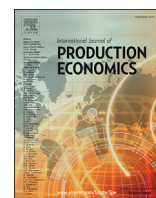


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## Knowledge sharing dynamics in service suppliers' involvement for servitization of manufacturing companies



Néstor Fabián Ayala<sup>a</sup>, Carolline Amaral Paslauski<sup>a</sup>, Antonio Ghezzi<sup>b</sup>,  
Alejandro Germán Frank<sup>a,\*</sup>

<sup>a</sup> Organizational Engineering Group (Núcleo de Engenharia Organizacional – NEO), Department of Industrial Engineering, Universidade Federal do Rio Grande do Sul, Brazil

<sup>b</sup> Politecnico di Milano, Department of Management, Economics and Industrial Engineering, Italy

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## ABSTRACT

Manufacturing companies that adopt the servitization strategy usually show lack of knowledge regarding the service offering associated to their manufactured products. Acquiring external knowledge from service suppliers can be a way to tackle this problem. The objective of this study is to understand how manufacturing companies aiming at a servitization-driven business model innovation (BMI) integrate such knowledge from service suppliers. We focus on different types of collaboration that can occur and on the knowledge sharing (KS) dynamics of this collaboration. We employ a multiple-case study approach to analyze nine BMI processes from companies that transformed their traditional business model (BM) to a servitized BM. As a result, we obtain a theoretical framework that presents six possible KS dynamics for the servitization design by originally combining two main approaches for servitization-driven BMI (i.e. product-oriented and service-oriented product-service systems) and three main configurations of relationships with service suppliers based on traditional new product development classifications of buyer-supplier integration (i.e. white, grey and black box configurations). Implications of combining a BMI and a buyer-supplier KS perspectives to investigate the process of servitization for manufacturing companies are then discussed.

### 1. Introduction

Several manufacturing companies are innovating their existing Business Models (BMs), traditionally centered in product offering, by adding services to their products or by delivering these products as services (Brax and Visintin, 2016; Kohtamaki et al., 2013). This change is considered a form of Business Model Innovation (BMI) (Kindström and Kowalkowski, 2014) and was originally termed ‘servitization’ by Vandermerwe and Rada (1988). Servitization aims to create additional value to customers by offering a whole solution in the form of a Product-Service System (PSS), which is more difficult to be imitated, thus helping to reduce the threat of product commoditization (Baines et al., 2007; Chesbrough, 2011; Lindahl et al., 2014). Servitization can also determine higher and more stable profits, especially during economic downturns (Babu and Sachi, 2014).

The extant literature highlights some challenges that manufacturing companies are facing when dealing with servitization. Firstly, the

adoption of a servitization strategy involves risks and uncertainties for the company, since it implies an important change in the BM that can impact directly on performance (Benedettini et al., 2015; Suarez et al., 2013). Secondly, changes may be needed in the manufacturing supply chain configuration and coordination, as new partners become relevant both for setting up the PSS offered and for sharing and reducing the associated business uncertainties and risks (Paola et al., 2013; Saccani et al., 2014). These challenges are related to a deeper necessity: manufacturers need service knowledge in order to face such a BMI. Service-related knowledge is significantly different from that necessary for pure products design, and it may be hard for manufacturers to generate such kind of new knowledge by themselves (Alghisi and Saccani, 2015). Consequently, authors suggest that in order to support a servitization-driven BMI, manufacturers should acquire service knowledge from external service suppliers, these suppliers being an external organization or another business unit of the same company (Martinez et al., 2010; Windahl and Lakemond, 2006; Bastl et al., 2012; Davies,

\* Corresponding author. Av. Osvaldo Aranha 99 - Sala LOPP 508 - 5° andar, Escola de Engenharia, Universidade Federal do Rio Grande do Sul, Centro, CEP 90035190, Porto Alegre, RS, Brazil.

E-mail address: [frank@producao.ufrgs.br](mailto:frank@producao.ufrgs.br) (A.G. Frank).

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2004; Lockett et al., 2011). Some examples on well-established manufacturing companies illustrate what the literature reports. Focusing on the automotive industry to allow comparability, one example is the collaboration between Fiat-Chrysler and Google, where the two companies are merging their engineering teams to develop self-driving cars (Reuters, 2016). Both companies want to keep their focus on their own core capabilities during the development of PSS solutions. Their servitization strategy faces the challenge of coordinating joint product development activities from two different teams, since differences in culture, knowledge, and development methods, can be barriers among them. Another automotive company, General Motors (GM), invested in Lyft, its car-sharing service partner; as part of the agreement, GM participates in Lyft's board (Reuters, 2016). This allows GM to access to the partner's future plans and decisions. The servitization challenge in such case is how to gather access to strategic knowledge from the partner in order to keep the control of the business. Challenges are different in both cases regarding the buyer-supplier integration, the coordination mechanisms and the knowledge sharing dynamics between the partners.

Therefore, prior works highlighted that such manufacturer-service provider partnerships are only successful if they are carefully managed, which implies creating strong links of information and knowledge exchange (Bastl et al., 2012; Johnson and Mena, 2008; Lockett et al., 2011; Windahl and Lakemond, 2006). As Lockett et al. (2011) affirm, the adoption of a servitization strategy can have a negative effect on manufacturing companies if the relationship with suppliers is not correctly defined. In this line, studies suggested that different forms of collaboration and level of interaction with suppliers can be established in servitization, as also shown in the two examples above (Davies et al., 2007; Finne and Holmström, 2013; Hakanen and Jaakkola, 2012; Kowalkowski et al., 2011; Nordin, 2008). The proper level of suppliers' involvement may depend on aspects such as: the financial objectives of servitization and the desired level of contact with customers (Saccani, 2012); the service component's characteristics (Paiola et al., 2013; Saccani et al., 2014); the complexity of the solution (Finne and Holmström, 2013); and the level of servitization targeted (Bikfalvi et al., 2013), among others. However, there is a gap in the literature which consists in a lack of understanding on how manufacturing companies can involve potential service suppliers in a servitization strategy and how knowledge can be acquired from these suppliers to better face a servitization-driven BMI (Chirumalla, 2013; Hakanen, 2014; Leoni, 2015; Martinez et al., 2010; Reim et al., 2015; Windahl and Lakemond, 2006).

The integration of external knowledge sources by means of Knowledge Sharing (KS) activities has been a typical concern in other research fields (e.g. Athaide and Klink, 2009; Le Dain and Merminod, 2014; Petersen et al., 2005) and it can constitute an insightful theoretical lens for a better understanding of the problems identified. In this sense, KS can present different dynamics depending on the type of the buyer-supplier integration (Le Dain and Merminod, 2014) and on the type of servitization-driven BMI adopted (Bastl et al., 2012; Johnson and Mena, 2008). The analysis of such dynamics can shed light on the existing gap regarding how manufacturers can acquire knowledge from service suppliers in different servitization contexts. Therefore, the following research question emerges and is addressed in this study: *How do manufacturing companies aiming at servitization-driven BMI integrate knowledge from service suppliers?*

This research question considers companies that are evolving from a traditional manufacturing BM to a new servitized BM focused on different levels of PSS. Moreover, our research question contributes to the existing state-of-the-art by addressing the servitization transformation leveraging an unexplored approach, which stems from the integration of two different research fields that deal with servitization (i.e. BMI and buyer-supplier relationship for collaborative New Product Development), investigated through the theoretical lenses of knowledge management.

Consequently, the aim of this study is to understand the possible KS

dynamics that happen in the service suppliers' involvement for a servitization-driven BMI in manufacturing firms. Using a KS theoretical perspective to address the suppliers' involvement in the servitization context, we first bridge these two fields in a conceptual framework, and then we apply it in the analysis of a multiple case study on seven multinational companies in order to deepen the understanding of this phenomenon. Therefore, we explore the relationship between several differences concepts: we first classify product-service systems (PSS) offering into two different BMI orientations for servitization (product or service orientation) and then we relate such classification to three different types of NPD supplier involvement (black, grey and white box). Finally, the dynamics of KS in these different combinations is studied based on three main levels of KS: transfer, translation and transformation. As a result, we present a final theoretical framework for KS dynamics between the manufacturing companies and their service suppliers.

The main research contribution from this work is that the proposed framework reveals different KS dynamics and intensities that can happen between the manufacturer and their service suppliers, as well as it explains how the KS dynamics are affected by the type of collaboration and the servitization strategic orientation adopted by the company. We show that, by integrating these perspectives, it is possible to obtain a more fine-grained description about the levels of KS among the involved actors. We also discuss different servitization strategies manufacturing companies may want to pursue, based on speed of implementation and level of dependency on service suppliers. In this sense, while some types of collaboration and BMI orientation will require higher levels of KS, resulting in the development of internal service capabilities in the manufacturing company, other configurations could be more appropriate for a faster implementation of servitization or for a less risky BMI. Therefore, different configurations of BMI and suppliers' involvement are discussed in our results.

## 2. Theoretical background

### 2.1. Servitization as a manufacturing business model innovation

The servitization strategy consists in an integration process of products and services into a system – widely named as Product-Service System (PSS). It requires a new form of organizing the manufacturing company and its stakeholders to provide functionality to consumers (Beuren et al., 2013; Manzini and Vezzoli, 2003). Therefore, it is considered as a BMI in the context of the traditional product development and manufacturing system (Ceschin, 2013; Visnjic et al., 2016). A company can target different levels of PSS in the servitization strategy (Bikfalvi et al., 2013). Consequently, the BM can undergo different degrees of transformation, from incremental BMI, where the central value proposition (i.e. the BM's “what and why” according to Mitchell and Coles, 2004) does not change dramatically (although other BM components may vary), to radical BMI, where the value architecture changes significantly (Teece, 2010; Cortimiglia et al., 2016; Massa et al., 2017). At initial levels (i.e. incremental BMI), the company offers the core product and also some related services such as logistics and distribution, installation and commissioning, maintenance and upgrades, personal support and training (Durugbo, 2014; Wang et al., 2016). A more radical level of BMI (i.e. a deeper level of BM transformation) implies that the company will offer the product itself as a service, such as Rolls-Royce's offering of ‘power-by-the-hour’ instead of selling aero-engines (Baines et al., 2007).

Particularly, in this study we are considering manufacturing companies that keep their competence in technology, product development and manufacturing, and need to change the way such products are offered and commercialized. These companies might not want to abort their manufacturing activities, but need to transform how they offer their products and how they deal with customers – which are both key parameters of a BM (e.g., see Mitchell and Coles, 2004). Following Galbraith (2002) and Matthyssens and Vandenbempt (2010), a

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