Product-Service Systems across Life Cycle

An analysis of buyer-supplier integration for servitization strategies

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Abstract

The Business Model (BM) transformation process, changing from a traditional manufacturing BM to BM focused on servitization (servitized BM), may increase the management complexity, which is also reflected in a need of superior levels of organizational knowledge. Therefore, one alternative to deal with this challenge is by acquiring knowledge from suppliers. However, there is still a lack of studies analyzing the collaboration intensity and knowledge transfer with suppliers to be successful in the BM transformation for servitization. Thus, this paper aims to understand how companies deal with suppliers' knowledge integration aiming for servitization and to understand the knowledge transfer dynamics in this integration. Aiming this, we adapted to the context of servitized solutions development, the framework proposed by Le Dain and Merminod (2014) for supplier integration in collaborative new product development (NPD), which combines three typical supplier involvement configurations (black, grey and white box integration) with the three knowledge sharing levels proposed by Carlile (2004) (transfer, translation and transformation). By means of a multiple-case study analysis of seven multinational companies, we first reinterpreted the three classical supplier integration configuration, showing how they can happen in servitization; then, we analyzed the levels of knowledge sharing that are present in each one of the three suppliers' involvement configurations. Our results show differences of the framework when compared to the original one for supplier involvement. We also discuss causes of such a difference between purely product development and servitized product development.

1. Introduction

In past decades, the manufacturing industry used to consider the service offer as an undesirable cost for the business. Today, however, the service offer gained importance also in manufacturers and became a fundamental factor for customers' satisfaction [1,2,3]. This phenomenon was called by Vandermerwe and Rada [4] as servitization, consisting in a business model (BM) innovation of traditional manufacturers – were the traditional product selling focus is changed to a new BM focused on offering a joint solution package of product and services – increasing adding value offered to the consumer [5,3,6].

This BM innovation can be radical or incremental [7], and both may bring important challenges derived from the changes caused in the elements of the traditional BM to become a new Servitized BM [8,9,10]. According to Dahmani et al. [11], the decision-making process during servitization passes through three macro processes: (i) design of a product-service solution, (ii) transformation of a traditional BM to servitized BM and, (iii) organizational change needed to support the new BM.

Several authors point out that some of the principal difficulties for such BM innovation is the gap between the knowledge available in the company (mainly focused only on product) and the knowledge needed to offer a product-service package [10,12,13,14]. This means that companies focused on manufacturing may not have all the required knowledge to become servitized. Therefore, they need to acquire knowledge from outside, i.e, from an external organization or, even, another business unit [2,6].

However, even when prior research has been widely concerned in several aspects of servitization and product-service systems (PSS), only little research can be found regarding how companies involve their suppliers for

servitization [e.g. 30,32,33] and how they contribute with their knowledge for this new company's servitized BM [2,6,13,16,14,17]. Therefore, our research question is: *how do companies integrate knowledge from their suppliers aiming for servitization*? We address this question mainly from the knowledge management perspective.

Consequently, the aim of this paper is to understand the suppliers' involvement and collaboration during the BM innovation process aiming for servitization, focusing on the knowledge transfer and acquisition strategies during such involvement. Thus, our approach is based on the theory of knowledge sharing during the supplier integration. Aiming this, we used a multiple-case strategy with 7 multinational companies to deeply understand how this phenomenon happens in practice in order to propose a final interpretation of the levels of suppliers' involvement and the kind of knowledge used in each one of these levels.

As result, the main contribution of this paper is that it shows how another field of research, i.e. the supplier-integration in NPD, can support a better comprehension of knowledge sharing dynamic in the context of BM innovation for servitization. Thus, our paper integrates different fields around the topic of BM and servitization.

2. Literature Review

2.1. Knowledge transfer in BMI for servitization

Knowledge is considered one of the most important and strategic resources of an organization [18,19]. Knowledge Transfer (KT) comprises two main actions: the knowledge movement from a source to a recipient and its subsequent absorption and use, taking advantage from previous experience [20,21]. The literature has proposed different perspectives and approaches to describe the KT process [24]. In this paper, we specifically focus on Carlile´s [25] organizational learning theory, since this is the perspective used in the framework proposed by Le Dain and Merminod [26] that will be used for our case study analysis. As observed in Figure 1, Carlile [25] distinguishes three levels of knowledge transfer complexity across boundaries between actors involved in an innovation process: *transfer, translation* and *transformation*. Following, we discuss each one of these three levels of KT.

In this first level, *transfer of knowledge*, KT is considered external, explicit and storable. In this case, knowledge can be transferred mainly using information processing tools, e.g. the implementation of a product data management system that allow a common workspace where product data can be shared [25,26]. In practice, knowledge transfer can be identified when occurs an exchange of boundary objects between the actors, e.g., requirement specifications and timelines, prototypes and design drawings, etc. [25,26].

When the level of innovation grows, the complexity of KT increase besides and is needed a transition from a syntactic to a semantic or interpretative boundary because some differences and dependencies became unclear and some meanings ambiguous. This level is called as *knowledge translation*. In this level, the complexity of the knowledge naturally generates interpretative differences and became necessary to use

mechanisms to create a shared meaning between actor to cross this new boundary. In practice, knowledge translation can be identified when occurs discussion between the actors to avoid sticky knowledge misunderstanding [25,26,27].

Finally, in a high level of innovation, there is a transition from a semantic to a pragmatic boundary, where a solution has to be found to divergent actor interests. In this process, actors not only have the learning cost of accepting a new knowledge, but they have to transform their existing domain-specific knowledge, and even the common knowledge, to be able to effectively share and assess knowledge at the boundary. This stage is called *knowledge transformation* and is the more complex boundary, because the cost of transforming current knowledge can negatively affect in the willingness of the actor to make the necessary changes. In practice, knowledge transformation activity can be identified when a complex problem solving situation occurs during a project and which result in the building of a new solution [25,26].

As represented in Figure 1 and explained above, Carlile´s [25] framework is composed by 3-T (Transfer, Translation and Transformation) for transferring knowledge across boundaries. These 3-T are related hierarchically and, depending on the level of innovation, the actors will move up and down through the different levels of cross-knowledge complexity. Then, when the innovation level increase, knowledge transfer is necessary for the knowledge translation while the knowledge transformation process requires both transferring and translation, thus, the transfer knowledge process is the basis of the framework. The arrow in Figure 1 indicates that, because of the complexity, managing knowledge across a pragmatic boundary cannot be resolved with just one attempt; it requires multiple iterations [25,26].
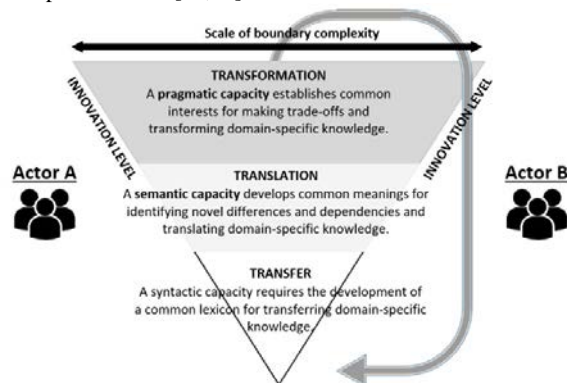

Figure 1: 3-T framework to management of knowledge across boundaries
(Source: Adapted from [25])

2.2. The supplier-integration approach

Petersen et al. [28] affirms that the inter-organizational relationship between suppliers and customer during an innovation process can be divided in three configuration levels, according to the supplier involvement: white box (design is customer driven), grey box (joint design) and black box (design is supplier driven). In the *white box* level, the customer is responsible for the whole design and specification of the solution and the supplier is mainly involved in the late project stage, commonly in the execution stage. In the second level of supplier integration, the *grey box* configuration, the design