Baraldi et al., 2007), and examining the interplay between cognition (network pictures) and action (strategizing activities) in empirical

network contexts (Abrahamsen et al., 2016; Harrison & Prenkert, 2009; Laari-Salmela, Mainela, & Puhakka, 2015).

The early discussion emphasized the interdependent and interactive nature of actors in network context, contrasting these conditions to the assumed autonomy of a firm in traditional strategy literature (Gadde et al., 2003). “Strategizing task is about identifying the scope for action within existing and potential relationships and about operating effectively with other within the internal and external constraints that limit that scope” (Håkansson & Ford, 2002, 137). This definition was elaborated by discussing the three network paradoxes, pointing to the limits of network management (Håkansson & Ford, 2002). In sum, a network is seen simultaneously as a structure of opportunities and constraints for strategic action.

Other studies have examined a variety of strategizing activities. Drawing on this literature, Harrison and Prenkert (2009) proposed three types of network strategizing. *Cognitive strategizing* covers network sensemaking, visioning and network picture formation (see also Tikkanen & Halinen, 2003; Laari-Salmela, Mainela, & Puhakka, 2015). *Positioning strategizing* addresses strategic decisions and actions related to influencing, maintaining and changing a focal actor’s network position and role (see e.g. Abrahamsen, Henneberg, & Naudé, 2012). Finally, *adaptation strategizing* refers to the purposeful adjustments made by actors to benefit from their network relationships (see e.g. Aaboen, Dubois, & Lind, 2013).

The main thrust of the strategizing perspective is laying out the special conditions that operating in a network context brings to strategic actions of a focal firm. The purposeful management of networks is not seen as possible, and therefore this stream has so far offered only generic managerial suggestions, especially compared to the strategic nets approach. This may change if the approach is combined with other theories enabling the drawing of more specific propositions.

2.1.3. Cognitive perspective – directing network management

The cognitive perspective to network management purports to provide theoretical tools and managerial suggestions for sensemaking and visioning in networks. These processes construct the “network theory” (often labeled “network picture”) of the focal actor influencing his/her evaluations, decisions and actions in terms of both feasible goals and strategic behaviors (Henneberg, Mouzas, & Naudé, 2006; Henneberg, Naudé, & Mouzas, 2010). The approach is part of the “cognitive turn” in management research.

Sensemaking has a privileged role in the approach because the network environment is not transparent but must be learned and “made sense of” through enacting with other actors and through cultural learning (Weick, 1995). A manager’s network theory – as representation of the network environment (Henneberg & Mouzas, & Naudé 2006) – extends an important influence on what he perceives as feasible actions and how the sensemaking process itself goes on. This affords considerable strategic power to sensemaking, also known as “network insight” (Mouzas, Henneberg, & Naudé, 2008) or “visioning” (Möller & Halinen, 1999; Normann, 2001). By using an early network theory, an actor can, by introducing attractive development agenda(s), influence the way in which other actors frame the situation, thus guiding their strategic actions (investments in resources and relationships). This kind of meaning giving power is especially relevant in the early emergence of major innovations or new business fields (Möller, 2010).

Key takeaways from the cognitive research include the characterization of the dimensions of the network pictures/theories (see Henneberg et al., 2006). Managers in different business contexts use different sets of dimensions and give them varying emphases in their network theories. This supports the types of nets proposed by Möller, Rajala and Svahn (2005).

Another major question is how the network theory and the resulting insight are constructed. Möller (2010) suggests that the creation of an actor’s network theory and agenda formation, and the resulting network influencing, are enabled by a firm’s network position and relationships, its

learning capacity and orientation (explorative versus exploitative). Mouzas et al. (2008) provide another important framework describing how individual managers' network theories are amalgamated through mindful interactions to the strategic insight at a firm level. "The result of managing ... multilateral exchanges, manifold rationalities and recurrent practices is described as network insight. It is an objectified managerial outcome that includes 'hard elements' which are measurable in terms of concrete deliverables...practices or organizational procedures, as well as 'soft elements' such as organizational learning and differential knowledge within a business network" (p. 173).

The cognitive perspective contributes to our knowledge of how firm- and individual-level actors make sense of and direct their actions concerning focal nets and the larger network environment. This research has produced managerially relevant frameworks and guidelines. The approach has direct links to the dynamic capabilities perspective and provides a more detailed understanding of the construction of specific management capabilities, addressed in the strategic nets approach through sensemaking, visioning and agenda construction. The cognitive perspective is also closely linked to the strategizing approach, forming the basis for strategizing activities.

2.1.4. Knowledge perspective – explaining differences in network management

Knowledge perspective is closely intertwined with the cognitive view. We wanted, however, to address it separately because of its central, although somewhat overlooked role in network management. Knowledge perspective addresses the role of various kinds of knowledge in the value creation in networks, and how actors – individuals and organizations – learn in a network context. According to the network view, organizations depend on their ability to accrue dispersed knowledge and technological resources held by other actors. Learning plays an important role in this process, requiring mutual understanding, adaptation, transfer, and co-creation of knowledge (Araujo, 1998; Dyer & Nobeoka, 2000; Håkansson, 1993; Kogut, Shan, & Walker, 1993).

Although knowledge perspective is embedded in many network management studies, it is seldom central to the study. One exception is the study by Håkansson, Havila and Pedersen (1999) which showed in a traditional industry the importance of supplier connections and networks for company learning. Another is Möller and Svahn's (2006) paper on the role of knowledge and learning in the three types of strategic nets. Möller and Svahn (p. 1000) claim that "...the ontological distinctions in value systems underlying the net types form different epistemic conditions. The level of determination of the value activities is reflected in the specificity of knowledge structures influencing the relevance of different modes of learning", especially the balance between exploration and exploitation activities.

The perspective offers several managerial suggestions. In current business nets, coordinated adaptive learning can support system efficiency, where knowledge integrators play a central role in coordinating often extensive value systems. The business renewal nets need a more generative learning culture, where the key is to bridge the boundaries of communities of practice (Amin & Cohendet, 2004), to make them work together and to adapt the resulting local innovations to the benefit of the larger net. In the emerging value nets, an innovation-oriented culture and activity in several nets increase an actor's exposure to emerging new ideas. Synthesizing skills are needed to process these ideas into a systemic vision of a business opportunity (Möller & Svahn 2006, 1001–1002).

The knowledge perspective is connected to the strategic nets approach, especially through the dynamic capabilities view and to the absorptive capacity literature (Cohen & Levinthal, 1990; Berghman et al., 2013). By examining the character of knowledge – based on the level of specification of the value-system underlying the net – knowledge perspective provides strong guidelines for understanding why we have different types of nets and network logics and how these can be constructed and managed. The approach offers guidelines for network organizing, use of multiparty teams, and knowledge co-creation, codification and sharing.

2.1.5. Institutional view – extending and challenging network management

The institutional approach addresses the construction of social, political and economic institutions and their influence on organizations and actors (Scott, 2001). “Institutions are the rules of the game in a society or, more formally, ... the humanly devised constraints that shape human interaction....Institutional change shapes the way societies evolve through time and hence is the key to understanding historical change” (North, 1991, 3).

In the network context, the institutional approach has been used in examining the collective construction of issue-based nets (Brito, 2001) and, more recently, the purposeful mobilization of complex innovation coalitions. Brito’s early work (Araujo & Brito, 1998; Brito, 2001) addressed how small wine producers, through collective action, influenced their institutional and economic environment. Recent examples of institutional entrepreneurship show how individual actors and their collectives can influence the construction of science and technology based commercial clusters (e.g., functional foods cluster, Ritvala & Kleynmann, 2012), persuade different stakeholder groups to adopt environmental policies and action (Ritvala & Salmi, 2010; 2011), and to change the dominant industry structure and logic (Matthyssens, Vandenbempt,, & Van Bockhaven, 2013).

The institutional approach offers several valuable additions to network management, especially in terms of purposeful orchestration of networks for the emergence of new business systems and/or modifying current business networks. An essential aspect is a strong social or political structure (institutionalization) and a need to influence or reconstruct it. An institutional entrepreneur (e.g., a start-up company or a strategic net) tries to influence key stakeholder groups by changing the institutional rules (e.g., breaking old industry recipes) using cognitive framing (agenda setting) and communication activities.

Institutional theory is a significant mediating approach, bridging the traditional IMP emphasis on organic emergence and the strategic nets perspective, assuming relatively strong network

management capacity (see the discussion by Matthyssens et al., 2013). By examining various collective forms of influencing, the approach offers promising managerial tools for orchestration of networks whether business fields, innovation systems, industries or clusters.

2.1.6. Innovation networks – uncovering network orchestration

Innovation networks studies focus on inter-organizational collaboration aiming at innovation, thus forming a specific context for the study of network management. Business networks research has always been interested in the co-creation of innovations (Håkansson 1987; 1990), but accounts for only a small portion of innovation network research conducted in the business and management field. Ongoing fragmentation of traditional industries, increased knowledge intensity and cost of R&D together with globalization of production and innovation practices have intensified inter-organizational interdependence and increased the extent of networked innovation (Adner & Kapoor, 2010). Another observation is that innovation networks are not an all-purpose category but exhibit great variety including science-driven networks, technology coalitions, dominant design networks, platform constructing networks, new product nets, and commercialization networks. Research in this broad domain is abundant. Within this stream, we single out a few recent studies that contribute to the purposeful design and orchestration of innovation networks, an important area of network management.

Several studies indicate that modes of network organization and orchestration capabilities vary across types of innovation networks (Möller & Svahn, 2009; Pisano & Verganti, 2008; Powell & Grodal, 2006). The inherent uncertainty concerning the technological and business opportunities in radical innovation emphasizes sensemaking, framing and visioning capabilities discussed in the cognitive stream. Visioning enables the identification of potential technological pathways and opportunities for future business development. As such, it forms a precondition for the construction

of a development agenda for influencing and mobilizing the relevant stakeholders (see e.g., Bessant, Öberg, & Trifilova, 2014; Möller, 2010).

At the risk of simplification, the early innovation phase with dispersed tacit knowledge and resulting uncertainty calls for open and flexible network forms and presumes strong cognitive capabilities – sensemaking, framing, visioning, and agenda setting (Möller & Svahn, 2009; Paquin & Howard-Grenville, 2013; Bessant et al., 2014). When the resources and value activities required in the innovation construction take shape, increasing the share of codified knowledge and favoring specific development paths – thus reducing uncertainty – the network coalitions become smaller and more tightly coupled. This calls for creation of joint goals, negotiated actor roles, working norms, and coordinating systems, in other words, more coordinated strategic net management (Dagnino, Levanti, & Mocciaro Li Destri, 2016; Partanen & Möller, 2012).

Another dynamic aspect in a focal network construction is the shifting balance between exploratory and exploitative practices. In the early phase of exploration – getting to know relevant actors and their capabilities – is more pronounced, but shifts later to more balanced combination of exploration and exploitation behaviors, to the utilization of each other's resources (Aarikka-Stenroos et al., 2014; Medlin & Törnroos, 2015; Möller & Svahn, 2006).

From a network management point of view, innovation networks represent a context rather than a theory-driven research stream. Innovation network research draws on several theoretical approaches. The briefly mentioned studies have clear links to the strategic nets approach, the cognitive and learning views, and increasingly also to the institutional perspective, and offer relevant managerial guidelines for network orchestration.

2.2. Remarks on the evolution of network management research

The discussion of the new openings in network management research since 2000 offers several observations. At the abstract level, one can discern two kinds of novelty: 1) those driven by a new disciplinary perspective enabling new conceptualization and insights to business networks and their management; and 2) those driven by interest in the specific context of network management. The cognitive and learning streams, as well as the institutional approach represent distinct disciplinary openings. Also strategizing is mostly theory-driven in limiting the scope of management and does not add content to it. Innovation research increases our understanding of a new application domain of network management, for instance management of radical or incremental innovations, or management of innovation creation or commercialization, and the strategic nets perspective focuses on management of a specific kind of net, a limited net of actors with a business purpose. These approaches rely on several theoretical sources.

Each research stream augments our knowledge of network management by supplementing the general network conceptualization with its own disciplinary scheme or perspective. The discipline-based openings, in particular, add to the explanatory power of the inherently descriptive and generic IMP network theory. The context-driven streams, in contrast, add to our understanding of contingencies specific to each management setting, facilitating the construction of context-driven and lower-level theories.

Another finding is that the research streams since 2005 (Figure 1) are extending the traditional domain of business networks and answering research questions concerning the macro network environment. They study the construction/orchestration of complex and often innovative network constellations and the management of networks in such recently introduced contexts as business fields, ecosystems or platforms. We now will discuss these extensions in the light of the articles published in this special issue.

3. New contributions to business and innovation networks – nature of network extensions and their management

In this section we introduce the eight articles of this special issue by analyzing their contribution to the network management research. Inspired by the impressive input the studies provide to the field, we chose two issues for further analysis and elaboration: the domain extensions of network management research and the advancement of network management knowledge offered.

First, we will provide conceptual clarification to the labeling issue that accompanies the domain extensions. Second, we will analyze the contribution of the studies, focusing on how each study approaches networks as manageable entities and what they reveal of network management as an activity. Table 1 presents an overview of the published studies.

Table 1. An overview of published articles.

Article	Purpose of the study	Domain extension in focus	Theoretical approaches used	Context and empirical focus	Key results ref network management
Aarikka-Stenroos & Ritala: <i>Network management in the era on ecosystems: A systematic review and a management framework</i>	Examines how the emergence of the ecosystem approach has been reflected in B2B marketing research and its implications for managing in networks.	Ecosystem A co-evolutionary business system of actors, technologies, and institutions.	A variety of research streams on ecosystems: business/service/innovation/ startup/ entrepreneurial/ platform/ branding.	Literature review; generic.	<i>Ecosystem as a layer</i> to be managed, and composed of an embedded set of networks with constantly evolving boundaries. <i>Ecosystems as a perspective</i> affecting management at the levels of networks, nets, portfolios of relationships and relationships.
Planko, Chappin, Cramer & Hekkert: <i>Managing strategic system-building networks in emerging business fields: A case study of the Dutch smart grid sector</i>	Examines how to manage networks for collective system building.	Business ecosystem (or sector) Needed to develop and optimize technology, trigger socio-cultural changes, and to create a market for the new technology, including changes in governmental regulations and user behavior.	Research on strategic networks complemented by literature on inter-organizational networks in public sector.	A multiple-case study of six strategic networks having a system building objective and selected from within the Dutch smart grid sector. System building relates to radical and sustainable technological innovations. The sector represents an emerging business field.	Identifies <i>key management factors (favorable network characteristics)</i> related to network composition, governance structure, managerial processes and relational factors. Elaborates how <i>the managerial practices</i> used with respect to these factors influence the perceived network effectiveness.
Mason, Friesl & Ford: <i>Managing to make markets: Marketization and the conceptualization work of strategic nets in the life science sector</i>	Examines the conceptualization work performed by a strategic net to bring about changes to markets and their broader systems of provision.	Market (or organizational field) Strategic nets conceptualize actors' roles, markets and goods as part of marketization process.	Strategic nets literature complemented by marketization literature driven by actor-network-theory.	A longitudinal study of a strategic net aiming at marketization of medical discoveries (innovations) in a life sciences context in the UK.	<i>Identification of practices</i> performed by a strategic net to generate <i>new and disruptive market devices</i> . Shows that the market devices re-configure markets, change how they are performed through new conventions of calculating and valuing, and re-present new forms of scientific and market knowledge.
Van Bockhaven & Matthyssens: <i>Mobilizing a network to develop a field: Enriching the business actor's mobilization analysis toolkit</i>	Explores how business actors can tackle the behavioral challenges faced when they mobilize a network to introduce radical innovations into their field.	Business field Such fields acknowledge the role of not just the players directly involved in value creation and exchange, but also that of the outsiders influencing it, even before a market is formed.	Strategic networks literature used in combination with stakeholder theory and social movement theory.	A thought experiment related to the introduction of personalized medicine into the field of health care in Belgium.	<i>Identifies six analytical voids</i> in stakeholder theory, social movement theory and strategic business net theory, with respect to network mobilization that aims to develop a field. <i>Proposes three tools</i> designed to capture patterns of unaddressed information needs in the identified voids: stakeholder utility functions, stakeholder mental model maturity map, and value-based influence paths.

<p>Aarikka-Stenroos, Jaakkola, Harrison, & Mäkitalo-Keinonen: <i>How to manage innovation processes in extensive networks: A longitudinal study</i></p>	<p>Investigates how an innovation can be managed from visioning to commercialization in an extensive network characterized by actor diversity.</p>	<p>Extensive networks Complex network context, comprising of a wide range of actors whose input are needed throughout the innovation process.</p>	<p>IMP business network view, strategic networks, and innovation management and networks literatures used in combination.</p>	<p>A longitudinal case study of two innovation cases from healthcare/welfare industries in Finland; one representing an incremental, the other a radical innovation.</p>	<p>Refines <i>six management activities</i> portrayed in previous studies, and introduces a <i>new activity: leveraging</i>. Indicates connections among management activities.</p> <p>Shows how actor diversity can both support or complicate management; how the innovation goal (radical vs. incremental) affects the emphasis on management activities; and how agency of management may change along the innovation process.</p>
<p>Perks, Kowalkowski, Witell & Gustafsson: <i>Network orchestration for value platform development</i></p>	<p>Examines how lead firms orchestrate network relationships to support and build novel value platforms.</p>	<p>Value platform Viewed as dynamic configurations of (tangible and intangible) resources that act as a foundation upon which network members co-create value through a set of specific practices.</p>	<p>Strategic networks, organizational networks, and innovation networks approaches used in combination.</p>	<p>A multiple case study of six platforms from different industries in Europe, in which the value-creating systems varied, from renewal to emergence of new ones.</p>	<p>Specifies <i>network orchestration mechanisms</i> and identifies the <i>underlying practices</i>, which either facilitate or impede the way firms orchestrate the network.</p> <p>Shows that <i>connectedness of orchestration mechanisms</i> is important in explaining the effectiveness of the way lead firms orchestrate value platform development.</p>
<p>Matinheikki, Pesonen, Artto, & Peltokorpi: <i>New value creation in business networks: The role of collective action in constructing system-level goals</i></p>	<p>Examines how multiple organizations collectively form a system-level goal, and how this affects new value creation at the level of the whole network.</p>	<p>N.A. Focus on networks in general.</p>	<p>Research on business networks complemented by literature on meta-organizations (collective action by autonomous organizations).</p>	<p>Case study of two Finnish health care networks that developed innovative joint treatment practices for the better care of patients. Cases involved with innovation and uncertainty, aiming at new value creation.</p>	<p>Forming a system-level goal requires participation of multiple actors in framing and agenda construction. Identifies moderators to the interactive and collective process of determining a system-level goal, and suggests that the network architect has an important facilitating role. The collectively formed goal encourages actors to commit, which leads to positive network level outcomes.</p>
<p>Bayne, Schepis & Purchase: <i>A framework for understanding strategic network performance: Exploring efficiency and effectiveness at the network level</i></p>	<p>Develops a framework to understand how strategic network processes contribute to its efficiency and effectiveness and the overall performance of the network.</p>	<p>N.A. Focus on strategic networks, which are understood as intentionally constructed subsets of three or more actors purposefully collaborating towards specific goals.</p>	<p>Research on strategic networks and IMP complemented by literature on inter-organizational networks in public sector.</p>	<p>Case study of two strategic networks operating in agribusiness sector in Australia. Cases represent government- and market-driven CSR initiatives related to environment and animal welfare; and different value-creating systems: one renewal network, one emerging network.</p>	<p>Identifies ARA-model related <i>management activities that influence strategic network effectiveness and respectively strategic network efficiency</i>.</p> <p>Proposes that achieving both efficiency and effectiveness positively influences perceptions of overall strategic network performance. Achieving network efficiency without achieving network effectiveness may result in negative overall strategic network performance perceptions.</p>

3.1. From business networks to ecosystems and beyond – a conceptual clarification

The domains and organizational constellations of business and innovation activities are receiving an increasing number of labels (sectors, ecosystems, fields, platforms). This is not a mere semantic issue but raises numerous theoretical questions. To what extent do we talk about the same phenomena or about various embedded or linked phenomena? How do these relate to the network approach? To what extent do the network theory and especially the network management knowledge cover these new domains? Conversely, what new perspectives do these extensions add to network management knowledge? Six of the eight articles in this special issue address network management applications in new domains. Table 1 shows the domain extension studied in each article. We will examine the domains in ascending order of generality and start with the constructs of sector and cluster.

3.1.1. Sectors and clusters

Planko, Chappin, Cramer and Hekkert (this issue) how a specific economic sector is being (re-)constructed through intentionally developed “system-building networks” comprising interrelated and coordinated networks intended to develop a new smart grid technology for the Dutch energy sector. Planko and colleagues argue that emerging or changing sectors can be transformed by centrally coordinated strategic nets. This corresponds to our view of sectors, even if the Planko and colleagues call it a “business ecosystem” (see Table 1). The term “sector” derives from traditional economics (primary sector, manufacturing sector, service sector), and has been used more recently with the “cluster” concept (Porter, 1990), to refer to interrelated industries of economic activity (Kendrick, 1996) and is also used in evolutionary economics to cover both production and innovation, including institutional aspects (Malerba, 2002; 2005). For example, the

forest sector can include “forestry – seeding, planting & harvesting,” “forest machinery,” “saw mills,” and “pulp & paper mills.” That is, sectors or clusters are formed by interrelated sub-industries.

As sectors are comprised of interrelated industries, the question of the relevance of network approach and network management returns to the roots of industrial network theory (Axelsson & Easton, 1992). If a sector or cluster, or any subdomain, resembles working product/service markets (with several relatively independent and competing suppliers, middlemen, and customers), the network approach is less than useful. If however, a sector consists of webs of interrelated networks and their actors, network theory and its management notions form an effective research approach as stated by Planko and colleagues (this issue).

3.1.2 Business field

The term “field” is used often for referring to business and innovation domains. Van Bockhaven and Matthyssens (this issue) examine how to mobilize a network for transforming the practices of part of the health care field, more specifically a sub-domain of personalized medicine. Mason, Friesl and Ford (this issue), in studying the marketization activities of new life science discoveries carried out by a strategic net, are addressing an organizational field (note: this is our interpretation). Möller and Svahn (2009) use the term “field” in their discussion of the “networked” emergence of new business fields.

What is the difference between a field and market or sector? A field does not presume any clear market structure and by adopting a sociological perspective, emphasizes the presence of a broader set of actors than does the market (Granovetter, 1985; Martin, 2003, for an earlier elaboration of the field concept see Möller & Svahn, 2009). The concept is anchored in institutional theory and refers, according to DiMaggio and Powell (1991, 64–65), to “those organizations that in the aggregate, constitute a recognized area of institutional life: key suppliers, resource and product

consumers, regulatory agencies, and other organizations ...” The field approach also puts emphasis on the inter-organizational links between actors and their cognitions of the emerging business field (Lawrence & Phillips, 2004; Greenwood, Suddaby, & Hinings, 2002). The field construct assumes inter-organizational relationships and various network formations but adds an institutional setting with non-business actors (Kenis & Knoke, 2002). In a way, the construct can be interpreted as an institutional description of sectors or clusters and their subsets. We see the field approach as a highly useful extension to business network perspective, which forces researchers and managers alike to take into account the complex array of institutional norms and stakeholders. In brief, the field concept does not replace the network perspective but augments network management with significant suggestions of how to influence various stakeholder groups and the institutional norms as presented by Van Bockhaven and Matthyssens (this issue) and by Mason et al. (this issue).

3.1.3 Ecosystem

The ecosystem perspective, drawing originally on biological ecosystems to describe differences in the nature of industries and also seen as a third mode of economic organizations besides markets and hierarchies (Moore, 1993; Moore, 1996), has rapidly gained currency in describing collaborative forms of constructing innovations and business coalitions (Adner & Kapoor, 2010; Autio & Thomas, 2014; Frow, McColl-Kennedy, & Payne, 2016). The drawback with the ecosystem’s popularity is, as Aarikka-Stenroos and Ritala (this issue) argue is that the term “... has become a buzzword, sometimes adding very little to the analysis. Indeed, a critical look at the rapid expansion of B2B studies using the concept reveals that it is used in a variety of ways, ranging from a synonym for business networks to an analogy for interconnected environments, and even to describe a full-fledged theoretical and empirical approach”. Aarikka-Stenroos and Ritala (this issue) offer an extensive analysis of how different disciplines use the ecosystem perspective. They distinguish business ecosystem, innovation ecosystem, entrepreneurial and start-up

ecosystems, platform ecosystem, and service ecosystem literatures, and their sub-categories. Based on a comprehensive literature analysis, the authors suggest two approaches to ecosystems from the network management perspective: “ecosystem as a new layer” to be managed, adding to Möller and Halinen’s (1999) framework of network management levels, and “ecosystem as a novel perspective to business networks, which involves providing an update to current business network frameworks.”

We see that most authors using the ecosystem term combine the “layer” or domain view and the “perspective” view. When treated as a domain, we should ask what are the differences between “sector/cluster”, “field”, “network environment”, and “ecosystem”? What new dimensions or characteristics does the ecosystem description provide? It seems that the broad ecosystem applications (ecosystem as a metaphor for industries, sectors, and clusters) assume that the focal domain is composed of interrelated actors having competitive and collaborative relationships and various aims for influencing and even directing the co-evolution of the focal domain. These larger “ecologies” can comprise several interrelated and competing “business ecosystems” often driven by a hub firm (e.g., Apple’s iPhone/iTunes ecosystem, Google’s Android ecosystem), and constituting, with an array of technology providers “platform ecosystems” and with even other, non-business actors “mobile phone/services ecosystems”. The mobile phone/services ecosystem may be depicted as part of a more extensive ecosystem comprising all electronic and software fields (and their science and research extensions). This simplified example raises the following observations.

First, all domain-type of ecosystem applications can be described through the actors-resources-activities metalanguage, meaning that the IMP network theory can describe ecosystems. Second, the different views on ecosystems overlap with the other labels; more expansive ecosystem applications (ecologies) seem very similar to the business field conceptualization (DiMaggio & Powell, 1991; Kenis & Knoke, 2002), while most of the more limited applications are analogous to the strategic nets proposed by Möller, Rajala and Svahn (2005). This is clear from Adner’s (2006,

98) definition of ecosystems as “the collaborative arrangements through which firms combine their individual offerings into a coherent, customer-facing solution.” This is a neat way to describe a strategic net. Underlying our hint of irony is the worry that those ecosystem enthusiasts that are not familiar with business and innovation network research (or institutional studies) are reinventing the wheel, a serious problem in social sciences and one that is especially pertinent to the silos of business studies.

This does not mean the ecosystem approach is without merit – quite the contrary. The perspective forces us to develop theoretical tools for deeper understanding of the processes and mechanisms that drive the construction and change of business fields, noting both institutions and technologies as part of them (Adner, 2017). Institutional theory and evolutionary economics, together with cognitive and learning theory seem useful sources for more advanced studies. The broad ecosystem studies can contribute to the innovation network orchestration research and vice versa, and it seems clear that the more focal-, hub- or coalition-centered ecosystem researchers would benefit from interaction with strategic nets scholars.

3.1.4. Platform ecosystem

The platform concept, as a business ecosystem, has proliferated in the business and technology research. Thomas, Autio and Gann (2014) identified four literatures that use the construct. It can denote organizational (internal) platforms, product family platforms (internal or coalition-based), market intermediary platforms, and platform ecosystems. For us the last one is of most interest (Thomas et al., 2014, 201): “For the platform ecosystem stream, the platform is a set of shared core technologies and technology standards underlying an organizational field that support value co-creation through specialization and complementary offerings.” This stream draws on a variety of theoretical perspectives, including industrial community, economic externality, and

resource dependence perspectives. This definition ties platform ecosystems to the business ecosystem and organizational field conceptualizations.

In this issue, Perks, Kowalkowski, Witell and Gustafsson (this issue) see that although the platform concept has traditionally been technology- and product-based, “they are shifting towards a value and network-centric notion in that they evolve from the joint actions of network actors rather than the features and attributes of products.” Emphasizing their value-creating character, the authors call them “value platforms,” and suggest that a network of actors can, by constructing a value platform, create a value system, enhancing the competitiveness of the network and its members.

This proposition corresponds to the strategic nets theory including the notion of value creating systems – and their varying logics effective in different types of strategic nets (Möller & Svahn, 2003; 2006). The strategic nets approach covers well the more focused platform ecosystems (or “value-platforms” built by and for a limited number of actors). The construction of broader and less well-defined platform ecosystems poses more open questions for network management. Involving orchestration of not only business firms and various technological actors but also regulators and other stakeholders, this stream could utilize knowledge available from innovation network research and institutional theory. In sum, we see platform ecosystems as being constituted by webs of inter-organizational relationships, making them comparable to business networks.

3.2 The nested nature of domain extensions

Figure 2 shows the domain extensions and their relations to strategic net management, summarizing the results of our analysis. The boxes represent the domain of each extension and denote the nested and overlapping character of the four domain extensions and the strategic net. Arrows indicate the main aspects that the extensions add to the network management agenda, challenging its use in these domains but also offering ideas for development.

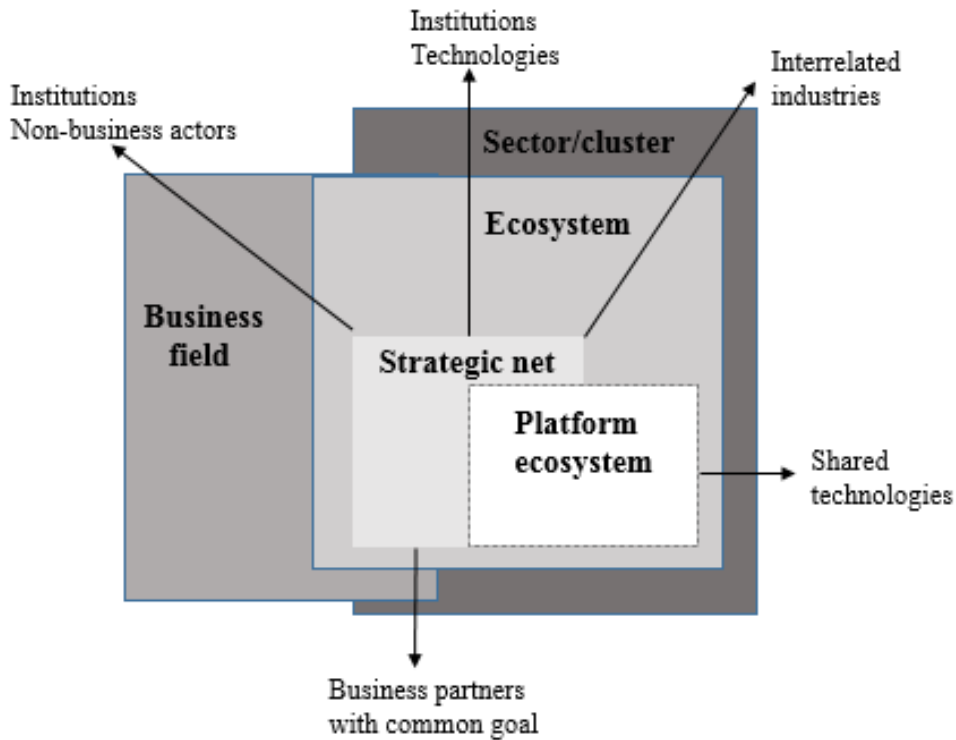


Figure 2. Nested domain extensions for network management.

We wish to stress the nested nature of the domain extension definitions. This means that a sector consists of several business fields, which themselves can contain a subset of hub- or coalition-driven ecosystems, which correspond to strategic nets and often contain underlying platform systems (see Figure 2). That said, each construct does not have to refer to a unique empirical domain; rather, various constructs summarize a perspective constructed by a particular research community (e.g., economists describing economic sectors, institutional and organizational theorists and strategy researchers providing characterizations of organizational fields, and technology and business researchers stressing the role of platforms). With diverse theoretical lenses we can reveal different aspects of complex phenomena. All domain extensions represent complex socio-techno-economic systems requiring multi-theoretical descriptions, as shown in the theories and chosen for the eight studies in this issue (see Table 1).

It is, however, important to note that the network view to management, i.e. the IMP network theory and the strategic nets perspective, have much to offer for management research in the new domains. We argue that actor behavior and relationships in all domain extensions, ranging from economic sectors to value platforms, can be described in the actors-resources-activities metalanguage offered by the IMP-driven business network approach, and that the key contingencies identified in the strategic nets perspective offer a valid frame for studying management in these extended actor settings.

To demonstrate the value of the network management approach, we next examine the findings of the eight articles in this special issue in terms of how they address and generate new knowledge of network management in the selected contexts.

3.3. Advances in network management

Even after two decades of research, network management is a strongly progressing, but also controversial domain. The articles in this SI bring up issues that will add momentum to the further development of the area. We will present and discuss these issues in relation to several key areas in network management: the levels or domains to be managed, the embedded character of network management, nature of actors forming the networks and the issue of agency, and finally the content of network management. Table 2 shows the perspectives of the articles in this special issue and their contributions to network management. Although these dimensions and their contents are interlinked, for the sake of conceptual clarity we will address them separately.

Table 2. Perspectives on network management in published studies.

Article	Issue of network management in focus	Analytical approach to networks (nested levels)	Nature of actors in the managed networks	Agency in management	Management activities addressed
Aarikka-Stenroos & Ritala: <i>Network management in the era on ecosystems: A systematic review and a management framework</i>	Implications of the ecosystem approach for managing in networks.	Networks as nested multi-level structures or networks, nets, portfolios and relationships, and embedded in ecosystems.	Diverse actors: end-users, customers and user communities, developers and research organizations, competitors, and complementors, and institutional actors.	Left open, no stance taken. (Implicit assumption: single organization managing networks).	An array of activities related to ecosystem, network, net, relationship portfolio and relationship management. E.g. building relationships over conventional industry borders, sensing opportunities, developing interfaces, mobilizing diverse resources, coordinating between inter- and intra-organizational relationships.
Planko, Chappin, Cramer & Hekkert: <i>Managing strategic system-building networks in emerging business fields: A case study of the Dutch smart grid sector</i>	Effective network management for collective system building.	Strategic networks aiming to develop/ forming a business field or a business ecosystem.	Diverse actors: from both private and public sector, incl. research institutes and user groups.	Both companies and public sector actors as initiators. Individuals emphasized as network leaders and managers.	Network level management factors categorized in four groups: network composition, governance structure, managerial processes, and relational factors. Effective, more detailed practices in each category identified for system building networks.
Mason, Friesl & Ford: <i>Managing to Make Markets: Marketization and the Conceptualization Work of Strategic Nets in the Life Science Sector</i>	Nature of disruptive conceptualization work and how it transforms market practices and devices, creating a market for an innovation.	A strategic net embedded in markets and the broader system of provision.	Various private companies but also some public sector actors in the strategic net.	Role of managers and single actors emphasized as agents within the strategic net.	Routine-like management practices the strategic net performs related to conceptualizing of actors' roles: identifying, enrolling and mobilizing; goods: bundling, positioning, and valuing; and markets: mapping, representing, and calculation.
Van Bockhaven & Matthyssens: <i>Mobilizing a network to develop a field: Enriching the business actor's mobilization analysis toolkit</i>	Identifying behavioral challenges business actors face when mobilizing networks in order to introduce radical innovations, and proposing tools to tackle these challenges.	Business actor embedded in networks and aiming to develop a business field.	Diverse actors: actors directly involved in value creation and exchange and various outsiders and stakeholders influencing it.	Business actors and strategic nets taking a field level agency.	Focus not in activities but in behavioral challenges and information-adding analytical tools available for network mobilization.

Aarikka-Stenroos, Jaakkola, Harrison, & Mäkitalo-Keinonen: <i>How to manage innovation processes in extensive networks: A longitudinal study</i>	Management of an innovation process within extensive networks characterized by actor diversity.	Innovation process embedded in extensive network, i.e., a large-scale and dynamic context.	Diversity of actors emphasized. Multi-sector collaboration, and private and public actors needed.	Core actors or a hub firm. Agency may transfer from one actor to another along the innovation process.	Key management activities: motivating, resourcing, goal setting/refining, consolidating, coordinating, controlling, and leveraging; with some different emphases on radical and incremental innovations.
Perks, Kowalkowski, Witell & Gustafsson: <i>Network orchestration for value platform development</i>	The mechanisms and practices of orchestrating network relationships for developing novel value platforms.	A business actor managing the network around a value platform, that relates to a certain technology and product.	Various private business actors.	Lead firm in charge (a platform leader).	Specification of four network orchestration mechanisms and connections between them: envisioning, inducing innovativeness, legitimizing, and adjusting. Identification of underlying practices, which either facilitate or impede the way firms orchestrate the network.
Matinheikki, Pesonen, Artto, & Peltokorpi: <i>New value creation in business networks: The role of collective action in constructing system-level goals</i>	The collective process of system level goal formation and its determinants.	Single organizations embedded in networks (and forming a system level goal)	Diverse actors: private, public, and non-governmental organizations.	A network architect, as an important facilitator.	Focus not in network level management activities but factors explaining how the collective formation of a system-level goal is linked to network-level value creation.
Bayne, Schepis & Purchase: <i>A Framework for Understanding Strategic Network Performance: Exploring Efficiency and Effectiveness at the Network Level</i>	Examining how strategic network processes contribute to its efficiency and effectiveness and overall performance at the network level of analysis.	Strategic networks embedded in broader networks.	Diverse actors: both private and public organizations; government agencies and consultants in important roles.	Problematizing the issue of either governmental or business actor taking the agency.	Strategic network processes – building actor webs, developing collective sensemaking, developing activity patterns and utilizing resource constellations.

3.3.1. The levels and domains of networks to be managed

In the 1999 network management framework (Möller & Halinen, 1999) we identified four levels of management: industries as networks, firms in networks (or nets), portfolios of relationships (and nets), and exchange relationships. Later Möller, Rajala and Svahn (2005) elaborated the framework by integrating the idea of strategic nets and portfolios of nets into it. Since then, emphasis on network management research has moved from relationships to strategic nets and boundless networks. This trend is most strongly manifested in the contributions to this issue, which offer valuable suggestions for developing management at these upper levels, labeled as ecosystems, sectors, business/ organizational fields or value platforms (Table 1).

By drawing on the institutional theory, the business field approach complements the network perspective with an institutional conceptualization. It empowers the researcher to identify and analyze the various non-business actors and stakeholder groups constituting the field (in addition to business actors). Further, the approach sensitizes him/her to examine the nature and sources of the institutional rules and norms influencing the development of the field and the business opportunities and practices (Edvardsson et al., 2014); and vice versa, how these rules and norms can be shaped and even constructed by collective action (Van Bockhaven & Matthyssens, this issue).

Aarikka-Stenroos and Ritala (this issue) develop the idea of ecosystems as a separate layer for the network management framework or a perspective to be adopted in managing at other distinguished levels. We do not, however, regard ecosystems as an additional layer beyond “industries as networks” but argue rather (as discussed in section 3.1.) that ecosystems, business fields as well as sectors/clusters all give alternative approaches for analyzing the character of the networked environment. By concerning themselves with the role of firms and collectives (e.g., strategic nets) these approaches provide new and much-needed conceptual tools for examining the

management and transformation of networks. The social movement theory (Van Bockhaven & Matthyssens, this issue), theory of collective action (Matinheikki et al., this issue) and Actor-Network-Theory (Mason et al., this issue) provide good examples. These theories do not replace the actors-resources-activities view of the IMP School, but supplement it. Used in combination, they lay a more powerful foundation for analyzing the orchestrated construction of business fields and ecosystems.

The offered domain extensions imply that we should discard the strong distinction between the views of “completely open networks or boundless network environments” and “fully closed nets” and start to think in terms of a continuum of fields/ecosystems varying in their relative openness versus closure (Möller & Svahn, 2003; Prekert, 2015). The findings of Aarikka-Stenroos and colleagues (this issue) and Mason and colleagues (this issue) emphasize the need to see strategic nets as more plastic and changing entities with respect to their constellation; the key actors over the innovation or marketization process are likely to change.

The articles in this issue break new ground in network management studies, but obviously they also raise questions for future research to answer. Several articles, for instance, describe the emergence of new business fields and ecosystems (e.g. Planko et al. this issue; Mason et al. this issue); Van Bockhaven & Matthyssens, this issue) and answer the recent call for a better understanding of the emergence of new fields instead of focusing on existing systems and their change (Dattée, Alexy, & Autio, 2017; Möller & Svahn, 2009). However, more research is still needed to answer questions such as: how do new ecosystems come into being? Is there systematic variety between the emergence of different types of ecosystems? And if so, why?

3.3.2. The embedded character of network management

Besides the challenges in the operating environment, network management is complicated by its embedded character. In our framework (Möller & Halinen, 1999; Möller et al., 2005), we depicted network management through four nested levels. The events and actions in each level may influence others, and the flow of influence between levels is two-directional and often simultaneous. The same applies to business fields and ecosystems, and their constituent network constellations.

It is essential for network management researchers to recognize the contextual layers (structures and their conditions) and mechanisms influencing the situated managerial activity within them. In research practice, it is often necessary to choose one analytical approach that combines two levels, defines the analysis and keeps it manageable (Wilke & Ritter, 2006). In the articles of this issue, several levels of analysis are used: single actors operating in strategic nets (platforms) (Perks et al.), in networks (Matinheikki et al.) or in influencing an emerging business field (Van Bockhaven & Matthyssens) (see Table 2). Several contributors focus instead on strategic nets in broader networks (e.g. Bayne et al., this issue) or in markets (Mason et al., this issue), or in business ecosystem (Planko et al., this issue). Aarikka-Stenroos and colleagues (this issue) offer still another type of embeddedness that goes beyond mere structures: innovation process embedded in extensive networks. These choices reflect the micronet-macronet perspective proposed by Halinen & Törnroos (2005), and indicate a greater effort to comprehend the interactions and dynamics relevant for the management of collective efforts vis-à-vis the networked environment.

For the manager, embeddedness poses a dual challenge in that s(he) should be able to analyze how the nested character of influencing mechanisms affects the kind of strategic alternatives s(he) is able to conceive, and the feasibility and potential of recognized strategic alternatives to influence the contextual factors that drive the future performance of the chosen action. In more concrete terms, the embeddedness concerns issues like what customer and supplier relationships to prioritize, which strategic nets, focal ecosystems, or platforms to try to join or to orchestrate, and which

emergent science and technology coalitions to connect with. For identifying the causal mechanisms influencing these decisions, each research stream or domain offers different managerial guidance. The strategic nets approach suggests analyzing the critical resource dependencies (Partanen & Möller, 2012), the institutional view underlies the understanding of the influencing power of relevant stakeholder groups (Van Bockhaven & Matthyssens, this issue), and the platform perspective guides us to examine the power of platforms, their constituent technologies and their holders (Perks et al., this issue). Platforms, as “resource integration devices,” constitute a relatively new and promising perspective for understanding the mechanisms guiding the network formation (Thomas et al., 2014).

3.3.3. The nature of actors and their agency in forming the net/networks

The industrial network theory holds a broad view of actors, who can range from individuals, groups, and organizations to strategic nets, and other forms of collaborative coalitions (Wilke & Ritter, 2006). In practice, however, the majority of business network research has addressed various kinds of firms and organizations. Several of the new research openings emphasize the relevance of non-business actors especially for the construction of new innovation and commercialization networks or for trying to orchestrate major change in existing business fields (see Table 2). For example, in the highly institutionalized healthcare sector, regulators, public financing institutions, professional associations, patient groups, and individual experts can affect the commercialization of new medical treatments and forms of health care (see Aarikka-Stenroos et al., this issue; Matinheikki et al., this issue; Van Bockhaven & Matthyssens, this issue; see also Frow, McColl-Kennedy, & Payne, 2016). Another expanding phenomenon is the role of public-private partnerships in the development of science and technology driven new commercial offerings. These

include science parks, business accelerators and other forms of entrepreneurial networks (Mason et al., this issue; Partanen, Chetty, & Rajala, 2014; Rampersad, 2016).

Compared to the business actors, non-business actors bring very different orientations and goals to the innovation and business development networks, ranging from societal, regional and local development aims, to the more specific benefits sought by stakeholder groups (Aarikka-Stenroos et al., this issue; Van Bockhaven & Matthyssens, this issue). This complicates the mobilization as well as goal formation of multiparty coalitions and calls for new tools for creating understanding of the stakeholders' varying value-orientations (Van Bockhaven & Matthyssens, this issue).

The increasing variety of stakeholders relevant in the construction of strategic nets and various innovation coalitions raise the issue of agency. Who is/are actually managing in business networks, fields or ecosystems? Most studies of business networks seem to award managerial agency to a firm or organization and examine how these carry out network management activities in various contexts. Key managers are often given a central role and the firm is seen as their "extensions" in terms of managerial actions taken (e.g., Nordin, et al., in press). Agency can also be ascribed to a network organization or some other form of coalition. This is typical especially in examining the actions of the strategic nets driven by a hub firm (Möller & Svahn, 2003).

In the articles of this issue, the question of agency only became visible through the empirical results or occasional remarks; none of the studies investigated the nature of agency, the level of concentration or locus of power in leading the network. The role of a single company or manager as a leader of the network was taken for granted, without further problematizing. Planko et al.'s article (this issue) on a sectoral re-organizing in the Dutch smart grid business identified a distributed agency between a leader and a manager person; Bayne et al. (this issue) addressed the differences of public or private sector organizations as initiators of network collaboration. The idea of Van Bockhaven & Matthyssens (this issue) on strategic nets assuming field level agency is interesting,

but is not further elaborated. In sum, the topic of agency in managing networks leaves much room for future research.

3.3.4. The nature of network management

The previous sub-sections have described various aspects of network management. Here we pay attention to managerial activities and their challenges. Activities is used as an umbrella concept covering, managerial actions, capabilities and organizational forms involved, and sets of interlinked activities, also called as mechanisms. Management dimensions and elements concepts are also often used for this purpose (Järvensivu & Möller, 2009).

Our knowledge of network management has been dominated by the capability perspective, effectively endorsed and disseminated by the strategic nets approach (Möller & Svahn, 2003; Möller et al., 2005), and by the cognitive perspective, assigning a central role to the actors' network pictures and their related sensemaking capability (Henneberg et al., 2006). We asked, to what extent is our current network management knowledge sufficient for covering the new domain extensions with their additional environmental complexity? As a consequence, to what extent do we need new disciplinary openings to generate the needed knowledge? Again, the contributors to this special issue offer insights and suggestions.

Many of the articles regard management as an activity, and identify several key processes of management (see Table 2, last column). Moreover, this takes place in the extensive networks, and in various extended network contexts. Most of the studies examine the possibilities of network orchestration/management in innovation, new business field or ecosystem contexts characterized by uncertainty and the need to make sense and influence non-business actors (see Table 2).

As space limitations preclude a full presentation of eight excellent studies, we have chosen three prominent themes related to activities for further discussion: 1) management activities

perceived as practices, 2) network management seen as a process including the element of change; and 3) the managerial primacy of seeking performance with network management.

Several studies adopt a practice perspective adding to the capability and cognition-driven management knowledge (e.g. Mason et al., this issue; Perks et al., this issue). Mason and colleagues use the marketization perspective and Actor-Network-Theory to examine through what kind of work a strategic net constructs marketization for life-science-based invention(s). They focus on conceptualization work and identify three categories of practices: conceptualizing actors' roles (via identifying, enrolling, mobilizing), conceptualizing markets (via mapping, representing, calculating), and conceptualizing goods (via bundling, positioning, and valuing). Their article provides a highly significant new understanding of the practices, tools and types of knowledge involved in these conceptualizations through which a strategic net can generate new market devices that transform market rules and conventions, and introduce new methods and instruments of valuation that change the market.

Studies in this issue emphasize creating new business fields, getting innovations to the market, and working towards new value creation through networks. The dynamics of network management, especially in the context of innovation networks, pose a major management challenge. The longitudinal case study by Aarikka-Stenroos and colleagues (this issue) adopts the process view on innovations, covering the entire process from its envision-based beginning, through development, to commercialization, revealing the essential management activities (see Table 2, and also Aarikka-Stenroos et al., 2014; Möller & Svahn, 2009; Paquin & Howard-Grenville, 2013).

Although several articles in this special issue describe network performance in terms of "effectiveness, efficiency, or outcomes/goals" (e.g., Matinheikki et al., this issue; Planko et al., this issue) this under-researched topic is the focus of Bayne, Schepis and Purchase's contribution (this issue). They open a much-needed discussion on our knowledge of network performance from the standpoints of effectiveness and efficiency of an entire network. Bayne and colleagues argue that it

can be tricky to measure network performance because different individual and organizational participants can perceive it in different ways (Huxham & Vangen, 2005; Ford & Håkansson, 2006) and because performance can vary by the type and/or contextual nature of the network (Möller & Svahn, 2003). Examined at the network level, evaluating performance also raises the question of “effectiveness for whom?” (Provan & Kenis, 2008, 229). The results of Bayne and colleagues (this issue) suggest that building strategic network actor webs and developing collective sensemaking are crucial for improving strategic network effectiveness, whereas network efficiency is mostly influenced by use of resource constellations and developing activity patterns. Moreover, pure efficiency gains without effectiveness may even degrade perceived network performance suggesting that these two dimensions are linked. These are highly welcome empirical findings for this complex and insufficiently studied phenomenon.

Our analysis of network management and the brief introduction to the articles in this special issue have revealed a wealth of new theoretical insights and empirical findings. We have not attempted to summarize these detailed studies but highlighted some of their key findings. As always, insightful research not only enriches our knowledge base but enables us as researchers to pose more sophisticated questions. Based on our reading we see many questions whose answers will advance the development of network management theory.

Studies provided extensive reviews of diverse network management aspects or elements in a variety of domain contexts. This urged us to ask, in terms of theory development, to what extent are strategic net management, innovation management via networks, orchestration of business ecosystems, networked construction of value-platform management, or management of complex systems building networks distinct from one another? In other words, do we need context-dependent sub-theories of network management or can we construct a general theory of network management? A general theory would require linking the differences in network management to a

limited set of contextual factors influencing – or even causing – those differences. As our last endeavor in this introduction, we turn to this challenging issue.

4. Consolidation of knowledge – Towards a general theory of network management

In this section we offer an integrated view of the current knowledge of managing business and innovation networks by constructing a Network Management Framework (NetFrame), which consolidates the main streams and elements of the last decade of network management research into the contributions in this special issue. We contend that the framework and its underlying logics are an important step towards a general theory of network management. Figure 3 depicts the Framework.

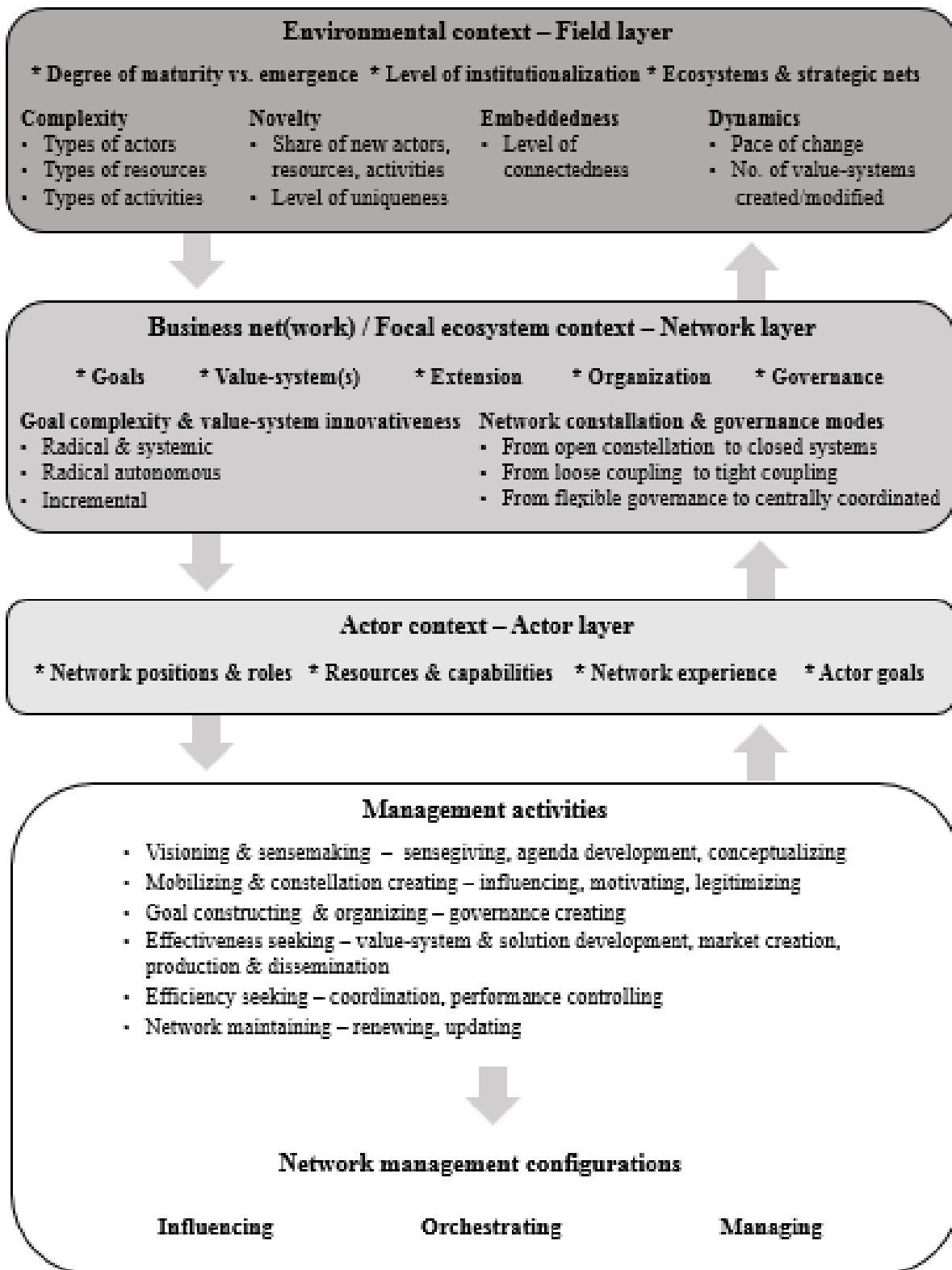


Figure 3. General theory of network management (NetFrame).

Our discussion of the new research openings and domain extensions in network management in sections 2 and 3 has underlined the broad and fragmentary character of network management

research. Understanding and using this kaleidoscopic knowledge base requires consolidation, but this is no easy task. It should be carried out by retaining the richness of our management knowledge and yet providing compelling theory-driven guidelines for understanding the entire picture and its key patterns. We try to preserve the richness by suggesting how the managerial decisions and actions are influenced and conditioned by three contextual layers (see Figure 3). Consolidation is provided by indicating how the management of the focal net(work) is highly conditioned by its contexts, the network goal(s), and the inherent logic underlying the value-creation system of the net(work).

Before explicating the framework and its underlying theory, we should clarify our terms. The NetFrame is generic in the sense that it can be used to examine the management of all kinds of business and innovation networks, from loose innovation coalitions and “extensive networks” to more closed and centrally led strategic nets. Moreover, as discussed in section 3.1., we regard strategic nets and intentionally established business ecosystems as ontologically similar network organizations. For the sake of brevity, we will use the term “business network(s)” – or just “network” – to refer to all network forms under investigation, unless the topic demands a more precise term.

4.1. Power of contextual layers in shaping network management

The NetFrame suggests that the management of a business or innovation network is influenced by three nested contextual layers: 1) the environment or field where the network is being constructed, 2) the network itself, and 3) the actor(s) in that network. It follows the ontology and logic of critical realism suggesting that there are elements and structures that have causal power and influence over all focal events and activities (here network formation and network management) (see Easton, 2010; Sayer, 2000). This is not naïve environmental determinism, but a recognition that contextual structures and elements like networks and actors influence the feasibility and

probability of potential new ecosystems and networks, and the development of their underlying value-creating systems. We will next discuss each layer.

4.1.1. Environmental Context – Field Layer

The nature of the environment, or field, in which the network is operating or is being constructed conditions the probable feasible goal(s) for the network, its actor constellation, and the share of available versus to-be created resources and capabilities, and the value-activities required to achieve the goal(s).

The environment influences the design and management of any network or focal ecosystem. In the NetFrame, the environment is described by its degree of maturity or emergence; its level of institutionalization, describing the importance of regulations and norms for operating in the environment; and the number of ecosystems and potential strategic nets constituting the field. These characteristics offer information about the structure, competition and cooperation in the field.

The emergence and inherent complexity of the field is indicated by its complexity, novelty, embeddedness, and dynamics. In embryonic fields there is great flux, opacity and thus uncertainty concerning the potential technological paths and the capabilities and resources their development requires, in addition to uncertain expectations about potential partners and their competencies. The business and managerial problems caused by these uncertainties are exacerbated when the emerging field is extensive and nested, involving several sub-fields or ecosystems/strategic nets, which influence and condition each other. Further complications are produced by technologies or systems requiring large, locked-in kinds of investments with long and uncertain return periods, and potential forthcoming regulations. Early years of gene technology and its applications development offers a fitting example. Many strategic nets/focal ecosystems (involving start-ups, major pharmaceutical corporations, university and private research labs) were competing on technological solutions and applications with relatively embryonic markets, while the field was being continuously regulated.

For more examples and discussion, see Aarikka-Stenroos et al., 2014; Dattée et al., 2017; Dougherty & Dunne, 2011; Möller & Svahn, 2009).

Mature environments or fields stand at the opposite end of the spectrum. All major players, their resources, capabilities and value-activities are well known to each other. The value-systems and their underlying technologies are transparent, as are the socio-political rules and regulations. This does not mean that there is no complexity or embeddedness in ecosystems, but that they are understood. Moreover, established markets and accumulated knowledge reduce the perceived uncertainty and enable experience and expectations-based calculated risk-taking. This is aided by the slow pace of localized change; the actors and network populating the environment are incrementally improving their value systems (Rosenkopf & Schilling, 2007).

We have deliberately compared embryonic to mature environmental contexts. Such “phasing” or typifying is a cognitive and theoretical sensemaking device. In reality, the environment is a mesh of complex systems, where some parts are emerging, some parts are mature and slowly transforming, and other parts are disappearing. This point holds also for business fields as illustrated by the evolution of mobile phone and mobile services field. When Nokia lost its leading position, the ecosystem built around its operating system dissolved in a few years while strong development efforts continued in Apple’s IOs ecosystem and in Google’s Android ecosystem. Consequently it is essential to try to “see” beyond the local parts or “pockets” in an extensive field. It is of utmost importance for management to identify and make sense of the characteristics of their focal environment because these characteristics will condition their choices and influence all aspects of network management.

4.1.2. Business network/Focal ecosystem context – The network layer

In addition to the operating environment, network management is influenced by the goals and character of intended or constructed networks. In the NetFrame, the network is described by its

goals, which presumably drive the value-system(s) required for reaching the goal. The targeted value-system influences the extension of the net in terms of the number and character of partners required, and affects the probable organizational and governance arrangements. For example, in strongly institutionalized fields, the mobilization and inclusion of regulators and other non-business actors can be critical.

Following the logic used to describe the nature of the environmental context, the business nets and focal ecosystems can be depicted with the help of their primary underlying value system. These range from loose networks targeting radical and systemic innovations in an embryonic business field to tightly coupled, well-integrated and centrally coordinated strategic nets targeting efficiency gains in mature business fields. For the sake of simplicity, we adopt Möller and colleagues' proposition that all networks can be positioned according to the level of determination of their underlying value-creating system (Möller & Svahn, 2003; 2006; Möller & Rajala, 2007). This is obviously a simplification; many of the more extensive networks can include several value-systems at all levels of determination. This does not, however, reduce the analytical value of this approach. It only means that a complex network should be broken down into its value-system-based sub-networks requiring different management.

We posit that the character of value-system a network intends to construct is strongly influenced by the goal of the network and the actors and resources available for it, an issue conditioned by the environmental context (Field Layer). Again, for the sake of simplicity the goal(s) and value-systems are described with their level of innovativeness (see Figure 3). Consequently, the value-system affects the kind of actors, resources and activities that are required in the network. Several studies indicate that the innovativeness of the network goal and the level of determination of the existing value-systems affect the constellation of the network, whether the organization is open or closed, and whether the mode of governance is flexible or centrally coordinated (Dagnino et al., 2016; Möller & Svahn, 2006; 2009; Paquin & Howard-Grenville,

(2013). (Figure 3). We suggest that the network constellation or organization and its governance can be described by the notions of network membership, the nature of coupling between network members, and the network governance solution (see Orton & Weick, 1990; Powell & Grodal, 2006; Provan & Kenis, 2008). As these perspectives are interwoven, we discuss them together.

The constellation of a network in terms of its membership can vary from open to closed systems. Open (or flexible) constellations are typical in the early construction of complex ecosystems involving extensive networks with “fluid” membership without any formal inclusion or exclusion criteria or guiding rules. For example, researchers and experts working in business and non-business organizations in a specific field form these kinds of network constellations. An open constellation involves numerous weak ties that are important sources of sensemaking, ideation and contact development in emerging business fields.

With semi-open systems we refer to such network constellations, which may have different types of membership, potentially a core strategic net with an established organization, and outer layers of more loosely connected actors (e.g., NGOs, university labs, and other non-business partners). Studies by Aarikka-Stenroos et al. (this issue), Mason et al., (this issue), and Van Bockhaven & Matthyssens (this issue) offer good examples. Finally, closed systems are strategic nets or focal ecosystems with negotiated membership and partner roles, and established governance system. Some of the value platform cases studied here by Perks et al. (this issue) resemble this option. The organizational solutions include lead organization or “hub-firm” governed networks, participant-governed networks (establishing a board or other collaborative solution), and “network administrative organization”- governed networks. The last one refers to solutions where the network partners establish a separate actor or organization to manage the networks (see Provan & Kenis, 2008).

The issue of network constellation, organization and governance merits an important clarification. These are clearly results of managerial activity, so why do we position these elements

already at the Network layer? The problem is the time perspective. When addressing the construction of a new business network/ecosystem, the emphasis should be on the entrepreneurial actor's or team's early intentions concerning the envisioned goals and value-system of the network to be. Then, the appropriate placing of the creation of network constellation, organization, and governance would be in the Management activities box. However, when dealing with an already constructed business network/focal ecosystem these organizational solutions have already been formed by managerial actions and can be placed in the Network layer as structures influencing the Management activities.

4.1.3. Actor Context – The Actor Layer

Finally, we propose that the characteristics of an organizational actor influence its potential contribution to the network and its management. An individual actor could likewise be posed as the fourth layer in the framework, but this is left out for the sake of simplicity. As indicated in Figure 3, an actor's potential contribution are conditioned by its position and role in the network, resources and capabilities, including experience in networking and network management, and actor-specific goals. The relevance and uniqueness of an actor for the value-creating system influence that actor's position in negotiating network goals and governance, and in value appropriation (Partanen & Möller, 2012). An actor's uniqueness is determined by the potential availability of alternative actors and what kind of investments, including development time, are needed to create the capabilities offered by the actor. Finally, an actor's suitability is influenced by her goals and corporate culture, and the extent to which they are compatible with those of the network. Goal and cultural incompatibility can jeopardize the development and operation of a network of which freeriding and continuous disputes are typical indications (Matinheikki et al., this issue; Planko et al., this issue).

In conclusion, the NetFrame posits three contextual layers that influence and condition the feasible and probable network management activities (Figure 3). First, the nature of environment where the aimed or established network or focal ecosystem is being constructed influences the feasible goals of the network, its actor constellation, and available versus to-be created resources and value-activities. The main feature of this context is its degree of emergence, ranging from embryonic to mature. Second, the nature of the intended network or focal ecosystem influences feasible network constellation, organization and governance. The innovativeness of the goal of the network and the level of determination of the required value-creating system(s) constitute the major conditioning characteristics. Third, the individual actor's characteristics such as its position and role in the net – based on actor's resources – conditions its potential contribution to the network and its management. The constructed contextual layers of network management are nested and interrelated, the flow of influence is two-directional, and the dynamics effective at all levels importantly affects interactions between the layers. This view embraces, besides the layered view of reality (Layder, 1994), the structuration perspective of Giddens (1988) and Stones (2005). Structures influence the construction of networks, and network actors and their behaviors, but actors construct the networks, and it is actors and networks that ultimately constitute the environment.

4.2. Network management – a configuration approach

We describe network management through a set of management activities in Figure 3. Four management principles are recommended for business networks (Järvensivu & Möller, 2009, 657):

- “The value-creating system has an agenda for the value creation and a plan for how the system can bring about this value; the agenda and plans must be created by or at least made known to key actors within the system.
- Required actors, resources, and activities are identified and coordinated to bring about the value according to the agenda and plans.

- The actors are mobilized and energized to carry out the necessary value-creating activities.
- The value creating activities are carried out in a way that produces effective and efficient results vis-à-vis the agenda and plans; if not, corrective measures are made to improve the system.”

These are strong requirements but offer a concise summary of a network management wish list, which may be achievable in well-established and mature networks but not for networks in making. In our discussion we use the term “management activities” to cover a wide range of network management concepts: managerial work (Mason et al., this issue), mechanisms (Perks et al., this issue), capabilities (Möller & Svahn, 2003), competences (Ritter & Gemünden, 2003), and management functions (Järvensivu & Möller, 2009). The listing of activities in the framework encompasses the main types of identified management activities. It is not based on a systematic review of the literature but relies on our own work and several summarizing and synthesizing efforts. Dagnino et al. (2016) cover 10 studies of orchestrated networks; Perks et al. (this issue) cover eight; Aarikka-Stenroos and Ritala (this issue), and Planko et al. (this issue) provide more than 20 references on network or ecosystem management. Based on their findings, we suggest that the following six activity sets cover the key dimensions of network management:

1. Visioning and sensemaking: also sensegiving to the emerging aspects of environment, agenda development or conceptualization, representing an early envisioning of the possible value-offering of the potential network.
2. Mobilizing network actors and constellation creating: influencing, motivating, partner selecting, role negotiating, and network legitimizing activities.
3. Goal construction and organizing: governance issues, e.g. establishing partner responsibilities, operating procedures, and negotiating knowledge and innovation sharing, and appropriation principles.

4. Effectiveness seeking: activities related to value-system and solution development, market creation, production and dissemination.
5. Efficiency seeking: coordination and performance control.
6. Network maintaining: renewing and updating.

These activity sets are clearly interrelated and some activities could be grouped or labeled differently. After more than 15 years of network management research, however, we regard these sets, as well-founded, and even self-explanatory.

4.3. Network management theory – key principles

We have outlined the key elements of network management; it is now time to integrate the contextual layers and the management activities.

We suggest that all six of the management activity sets drawn from the literature are relevant in creation and management of all kinds of business and innovation networks. We further argue that these activity sets have varied emphases and content across different types of networks. We therefore adopt the configuration view of network management activities (Raab, Mannak, & Cambré (2015). The central point is that the conditioning factors – involving the environmental context, network/ecosystem context, and actor context – jointly condition the nature of feasible and probable network management activity configurations – also involving network constellation creation, organization and governance creation.

The joint adoption of the contextual and configuration views entail that the content and emphasis of each management element in the configuration may be have distinct contextual circumstances. For example, visioning and agenda development are qualitatively different, and require different capabilities, in the emergence of a radically new business ecosystem compared to operating in the mature, highly specified industries. In a more general manner, we suggest that complexity and uncertainty concerning the value-systems characterizing the context layer (as a

sector, field, or ecosystem) condition the effective modes of the network management configuration. This influence is moderated or accentuated by the network layer. For example, when the network under construction is characterized by markedly emergent features, feasible organization alternatives favor flexible actor constellations with a small and tightly coupled core (Capaldo, 2007). The emphasis is on visioning, sensemaking and sensegiving, and on agenda development. An established strategic net, operating in an assembly business context (e.g., the automobile industry, electronics), has typically created a closed system with central coordination, and often distributed governance (the first tier-suppliers are responsible for their own sub-networks). The management activity configuration underlines efficiency-seeking solutions and capabilities, like interlinked production and logistical systems, and IT systems. For examples, see Möller and Svahn (2003), and Möller and Rajala (2007).

To facilitate the interpretation of the network management configurations, we have outlined three prototypical configurations depicted at the bottom part of the Management activities box: influencing, orchestrating, and managing (Figure 3). These conceptual devices reflect the expected emphasis of the activity set configurations when considering embryonic networks/ecosystems in emergent fields, extensive networks with various institutional participants, and well-established strategic nets. One should, however, be careful when using ideal types. Real configurations can be messier because they contain mixed profiles such as combining influencing and orchestrating, or orchestrating part of an extensive network by a centrally managed core.

We argue that the extent to which network management can adopt the discussed principles is conditioned by the characteristics of the current and available network actors (the actor layer). When partners with sought capabilities are not available, the core firm must either develop the competences in-house or cultivate suitable partners. The importance of actor capabilities for achieving the goals of the network influence the actor's power position in the value-creating system, including opportunity for value appropriation.

This network management theory is multifaceted, but as it covers the most important influencing factors it offers significant heuristics for effective management of highly complex systems. It is based on the ontological differences among various kinds of fields or environments, and among various kinds of business networks or ecosystems. We have captured and discussed these differences on the network level by the value-creation system construct. The fundamental differences in value-systems have been defined through their level of determination, the extent to which actors, resources and value activities are specified or uncertain (Möller & Svahn, 2006). This ontological condition informs the ways of knowing, innovating, and managing and organizing, and has a solid background in organizational theory (March, 1991; Orton & Weick, 1990; Polanyi, 1966).

5. Conclusion and suggestions for future research

To summarize, we have tried to achieve the following ambitious objectives with this paper. Our first was to present a concise review of the developments in business network research from 2000 to the present. The emphasis was on identifying new disciplinary openings, as illustrated in Figure 1. We also analyzed the nature of the domain extensions including business sectors, fields, ecosystems, and platforms, and cleared up some of the conceptual confusion. Our goal was to clarify the input of these domains to the network management approach and the role of business networks and network management, in turn, in each domain (Figure 2). Next, with the help of the findings of the articles in this special issue, we proposed a general theory of network management explained with the NetFrame (Figure 3). The theory describes the contextual levels (environment, network, actor) and the key factors at each level that influence network management activities, proposing prototypical configurations of management activities. We argue that the constructed theory makes a significant contribution to the network management theory and practice.

To conclude, we provide some suggestions for future research. Our journey through the network management literature for almost two decades and the exiting articles in this special issue have generated many promising themes that deserve further research.

The articulated theory of network management, based on fragmentary research clearly requires more empirical validation. As the proposed NetFrame theory is quite comprehensive, more fine-tuning is required. The following themes should take priority.

- Examining management in the emergence of business fields of varying complexity, novelty, and systemic characteristics. Special interest should be given to the institutionalization of the field(s) and to the managerial means for sensemaking and influencing various aspects of institutionalization (see e.g., Van Bockhaven & Matthyssens, this issue; Edvardsson et al., 2014).
- Examining networked construction of different type of new focal ecosystems varying in their complexity, novelty, and systemic characteristics. Particular attention should be given to the sources of ecosystem performance, as we need a much better understanding of the combinations of factors that influence system-level performance. Competition and collaboration between ecosystems would also be an issue of managerial relevance.
- Business fields consist of several interwoven business and innovation networks in different phases of development. A neglected issue has been how to orchestrate or coordinate interlinked networks. On the actor level, a similar question concerns the management of one's positions and roles in several business/innovation networks. Möller and Halinen broached this issue already in 1999.
- Examining features and opportunities of dualistic or other dispersed forms of network agency. Here we refer to the notion that network construction and maintenance is primarily a social-system issue, requiring leadership-driven agency, while the management of the targeted goal(s) of the network (value-offering and its underlying value-creating processes) may need

differentiated project management. We owe this idea to Nykänen (in press) and Planko, et al. (this issue).

- All these research domains would benefit from research on network performance at both network and actor levels. The study by Bayne et al. (this issue) has created a significant opening. This presumes further development of performance indicators covering the effectiveness and efficiency aspects and strong linking of performance to the type of goals sought by the network.
- Finally, we have very limited knowledge of the value-appropriation in various network or ecosystem modes. What kind of contracts are typical? Are there systematic differences? What are the causes? Moreover, one should examine the empirical validity of the theory-driven association between an actor's capability-base and her ability to capture value.

Most of these suggestions call for programmatic research, because single studies alone cannot achieve significant breakthroughs. Emergence of business fields and the construction of more focused business ecosystems often cross national borders; moreover, their study requires inputs from different theories and disciplines. We should establish international multi-university research programs focusing on specific field(s). Woody Powell's programmatic work at Stanford, mapping the evolution and commercialization of the life sciences is a promising example (Powell, Koput, & Smith-Doerr, 1996; Powell et al., 2005).

Another issue in business network research is the amount of case study research based on only one or two cases. There is nothing inherently wrong with this approach but when the study design is weak, the results are often insubstantial. Even if challenging in practice, researchers should pay more attention to the theoretical sampling of cases. There is a host of available theories to construct theory driven research designs, which at best are providing us knowledge of why some phenomenon exists in the specific mode in a specific context, and further how to influence it. In

network management, as our NetFrame suggests, time should be ripe for the seeking of theory driven contextual explanations, and even testing theory-based propositions.

One way to strengthen the theoretical basis of network management research is to apply more of the developments in organizational theory, strategy and management research. This should work both ways. We should be proud of the advancements made by business network research and submit our findings for publication in management journals.

To conclude, we offer our warm thanks to all the authors who submitted their work to the *Special Issue in Managing Business and Innovation Networks*, and to all the reviewers for their dedicated efforts. We are especially grateful for the teams behind the eight published articles for sharing their innovative and advanced knowledge and ideas with the network management community. We are confident that this Special Issue will advance the development of network management research and theory.

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