

Product-Service Systems across Life Cycle

## Transforming a traditional product offer into PSS: a practical application

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### Abstract

In the last decades, companies have shifted from traditional business models based on selling products to product-service systems (PSS). Despite this tendency, there is a paucity of complete methodologies and tools to guide companies on how the transition should occur. To address this issue, the goal of this research is to present a complete framework to support manufacturing companies in the servitization journey. This novel proposal involves the application of design thinking to define the value proposition integrated with a PSS oriented business model creation, that goes beyond generic methods normally applied; and the specification of business process architecture to support PSS implementation. This research followed a prescriptive approach by means of action research technique. Key findings of the framework application are presented.

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### 1. Introduction

Manufacturing companies are challenged by increased global competition, faster technological improvements and a greater demand for product differentiation to meet new customer's needs and secure competitive advantage [1,2]. Thus, in the last decades companies have shifted from traditional business models based on selling products to PSS models [3–10]. By doing that, they aim to add value to their offerings through a user oriented [11,12] and integrated solution known as Product-Service System (PSS) [2,3,13–16].

The degree of transformation required for PSS business model transitions varies depending on the company's strategy and risk sensitivity [17]. One first scenario comprises both product and services components of the PSS as novelties [18,19]. In this case, product and services should be developed simultaneously from the beginning, which increases business risks [17]. A second scenario includes offering existent product and services, which results the minimum risk combination [17].

A third scenario considers a new product with an existent service platform [17]. Finally, a fourth scenario, which is the focus of this article, encompasses an existent and fully developed product combined with new services platform [4,6,10,19]. In such cases, the PSS development process focuses on the services. Nevertheless, the method should also evaluate if the product has necessary functionalities to enable the PSS offer or if it requires modifications (adjustments in hardware to enable automatic billing, installation of sensors to monitor customer's operation and enable predictive maintenance, or product modifications to satisfy customer's new requirements). Regarding this last fourth scenario, there are other two variations. Some companies may choose to operate only with PSS business model while others can operate both traditional and PSS business models in parallel. In other words, they can continue selling traditional products and the integrated product service solution concomitantly in order to expand their market share and gain access to new markets [6,20].

Independently of the degree of transformation, it is widely known that offering a PSS involves the proposition of a new business model, which is normally defined in the beginning of the development, or even in the front end of innovation (FEI) [5,9,19,21–23]. Business models are representations of the organization's logic to create and deliver value to customers [19,24–27]. Depending on the author, this logic may depict different elements, such as the company's strategic choices, operations and relationships. Generic methods for generating business models, such as the Canvas business model [24], deliver a simplified and aggregated representation of a business' logic with an insufficient level of detail for PSS development [18]. Thus, some authors suggest the use of specific methods that comprise greater level of details when developing a PSS business model [18,21]. Furthermore, designing a PSS business model, even in the case when the product component is already existent and fully developed, demands details about the service offer (such as business processes related to services, service level agreements, partnership agreements) that are not mature enough at the FEI phase. According to previous research [18], the PSS business model design may begin in the FEI, but the detailing should continue concurrently to the design of new services in the development phase (including the necessary new processes architecture for delivering the services). Regarding this perspective, methods presented in literature to design business models are useful to define an initial version, but they lack the appropriate level of detail for the purpose of a PSS offering [6,18]. Moreover, some authors indicate that literature is sparse in suggesting complete methodologies and tools to guide companies on how the transition should occur [3,4,6,28,29].

In regard to practical application, the number of studies focusing the transition from traditional to PSS business models is considered still limited [4,6,8,18]. Additionally, recent literature work [3] suggests that research community should take more prescriptively approaches in the change process and use techniques such as action research in order to actively support PSS practitioners in developing the tools and techniques that are still needed.

Hence, aiming to tackle some of the aforementioned gaps, the goal of this research is to present a complete framework developed by means of action research in order to support manufacturing companies in the transition from traditional product to PSS business model.

After the description of the research methodology (section 2), this article describes the methods constituting the proposed PSS transition framework and discusses the main findings of a practical application (section 3). Lastly, a section of final remarks is presented (section 4).

## 2. Research Methodology

This research follows a prescriptive approach, adopting an action research technique to propose a framework to help companies in the transition from traditional product to PSS offer. This method was chosen, because as already pointed by Baines et al. [3] most papers about PSS are descriptive and based on case studies. Like him, we also believe that researchers have an opportunity to be more active in

developing actions rather than simply providing an analysis on the outcomes of others, hence prescriptive researches should be more explored.

The action research approach is a scientific method characterized by the cooperation of researchers with collaborators from industries in order to develop the solution to a scientific and organizational problem. Two main differences of action research when compared to case studies are: (i) the solution or parts of it are developed during the research; and (ii) the researchers have an active role in the solution execution [30]. This study adopted the action research method proposed by Coughlan and Coughlan [30], which consists of a four-step cyclical process: diagnosing, planning, taking action and evaluating action. After each evaluation, a new cycle may start if necessary.

This work is being conducted since September 2015 with the collaboration of a dental and hospital equipment manufacturer. This company (here after named Diagnosis CO for confidentiality purposes) has a diverse portfolio, but the family of products selected to become PSS is diagnostic imaging equipment. Those are high cost products manufactured and sold by Diagnosis Co predominantly by means of B2B transactions. Diagnosis CO is a mid-sized company employing over 450 persons. The company has strong competences in product development and manufacturing. Diagnosis CO decided to focus on a PSS strategy after losing sequential opportunities to entry new market segments due to customers' economic restrictions on making high investments to buy the equipment. Moreover, they intended to have recurrent revenue with the PSS strategy.

As we adopted action research approach, besides guidance and coordination, the researchers also actively participated in the execution of framework activities. Our team was composed of four professors, two PhD researches and four MSc. researches. The company structured a project team constituted of the Market Intelligence Manager, the Engineering Manager and the Post-Sales Manager. The President, the Sales Director and the New Business Director were involved in specific project gates to validate decisions and approve the project continuation.

A first cycle of the action research until the business model configuration was already deployed and it is the focus of the following sections.

## 3. Results and Discussion

### 3.1. PSS Transition Framework Overview

The proposed Framework (Fig. 1) aims to guide companies on their transition to PSS business models, when they identify servitization as an opportunity and strategic solution to their business. It is important to highlight that the representation and phases of the framework were defined during the project development. It was grounded on two important considerations. The first consideration is that the PSS business model dimensions - here considered as customer segments, value proposition, channels, customer relationship, processes, partnerships, resources, revenues and costs - cannot be completely detailed in the FEI phase.

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