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Implementing sustainable product–service systems utilizing business model activities

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Abstract

To stay competitive and comply with government legislation, many global manufacturing companies try to diminish their environmental impact and avoid commoditization of their products by offering sustainable product–service systems (PSS). Offering PSS successfully is highly challenging, however, and significant interfirm heterogeneity exists with regard to successful PSS provision. Based on multiple case studies in two global manufacturing companies, the importance of the business model as an organizing device to align and coordinate key activities and scarce resources in PSS is highlighted. The analysis provides insights into the underlying building blocks that will help firms implement a PSS business model and provides new implications for analyzing and improving PSS offers.

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1. Introduction

Many global manufacturing companies seek to reduce their environmental footprint, because governmental policies and legislation are striving to diminish environmental impact. In addition, many customers demand cleaner and more environmental-friendly products and production [1]. A promising—but challenging—way to achieve sustainability while also fulfilling customers' needs and ensuring firm profitability objectives is to combine products and services into a sustainable product–service system (PSS). This entails providing an integrated mix of products and services that fulfill certain customer needs in an economical and sustainable manner [2,3].

Offering sustainable PSS is inherently challenging. These challenges are related to the design and sale of product-service combinations, aligning interest of all stakeholders, required changes in the mindset of all actors and the prevention of rebound effects and less careful customer behavior [3,4,5,6]. Consequently, many firms struggle to develop and deliver PSS effectively to contribute to the triple bottom line of environmental, economic, and social payoffs [7,8].

Recent studies have contributed with valuable insights into addressing the specific challenges manufacturing firms face for successful PSS provision [e.g., 9,10]. These studies reveal a rather fragmented and isolated perspective on how to effectively offer PSS to customers. Studies tend to focus only on certain tools that can help address very specific problems [1,11]. Indeed, important questions pertaining to the overall firm's logic of how value is created, delivered, and captured have remained unanswered even though such issues are critical to providing PSS successfully [4].

In response to this lacuna, some researchers have proposed that a business model perspective [12] could provide a better understanding of how to approach successful PSS provision [8,13]. Commonly, the business model concept is used to illustrate a specific offer emphasizing the differences between PSS and a traditional, product-based business model [14] or to showcase the relevance of external networks in the business model implementation process [5]. Although many of these recent studies have tried to convey the utility of the business model concept in PSS provision, none provide an inclusive view of business models that considers the underlying

building blocks and activities that are needed to implement PSS [9,15].

To address this gap, the purpose of the present study is to provide insights on the underlying foundation of how manufacturing firms benefit from applying and using the business model concept for providing sustainable PSS. More specifically, in the present study the focus is on identifying and describing the building blocks and the activities that are necessary for PSS business model provision. The study also shed light on how firms organize these activities such that they overcome challenges and make their PSS business models work. The analysis is grounded in case studies of two global industrial manufacturing firms that offer sustainable PSS to their global customer base. The present study provides empirical insights into which activities are necessary for manufacturing firms to undertake to effectively create, deliver, and capture value by providing PSS. In sum, the present study provides novel insights and contributes to the emerging discussion regarding the relevance of the business model concept in adopting and providing PSS.

2. Theoretical background

2.1. The emergence of the sustainable PSS concept

Initial studies on PSS recognized the sustainability and environmental implications were fundamental, and the PSS concept was defined around these aims [7,16]. Over the years, however, sustainability was treated more as an inherited result of PSS, and the focus shifted to achieving economic benefits and customer satisfaction [17]. In hindsight, several studies have acknowledged that in certain cases PSS results in a negative effect on the environment through less careful behavior and rebound effects [3,6]. In recent years, however, the emphasis has shifted to achieving sustainable benefits by recognizing the need to work actively to realize the full sustainability potential of PSS [1]. Sustainability in PSS can be reached mainly through improved resource utilization or innovations that change operations such that they are more beneficial for the environment [8]. By producing fewer products and increasing durability and recyclability, the PSS is optimized to be eco-efficient [14,18]. Thus, by focusing on the entire life cycle, reducing the environmental impact of PSS is a strong argument in the literature [1]. With these thoughts at the forefront, Vezzoli et al. [19] established PSS as a sustainable concept, where the economic and competitive interests of the providers continuously seek new solutions to environmental, social, and economic benefits.

Additionally, many researchers have pointed out that the challenges firms face when implementing PSS often negatively affect the firms' performance [20]. To address these challenges, some researchers have proposed that constructing a well-structured business model perspective could contribute to a more inclusive approach to PSS provision [8,13,15]. Furthermore, such an approach could potentially contribute to improved performance, especially in firms that implement advanced, results-oriented PSS.

2.2. PSS business models: Components and challenges

Teece [12] defined business models to center on how value is created, delivered, and captured. The literature lacks clarity, however, surrounding the single components of this definition, and it seems open for interpretation as to exactly what activities these components entail. The initial literature on the PSS business model concept has commonly been used to categorize different types of PSS such as product-, use-, or results-oriented [3,18]. More recent PSS studies have highlighted that business models are central to implementing PSS successfully [8].

Many prior studies on PSS business models have focused on transitioning from providing products to solutions and on network aspects concerning PSS [e.g., 5,9]. Other studies on PSS business models have mainly developed frameworks that focus on specific elements that are part of PSS business models [4]. However, the lack of an explicit definition of the three business model components (value creation, value delivery, value capture) hinders applying this concept to sustainable PSS. Nevertheless, the literature frequently touches on different aspects that constitute the business model components, as well as challenges. On the one hand, value in sustainable PSS is created by taking over work tasks from customers and accomplishing them more efficiently, which also improves the relationship with the customer and their loyalty [1,18]. On the other hand, value is created through positive effects on the environment in terms of reduced material use and higher levels of resource utilization [3,7,19]. Customers' knowledge and knowledge about customers are strong barriers to value creation in sustainable PSS. For example, customers that do not favor ownerless consumption constitutes a frequently mentioned barrier to successful PSS [7,17]. Value delivery is characterized by the high skill, competence, and experience levels required to control the entire process of providing sustainable PSS [8,18]. In addition, new organizational structures and new partners need to be integrated into PSS provision. Given these parameters, challenges occur because processes need to be developed, industrialized, and automated; the staff needs to be qualified; and stakeholders need to be identified and integrated into a PSS-oriented organization [18].

To capture value, it is important to design sustainable PSS such that customers are willing to pay for the added value [7]. At the same time, costs need to be handled efficiently. In addition, the profitability of PSS is difficult to show because cash flows are uncertain and quantifying savings is difficult [20]. Pricing and absorbing risks are significant problems that manufacturers need to address when capturing value from sustainable PSS [10,17]. As such, significant opportunity exists to use the business models concept to align functions and activities in the firm toward a common strategic goal, to use the concept as a coordination device, and to reach internal and external fit in the transition toward providing PSS that could positively affect the firms' performance [5]. Thus, the possibilities to exploit the full potential of sustainable PSS increase significantly, and the economic, social, and environmental benefits can be captured fully.

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