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Managing strategic system-building networks in emerging business fields: A case study of the Dutch smart grid sector

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ABSTRACT

Companies that wish to launch innovative sustainability technologies can collaborate in strategic networks of actors from industry, government and research institutes to pro-actively build a business ecosystem around their new technology. This is called collective system building. In this paper, we examine how to effectively manage networks for collective system building. Based on a review of the literature, we identify the key factors of effective network management and we propose a conceptual framework for network management at the network level. Subsequently, we conduct a multiple-case study in the Dutch smart grid sector to examine how these key factors are implemented by system-building networks. We find differences with the existing network management literature regarding network composition, network management structure, governance modes, decision-making processes, project management, the free-rider problem and trust-building mechanisms. Our study contributes to a better understanding of effective management of system-building networks, which in turn can lead to greater success in establishing new business fields. We contribute to the literature on strategic business networks, specifically on emerging business networks building new business fields.

1. Introduction

Corporate collaboration in inter-organizational networks has become a predominant form of business management (Gulati, 1998; Hagedoorn & Schakenraad, 1994; Möller & Svahn, 2003, 2009; Nalebuff & Brandenburger, 1996). A critical success factor for businesses will be the ability to build and develop strategic networks (Partanen & Möller, 2012), especially in fast-changing technology-intensive sectors, in which the products and services offered are not only complex in themselves, but also include a large variety of complementary products and services (Partanen & Möller, 2012). Due to high velocity markets, the high level of technological complexity and the diversity of resources and capabilities required to develop the necessary infrastructure, it is almost impossible for a single firm to create new technology (Möller & Svahn, 2009). Such radical innovation often requires building a new business field (Möller, 2010; Möller & Svahn, 2009). The creation and commercialization of new business fields is carried out by linked actors in complex inter-organizational networks (Möller & Svahn, 2009), whose aim is to create state-of-the-art products and services and high efficiency production and business processes, which generate added value for customers (Möller, 2010). In other words, a supportive ecosystem is necessary for radical innovation.

The creation of a supportive ecosystem around a new innovation is one of the crucial success factors for commercializing radical innovations (Aarikka-Stenroos & Lehtimäki, 2014). In fact, the main external barrier to radical innovation is an undeveloped network and ecosystem around the innovation (Sandberg & Aarikka-Stenroos, 2014). Therefore, to increase market success, firms intentionally build network relations and develop new business fields in innovation networks (Aarikka-Stenroos, Sandberg, & Lehtimäki, 2014). The development of such an ecosystem is largely beyond a single firm's influence and needs to take place in networks (Sandberg & Aarikka-Stenroos, 2014).

Building a supportive business ecosystem is relevant for any firm aiming to develop and commercialize radical innovation, but especially for radical sustainability innovations. Sustainability transitions cause actors to operate in great uncertainty and require transformative change (Knight, Pfeiffer, & Scott, 2015). Society-wide changes are necessary for the successful commercialization of innovative sustainability technologies (Geels, 2002, 2005; Kemp, Schot, & Hoogma, 1998). To realize such changes, firms need to collaborate with other actors (Musiolik, Markard, & Hekkert, 2012), as together they can pro-actively change their environment and build a favorable ecosystem in which their innovative technology can flourish. In transition literature, this process is called 'collective system building'. Collective system building is defined as the "processes and activities that firms can conduct in networks to collectively create a favorable environment for their

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innovative sustainability technology" (Planko, Cramer, Chappin, & Hekkert, 2016, p. 2329). It aims at developing and optimizing technology, triggering socio-cultural changes, and creating a market for the new technology, including changes in governmental regulations and user behavior.

System-building networks can be classified as strategic networks, i.e. networks created intentionally by three or more organizations with the aim of achieving a common goal, and with deliberately created structures and negotiated roles and responsibilities (Järvensivu & Möller, 2009; Möller & Rajala, 2007). These strategic networks need to be managed intensively in order to be effective (Provan, Fish, & Sydow, 2007; Rampersad, Quester, & Troshani, 2010; Turrini, Cristofoli, Frosini, & Nasi, 2010). Moreover, different types of strategic networks need to be managed differently (Järvensivu & Möller, 2009): networks in established industries or aiming at incremental change need different management and coordination mechanisms than networks operating in emerging business fields, so-called 'emerging business nets' (Möller & Rajala, 2007). System-building networks are emerging business nets, as they operate in great uncertainty in emerging business fields, trigger radical system-wide changes, and combine old and new actors. The majority of network management research has focused on networks in more established business fields (Choi & Hong, 2002; Håkansson & Persson, 2004; Wilhelm, 2011), and the management of networks in emerging business nets is under-researched (Möller & Svahn, 2009). The few studies on network management in emerging business fields focus on the firm's perspective, examining how managers can reap the most benefits for their firm from their network collaboration (e.g. Ford & Håkansson, 2013; Freytag & Ritter, 2005; Ritter, Wilkinson, & Johnston, 2004). However, rather than management *within* networks to reap firm-level benefits, this paper focuses on the management *of* networks to reap system-level benefits.

In sum, network management at the network level in emerging business fields is under-explored (Aarikka-Stenroos et al., 2014), and more empirical research is required to generalize exploratory findings (Heidenreich, Landsperger, & Spieth, 2016; Rampersad et al., 2010). Therefore, it is important to investigate the key drivers of effective network management at the network level (Rampersad et al., 2010). The aim of our paper is to gain a better understanding of how system-building networks are managed to build a new business ecosystem. Our research question is "how are networks for collective system building managed to reach their collective system-building objectives?" From the literature, we have identified the key factors of network management to achieve common objectives, and we empirically examined whether these key factors were relevant for system-building networks in the Dutch smart grid sector and how they are manifested in these networks.

This paper contributes to the emerging theory of network management (e.g. Järvensivu & Möller, 2009; Möller, 2010; Möller & Halinen, 1999; Ritter & Gemünden, 2003a). Instead of focusing on the firm, we study network management and the outcomes at the network level, in the context of building a new business field or business ecosystem for sustainability technologies. We provide additional insights into key factors of network management in emerging business fields.

2. Setting the scene: sustainability transitions, the smart grid sector and system-building networks

To investigate how collaborative inter-organizational networks are managed to build new business fields, we chose the empirical case of the Dutch smart grid sector, a field in which actors develop interdependent and compatible products and services under great uncertainty, and collaborate to establish a new business field.

The Dutch smart grid sector is an emerging technological system. A smart grid is an electricity network combined with an ICT network, adapted to renewable energy sources. Its 'smartness' allows balancing the supply and demand of energy on the grid, thus making the electricity grid more sustainable, efficient and robust (Verbong, Beemsterboer, & Sengers, 2013). For example, smart washing machines enable users to do their laundry at the very moment when there is a surplus of energy on the grid, caused by other users' solar panels producing excess energy because of sunny conditions. Essentially, smart grids are not one technology, but a complex set of intertwined technologies.

Transition to a new technological regime is a long and difficult process. In order to implement their products and to achieve a sustainability transition, innovative actors build coalitions not only to develop new technologies, but also to create markets, build infrastructures and achieve changes in user practices, regulations, policy and cultural meaning (Geels, 2010). Regarding smart grids, actors also face many obstacles. There is still great uncertainty about the future evolution of the smart grid sector, and about how smart grids will evolve (Verbong et al., 2013), leading to a reluctance to invest (Tricoire, 2015). Moreover, some incumbents oppose the energy transition. Users' daily lives are influenced by the new technology: its adoption requires drastic changes in both user behavior and society (Van Der Schoor & Scholtens, 2015). To overcome these challenges and to build a new ecosystem, smart-grid actors closely collaborate in system-building networks.

In the Netherlands, firms along the energy value chain, research institutes, government actors and user groups are working hard to develop and implement smart grid technology. These actors form various networks with different constellations and different aims, for example testing full-scale smart grid concepts in practice, or standardizing or accelerating smart grid development and implementation (Planko et al., 2016). With these activities, such system-building networks aim to build a new business field with the smart grid technology at its core.

The phenomenon of system-building networks has been observed particularly in relation to sustainability transitions (Musiolik & Markard, 2010). Insights from sustainability transitions are very useful for understanding the emergence of new business fields and for bringing innovations to the market (Knight et al., 2015; Möller, 2010).

3. Key factors of effective network management: proposal of a conceptual framework

Network management is defined as the tools and strategies used to manage a deliberately established inter-organizational collaboration in order to achieve its common goal (Klijn, Steijn, & Eldenbos, 2010; Milward & Provan, 2003b). It differs from organizational management, as networks have no organizational hierarchy and managers cannot apply the command-and-control mechanisms that are widely used within organizations. Instead, networks need to be managed in collaborative, non-hierarchical ways (Dooley & O'Sullivan, 2007; McGuire, 2002; Milward & Provan, 2006). The management of inter-organizational networks has been studied in many different, often overlapping fields and from different perspectives (Möller & Rajala, 2007), including industrial and business networks, strategic networks, innovation networks, and whole networks (Dhanaraj & Parkhe, 2006; Gulati, Nohria, & Zaheer, 2000; Klijn et al., 2010; Milward, Provan, Fish, Isett, & Huang, 2009; Möller & Rajala, 2007). These studies have been conducted in very different empirical contexts but can be used to develop theory on network management of inter-organizational networks (Järvensivu & Möller, 2009).

For system-building networks, the literature on goal-directed networks is most relevant, particularly the literature on strategic networks. Within this literature stream, the literature on emerging business nets – and especially on innovation networks – is most pertinent. Emerging business nets are future-oriented networks composed of actors aimed at developing new technologies, products and business models, or even creating new business fields. These actors strive for radical,