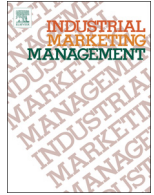




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Platforms in service-driven manufacturing: Leveraging complexity by connecting, sharing, and integrating

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ABSTRACT

Service-driven manufacturing firms often rely on networks in service operations; however, in order to leverage the network approach, firms must address the challenges of managing and orchestrating complex inter-organizational relationships. In this study, we identify how companies aim to leverage network-related complexity in their operations instead of trying to reduce complexity. We show how platform approaches have been used and could be used in this setting to assist in the flexible externalizing of resources and capabilities, and to provide structure for network orchestration. Although limited to the case-study setting, this study provides a rationale for using platform approaches in a service-driven manufacturing context, demonstrating how all of the identified logics have a special role in value creation in service networks.

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1. Introduction

Leveraging complex service-driven relationships is believed to provide a competitive advantage for manufacturers (Gebauer, 2008; Gebauer, Gustafsson, & Witell, 2011; Kindström & Kowalkowski, 2009; Mathieu, 2001; Neu & Brown, 2005). A transition from the business model toward a customer relationship orientation, results-driven solutions and customized value offerings, has been defined as “servitization” (Baines, Lightfoot, Benedettini, & Kay, 2009; Vandermerwe & Rada, 1989; Wise & Baumgartner, 1999). Research has shown that sufficient service scope and agility can be achieved by developing solution networks (Gebauer, Paiola, & Saccani, 2013; Henneberg, Gruber, & Naudé, 2013; Jaakkola & Hakanen, 2013; Kowalkowski, Witell, & Gustafsson, 2013; Matthyssens & Vandenbempt, 2010; Spring & Araujo, 2009). By building value constellations and using inter-firm resource complementarities, organizations attempt to overcome internal challenges (Baines et al., 2009; Brax, 2005; Martinez, Bastl, Kingston, & Evans, 2010; Tukker & Tischner, 2006; Turunen & Toivonen, 2011) and create solutions that reach beyond their resources and competences (Agarwal & Selen, 2009; Rusanen, Halinen, & Jaakkola, 2014; Windahl & Lakemond, 2006). Originally described as an “imaginative”

(Mathieu, 2001, p. 446) idea in the manufacturing context, the collaborative option has become increasingly appealing.

A network approach generates complexity emerging from the networked inter-firm structures. As a network quickly expands and grows, it becomes difficult to navigate. Research has shown that manufacturers struggle with orchestrating and managing solution networks to provide the intended benefits (Den Hertog, Van Der Aa, & De Jong, 2010; Gebauer et al., 2013; Kindström, Kowalkowski, & Sandberg, 2012; Spring & Araujo, 2009). Integration and control focused models (Davies, Brady, & Hobday, 2007; Windahl & Lakemond, 2006) as well as modularization (Pekkarinen & Ulkuniemi, 2008) have been proposed as means to reduce complexity of the inter-firm configurations. However, rigid structures seem to reach their limits because, in the solutions context, complex and diverse customer needs often require great agility and broad network involvement (Agarwal & Selen, 2009; Kowalkowski, Kindström, Alejandro, Brege, & Biggemann, 2012). Research has been scarce on showing models in which complexity of the network relationships could be not only reduced, but also used to the benefit of the service-driven manufacturer.

This study explores service network orchestration with a platform approach that has been proven to provide a means of inter-firm relationship management, especially in complex and agile environments (e.g., Gawer, 2009). The platform approach offers a point of control and rent extraction for industries (Baldwin & Woodard, 2008). Current research has focused on platforms in the context of orchestrating industrial ecosystems and complementarities (Jacobides, Knudsen, & Augier,

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2006; Teece, 2007), fitting well in the service environment where agile inter-firm networks are called for (e.g., Iansiti & Levien, 2004). Researchers have considered opportunities that platforms might offer in the service and manufacturing context (Brax & Jonsson, 2009; Kindström & Kowalkowski, 2009). However, the majority of this research has limited empirical evidence, and most importantly, only a few theoretical links have been made between servitization, solution networks, and existing knowledge on platforms as an approach to deal with the network. Thus, platforms have played a supporting role and have not been analyzed in detail from the perspective of services.

We aim to understand how platform strategies help companies benefit from the complexity inherent in service and solution networks in the manufacturing context. In this setting, we identified five mechanisms and three distinct logics that drive a platform approach, all of which are based on different means of leveraging the complexity. Our research addresses the gap in the literature related to operations management in the service network context by answering the following question: *How do service-driven manufacturing companies construct platforms in order to leverage network complexity?* Our findings indicate that the platform approach might offer a means of orchestrating service and solution networks varying in degree of openness, involvement, and control over the innovation and value creation.

2. Theoretical background

To establish the theoretical base, we will briefly outline the discussion on manufacturers' transition from product to solution business, focusing on innovation and delivery of services in inter-organizational networks. We discuss how platform approaches have been used in previous research with regard to abstract platform discourse and context-dependent servitization studies.

2.1. Servitization and inter-organizational networks

Various authors argue that manufacturers can create sources of competitive advantage through a service-driven relationship orientation and customized value offerings (Eloranta & Turunen, 2015; Gebauer, 2008; Gebauer et al., 2011; Kindström & Kowalkowski, 2009; Mathieu, 2001). The profitable transformation from a transactional business model to complex solutions is not straightforward because new capabilities, business models, and processes are required (Baines et al., 2009; Brax, 2005; Martinez et al., 2010). Organizations also face internal challenges and organizational inertia (Tukker & Tischner, 2006; Turunen & Toivonen, 2011).

Research has demonstrated how the network approach can help overcome the capability and resource requirements related to this shift (Agarwal & Selen, 2009; Henneberg et al., 2013; Kowalkowski et al., 2013; Rusanen et al., 2014; Windahl & Lakemond, 2006). The network approach acknowledges external resources and capabilities (Teece, 2007) that allow the network to support the tasks that surpass the company's own abilities (Agarwal & Selen, 2009; Rusanen et al., 2014; Windahl & Lakemond, 2006). Companies facilitate the creation of so-called service systems (Maglio, Vargo, Caswell, & Spohrer, 2009; Vargo & Lusch, 2011) in which various structures are used for orchestration: along with traditional service partnering, system- (Hobday, Davies, & Prencipe, 2005) and integrator-based models (Davies et al., 2007; Windahl & Lakemond, 2006) have gained attention.

The network approach alone does not guarantee success in the service orientation as the networked mode of operation creates complexity. The complexity-related challenges lie primarily in network orchestration (Bikfalvi, Lay, Maloca, & Waser, 2013) as the supply base (Choi & Krause, 2006) and industry structures (Hobday et al., 2005) become more diverse, changing the actor roles (Henneberg et al., 2013) and complicating the power structures of the market (Finne, Turunen & Eloranta, 2015; Neu & Brown, 2005). The supply-base complexity is seen as the result of the increasing number of suppliers, the degree of

differentiation among them, and the level of inter-relationships among actors (Choi & Krause, 2006). Industry structure and relationship diversity are results of vertical disintegration (Hobday et al., 2005). The multiplicity of actor roles is, according to Henneberg et al. (2013), a natural continuation as the networked actors do not have static roles but might operate in different and even overlapping positions at any one point in time (Ramirez, 1999).

2.2. Orchestrating inter-organizational networks with platforms

Research has recognized a number of ways to cope with the complexity originating from service networks. Studies on servitization have identified the capabilities required for network operations (e.g., Den Hertog et al., 2010; Gebauer et al., 2013; Hobday et al., 2005; Kohtamäki, Partanen, Parida, & Wincent, 2013; Kowalkowski et al., 2013; Spring & Araujo, 2009, 2013; Windahl & Lakemond, 2006) as well their relative importance in different network structures (e.g., Gebauer et al., 2013). More specifically, the abilities to manage, use, and exploit inter-organizational relationships (Windahl & Lakemond, 2006), sense opportunities, and restructure delivery and innovation (Kindström et al., 2012) as well as co-produce in the networks are crucial for success (Den Hertog et al., 2010; Kohtamäki et al., 2013). In addition, companies that organize solution networks need to be virtuosos in operations management of the networked environment (Spring & Araujo, 2009, p. 459).

Even if the capabilities for networked services and solutions have been identified, there is scarce research on the operational mode that could be applied in the manufacturers' service network context. However, especially in information and communications technology (ICT)-related studies, platforms have been suggested to serve as a mode that allows point of control and rent extraction (Baldwin & Woodard, 2008). Platform strategies have been proven to fit well in environments where agile inter-firm networks are needed to provide a competitive advantage (e.g., Iansiti & Levien, 2004). In addition, there has long been a strong interest in platforms in contexts where high-variety strategies are needed (e.g., Sawhney, 1998), offering an interesting link to complex service settings that demand agility and highly customized solutions.

Platforms can be applied in various levels of organization. The original aim of platforms was to accommodate a firm's increasing offering variety without overly complex internal structures (Sawhney, 1998). On the offering level, platform products constitute product families that allow easy modification through the addition, removal, or substitution of features (Meyer, Tertzakian, & Utterback, 1997; Sawhney, 1998; Wheelwright & Clark, 1992). On the organizational level, platforms have become a widely used mode for orchestrating and leading co-specialized business ecosystems (Gawer & Cusumano, 2002, 2008; Iansiti & Levien, 2004; Jacobides et al., 2006; Teece, 2007). The newest paradigm has shifted the focus of platforms from the offering and organizational focus toward the leveraging of the complex relationship structures of inter-firm networks (Gawer, 2009). So-called supply chain platforms form a common structure (interfaces and subsystems) of derivative products to be developed by several actors within the chain. In contrast, industry platforms and two-sided markets are used in an industrial ecosystem approach (Gawer, 2009). Two-sided markets have become specifically associated with products, services, firms, and institutions that mediate transactions among a number of actors in a business ecosystem (Eisenmann, Parker, & Van Alstyne, 2006; Evans, 2003; Hagi, 2009; Rochet & Tirole, 2003; Suarez & Cusumano, 2009). The intention is to bring together groups of users, and with a platform structure, provide the infrastructure and rules that facilitate transactions between parties. Industry platforms, in turn, serve primarily as a foundation on which other companies build complementary products, services, and technologies, thereby increasing the value of the actors in the platform via the direct and indirect effects of the network. In practice, the modern view of platforms usually materializes in the form of

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