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Effective product-service systems: A value-based framework

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ABSTRACT

Manufacturers increasingly engage in servitization and as a result offer services in combination with their products (i.e., product-service systems, PSS). However, while servitization in theory seems to be a promising strategy, in practice, the bundling of services with product offerings does not always result in the expected performance outcomes. In this paper, we propose a framework that helps manufacturers to overcome this servitization paradox. The underlying premise of our framework is the need to give primacy to the value customers derive from PSS. The framework builds on the idea that products and services differ with regard to the value that is created by the tangible elements and the interaction moments between manufacturers and customers; this is presented in a 2×2 matrix. Subsequently, this paper provides guidelines for identifying PSS that are effective in terms of value creation. First, the product and service elements of the PSS should have sufficient autonomous value to be sold separately on the market. Secondly, they should come from different quadrants of the 2×2 matrix. Lastly, the combination of product and service elements should create synergy. Through a survey among product and service developers and an experimental auction among customers we validate our ideas.

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1. Introduction

Increasingly, companies develop and market product-service systems (PSS) to gain a competitive advantage (e.g. Antioco, Moenaert, Lindgreen, & Wetzels, 2008; Manzini & Vezzoli, 2003). PSS involve offerings that include one or more product functionality and one or more associated service functionality. While a company can decide to offer PSS from the start, the usual path towards such an offering is that a company that already offers either products or services adds the missing component to its offerings. Service providers can choose to offer PSS by adding products to existing services ('productization'). For them, this bundling of products and services can be beneficial because it can result in, among other things, more efficiency (reduction of costs). For example, direct, personal contact with customers is (partly) replaced by (intelligent) products, such as robots to assist care providers (Sharkey & Sharkey, 2012). Another benefit of productization is that by integrating a product and service into a PSS, it is possible to make a service more tangible and easier to understand and evaluate before a purchase (Jaakkola, 2011).

In this paper, we focus on "servitization", which is a more common strategy than productization. Servitization relates to manufacturing companies shifting their business focus from designing and selling

physical products only, to designing and selling a system of products and services (e.g. Manzini & Vezzoli, 2003, Neely, 2008, Santamaría, Nieto, & Miles, 2012, Ulaga & Reinartz, 2011, Vandermerwe & Rada, 1988). As Neely (2008) notes, servitization concerns manufacturers who add services to products that would otherwise be offered at other positions in the value system, usually further downstream. For example, to profit from the rapid growth of the 3D printing market, some manufacturers of printing machines are exploring ways to offer 3D printing 'on demand' services to, for example, designers and artists. Servitization thus allows manufacturers located at different stages of the value system to create and appropriate a larger share of the eventual value to the final customers (cf. Mol, Wijnberg, & Carroll, 2005).

As a notable outcome of the servitization strategy, manufacturers may offer PSS (Chang, Miles, & Hung, 2014). These PSS can bring products closer to the customer and enable customization and tailor made solutions to a larger extent than traditional products. PSS can thus create a more personalized experience and increase the (perceived) added value of these offerings (Gebauer & Friedli, 2005; Penttinen & Palmer, 2007). Bundling of products and services is advantageous because services tend to lock the customer into a long-term relationship (Cohen, Agrawal, & Agrawal, 2006; Tukker, 2004; Vandermerwe & Rada, 1988). PSS may also provide a means to lower costs, for either the PSS providers or their customers (Ulaga & Reinartz, 2011). Furthermore, next to strategic and economic benefits, some PSS have the potential to bring about changes in consumption patterns that may accelerate the shift towards more sustainable practices and societies (e.g. Goedkoop, van Halen, te Rielen, & Rommes,

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1999, Manzini & Vezzoli, 2003, Mont, 2002, Sundin, Lindahl, & Ijomah, 2009, Tukker, 2004, 2015).

Although in theory there are many benefits of a PSS, in practice manufacturers often struggle to enhance their performance by developing and marketing a PSS (e.g. Baveja, Gilbert, & Ledingham, 2004, Benedettini, Neely, & Swink, 2015, Gebauer, Fleisch, & Friedli, 2005, Matthyssens & Vandenbempt, 2010, Neely, 2008, Spring & Araujo, 2013, Stanley & Wojcik, 2005, Ulaga & Loveland, 2014, Ulaga & Reinartz, 2011). In part, this seems to be due to the fact that knowledge on how to effectively develop, manage, and market PSS is still emerging (Benedettini et al., 2015; Reim, Parida, & Örtqvist, 2015; Spring & Araujo, 2009). For example, many manufacturers lack the knowledge to adapt their manufacturing capabilities to effectively develop services or PSS (Spring & Araujo, 2013; Tukker, 2015). In addition, as manufacturers use product performance indicators, they might lack the knowledge to effectively apply service performance indicators in order to improve their services or PSS (Kastalli, Van Looy, & Neely, 2013). Even if a manufacturer is able to develop a PSS, they might struggle with successfully selling it on the market due to the “manufacturer’s traditional goods-centric sales core” (Ulaga & Loveland, 2014, p. 122).

The primary purpose of this paper is to propose a new framework that analyses PSS from the perspective of how these offerings create value for the customer, and to show how this framework can contribute to developing competitively effective PSS for manufacturers that consider the servitization route. With this, we contribute to solving the ‘servitization’ paradox, which relates to phenomenon that servitization in theory seems to be a promising strategy, yet in practice, “the bundling of services with product offerings does not always produce the returns that companies expect” (Benedettini et al., 2015, p. 947). Using a customer value-creating perspective, we identify important principles that characterize effective PSS. In doing so we provide guidelines to managers for the successful development and marketing of PSS. Furthermore, by examining PSS from a customer value-creating perspective, we contribute to existing PSS literature which tends to analyze PSS and its effectiveness from a business (internal) perspective or a macro (ecological/environmental) perspective, rather than a customer perspective.

The sections below discuss the previous literature on PSS, to propose a framework that enables the offering of effective PSS. Subsequently, the results of two empirical studies are presented. One of these studies is a survey-based study of product and service developers; this study established that the way these professionals think and make decisions about the characteristics of products versus services corresponds well to the framework proposed here. The second study is an experiment to demonstrate the importance of determining upfront the added value that a PSS will deliver to customers. We do this by measuring the difference in consumers’ willingness to pay when emphasizing the PSS character of the PSS compared to emphasizing either the product or the service elements of the PSS. In the last section a discussion and suggestions for future research are provided.

2. Theoretical framework

2.1. Conceptualizing PSS

There is no generally accepted definition of a PSS (see Tukker, 2015 for a review of PSS definitions). The act of combining products and services is essential to a PSS. Tukker and Tischner (2006, p. 1552), for example, define PSS as ‘a mix of tangible products and intangible services designed and combined so that they are jointly capable of fulfilling final customer needs’. To distinguish between products and services, Tukker and Tischner (2006) use intangibility (see also, e.g., Zhang, Jiang, Zhu, & Cao, 2012).

In existing literature, next to intangibility, products and services are contrasted on the basis of degree of: simultaneity, heterogeneity, and unstorability (or perishability) (e.g. Easingwood, 1986; Jaw, Lo, & Lin,

2010; John & Storey, 1998; Morelli, 2002; Nijssen, Hillebrand, Vermeulen, & Kemp, 2006). Intangibility or the degree of material intensity refers to the fact that services are not material-based. Being material-based also implies that something can be physically stored. Unstorability or perishability relates to the fact that services only exist in time and not in space; thus, they cannot be stored. Simultaneity deals with the simultaneous production and the consumption of services, which implies interactions between manufacturers and customers. As noted by Santamaría et al. (2012), p. 147): “Interaction with customers is a distinctive and – in some services – a fundamental element of the service process.” Indeed, the design of customer interactions – how the service is to be delivered to the customers – has been acknowledged as an essential element of new service development (Alam, 2006; Cheng & Krumwiede, 2012; John & Storey, 1988; Secomandi & Snelders, 2011). Due to this interaction, services tend to be heterogeneous. Heterogeneity makes the service likely to be experienced differently each time it is consumed. Thus, the four differences can be reduced to two core differences with respect to tangibility and manufacturer-customer interaction. The next subsection builds on this core distinction, but first we explore what it means to combine products and services in an ‘effective’ PSS that is valued by customers.

2.2. Effective PSS

Shostack (1977, 1982) proposes that all products and services consist of combinations of product and service elements, and that the balance between those elements determines whether the combination is perceived as a product or a service. However, for the development and marketing of effective PSS, it seems beneficial to establish when a product with service elements or a service with product elements becomes an effective PSS. If almost anything can be labeled as a PSS, the PSS term appears meaningless.

Literature on PSS indicates that a PSS should satisfy customer needs (e.g. Manzini & Vezzoli, 2002; Neely, 2008; Tukker & Tischner, 2006; Wang et al., 2011). The PSS literature, however, often fails to operationalize what fulfilling customer needs actually entails. In marketing, service-dominant logic highlights the need to understand what value customers derive from services, rather than defining value from the manufacturers’ perspective (e.g., Vargo & Lusch, 2008). In management, it has also been pointed out that literature often pays scant attention to the demand side when examining competitiveness (Priem, 2007). This is unfortunate because only when customers ‘validate’ the value of products and services by actually acquiring them, are companies able to appropriate sustainable value from their offerings. In this paper, we thus follow the basic tenet of this stream of literature, trying to understand what value means to customers, not manufacturers, and thus adopting a ‘customer value’ perspective.

Literature on PSS has provided different typologies in which classification tends to be based on how PSS create value for companies and the implications for companies when embracing a servitization strategy, for example in terms of changes in property rights or ownership, needed skills and capabilities, and monetization/payment models (see e.g. Tukker, 2004; Lay, Schroeter, & Biege, 2009). While these classifications are helpful to manage PSS, we propose a supplementary view focusing on how PSS create value for customers.

From a business perspective it seems beneficial to invest in a PSS, if in the perception of the customer, the PSS adds more value than when the product and service are sold separately on the market. PSS manufacturers should thus make sure that customers perceive the added value of this combination. Unfortunately this is not always the case. For example, as demonstrated by Ulaga and Reinartz (2011), for PSS that ensure proper functioning of the seller’s product during all stages of its lifecycle (e.g. product lifecycle services such as maintenance contracts or take-back agreements), the services provided were considered by customers to come with the product as a matter of course. In other words, the services did not provide significant added value for

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