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Overcoming the Service Paradox – A Configurational Analysis

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Abstract

The service paradox describes that manufacturing businesses make significant investments to enhance their service business, in order to achieve higher returns, but fail to achieve positive profitability effects and sometimes even face bankruptcy. While a commonly recognized phenomenon in research and industry, it is still unclear why some manufacturers are successful with their services offerings, while others fail. Current research mostly focuses on successful cases of servitization, with the results often being inconclusive or interconnected, while research on servitization failure is sparse. In order to understand the service paradox, however, it is not enough to study success and failure in isolation. Therefore, the purpose of this study is to examine the causal factors responsible for the service paradox, by analyzing and comparing both the occurrence of service profitability and overall profit growth, as well as their absence. Conceptualizing the service paradox as a causally complex phenomenon, characterized by asymmetry, equifinality, and conjuncturality, a configurational approach is chosen. Elements of service strategy (focus of the offering on product – or process-oriented services, existence of a clearly formulated service strategy) and structure (existence of a separate service organization, service orientation of corporate culture) are included in the configurational model. Fuzzy set qualitative comparative analysis is employed to a sample of 143 German manufacturing companies. The existence of a clearly formulated service strategy and a strong service orientation of corporate culture are identified as necessary conditions for service profitability. Five configurations sufficient for service profitability and overall profit growth are identified, as well as three configurations sufficient for the absence of the outcomes. The discussion results in the formulation of four proposition and three ideal-type configurations for overcoming the service paradox, focusing on a match between the kind of service offering and structure of the service organization. This study therefore adds to the sparse literature on servitization failure and the service paradox. It offers a theoretically sound, fine-grained and realistic understanding of the causes of the service paradox, as well as on ways to overcome it, which ultimately aids managers of servitizing companies in better decision making.

Keywords

Servitization, service strategy, service infusion, fsQCA, complex causality

1. Introduction

Manufacturers increasingly face competitive pressure from low-cost economies and the commoditization of their physical products (Baines, Lightfoot, Benedettini & Kay, 2009). As a response, to realize higher profit margins and more stable revenue flows (Fang, Palmatier & Steenkamp, 2008), and to strengthen their competitive position by providing unique value for their customers (Kowalkowski, Windahl, Kindström & Gebauer, 2015), many manufacturing businesses add services to their core offering. This phenomenon was named servitization by Vandermerwe and Rada in 1988, and is currently defined by Kowalkowski, Gebauer, Kamp & Parry (2017, p. 8) as "the transformational process of shifting from a product-centric business model and logic to a service-centric approach". Servitization thus ranges from offering simple, product-related services to complex hybrid offerings (Ulaga & Reinartz, 2011), integrated solutions (Brax & Jonsson, 2009) or product service systems (Tukker, 2004).

A positive servitization-performance relationship was recently confirmed in a meta-analysis (Wang, Lai & Shou, 2018) and companies like Rolls Royce, ABB, and IBM serve as prominent examples of the benefits of servitization. However, not all servitizing companies achieve the intended positive effects. Some invest in the service business, which leads to increased service offerings and higher costs, but they fail to achieve the expected higher returns (Gebauer, Fleisch & Friedli, 2005). This phenomenon is referred to as the service paradox (Gebauer et al., 2005; Brax, 2005). Overall, servitized firms have higher costs per employee and are not always able to recoup the additional value that is required to be profitable with services (Neely, 2008). Furthermore, the share of service revenue is still low in European manufacturing businesses and their service strategies are not fully developed (Dachs et al., 2014; Lay, Copani, Jäger & Biege, 2010). Servitizing firms are also found to face a higher risk of bankruptcy (Neely, 2008; Benedettini, Neely & Swink, 2015; Benedettini, Swink & Neely, 2017), suggesting that servitization failure is a possible and often also likely occurrence (Valtakoski, 2017).

So why do some manufacturers achieve positive results with their servitization while others fail? Previous research has predominantly focused on successful cases of servitization (Kowalkowski, Gebauer & Oliva, 2017). Even though only 18% of servitization-related studies report specific performance criteria, a large number of possible success factors are identified in the literature (Fliess & Lexutt, 2019). Research, however, is far from reaching a consensus regarding those success factors, with many results being interconnected, inconclusive or even contradictory (Fliess & Lexutt, 2019; Lexutt & Fliess, 2018), indicating complex causality (Fiss, 2011). Little is known about servitization failure (Lütjen, Tietze & Schultz, 2017; Kowalkowski, Gebauer & Oliva, 2017; Story, Raddats, Burton, Zolkiewski & Baines, 2017; Valtakoski, 2017), with current research focusing on cost or risk-based explanations (Benedettini et al. 2015, 2017).

Even less is known about how any of the identified success- or failure factors combine and interact with each other in producing positive servitization effects as well as a lack thereof – in other words, how they relate to the service paradox. In order to understand the service paradox, it is not enough to understand why firms succeed, or why they fail, in isolation (VanRooij, 2015).

The purpose of this study is to investigate the causes of the service paradox from a configurational perspective, examining both the occurrence and the absence of service profitability and profit growth. Overall, complex phenomena like organizational success and failure are more accurately and realistically understood in terms of different, equifinal configurations of

relevant factors (Fiss, 2011). The service paradox is consequently conceptualized as a causally complex phenomenon, as indicated by the inconclusive and interconnected results of previous research. This study therefore adds to the sparse literature on servitization failure and the service paradox. It offers a theoretically sound, fine-grained and realistic understanding of the causes of the service paradox, which ultimately aids managers of servitizing companies in better decision making.

The article is structured as follows: in the next section, it is argued that the service paradox is best understood from a configurational perspective in terms of complex causality. Based on configuration theory and the extant servitization literature, the configurational model is built to contain elements of strategy and structure. After presenting fuzzy set qualitative comparative analysis as the appropriate methodology for dealing with complex causality, the results are presented and discussed. Four propositions are formulated and three ideal-type configurations for servitization are introduced, that serve as suggestions for management. The paper concludes with a summary of its contribution and suggestions for future research.

2. The service paradox and complex causality

The service paradox describes that some companies achieve positive profitability effects with their service offerings while others fail to achieve the same results (Brax, 2005; Gebauer et al., 2005) with some companies even facing negative effects and bankruptcy (Neely, 2008; Benedettini et al., 2015; 2017). For the purpose of this study, servitization is considered successful if the services are profitable and have a positive impact on the organization's overall profitability (Gebauer & Pütz, 2007; Gebauer, 2008). In line with the definition of the service paradox, servitization is considered unsuccessful, if it fails to achieve positive profitability effects (Gebauer et al., 2005). Consequently, both the occurrence as well as the non-occurrence of positive profitability effects of servitization need to be examined in order to shed light on the service paradox.

Current research mostly focuses on successful cases of servitization. Lack of success or failure are usually not mentioned, meaning that the models found to relate to servitization success are assumed to be equally suitable to explain its absence, meaning that symmetric causality is implied (Woodside, 2015). However, perceiving failure as a mirror image of success is not sufficient for fully grasping failure (VanRooj, 2015). Only recently has servitization failure been studied as an independent phenomenon (Benedettini et al. 2015, 2017; Valtakoski 2017). Interestingly, these studies use different theories and explanations for failure than the studies on success (Benedettini et al., 2015; Valtakoski, 2015; Eloranta & Turunen, 2015) indicating that, implicitly, it is understood that servitization failure is not just a mirror image of success and therefore warrants different explanations.

This study argues that the service paradox is best understood in terms of complex causality, i.e. causal *asymmetry*, meaning that different combinations of causal conditions explain the presence and the absence of an outcome (Schneider & Wagemann 2012); e*quifinality,* meaning that different configurations of causal factors can lead to the same result (Ragin, 2008); and *conjunctural causation,* meaning that a causal condition might not have an effect on the outcome on its own, but only in combination with other causal conditions, and that it might even have opposing effects when combined with different factors (Schneider & Wagemann, 2012). Complex causality is generally considered to provide a more accurate prescription of how complex phenomena, like organizational success and failure, occur in reality (Fiss, 2011)

Even though the concern that servitization success and failure are causally complex phenomena has been voiced before (e.g. Kohtamäki & Helo, 2015; Rabetino, Kohtamäki & Gebauer, 2017; Ambroise, Prim-Allaz, Teyssier & Peillon, 2018), a surprisingly small number of studies addresses this issue by adopting a configurational approach to servitization performance. Böhm et al. (2017) and Ambroise, Prim-Allaza & Teyssier, (2018) identify configurations of causal factors leading to revenue growth and overall profitability, respectively, while Forkmann et al. (2017) adopt a dyadic approach, identifying configurations for mutual value creation. All provide evidence for the equifinal and conjunctural nature of the causalities regarding servitization. Only Forkmann et al. (2017), however, report and discuss results on both the presence and the absence of the outcome.

The present study contributes to this literature by examining both the occurrence and the absence of positive profitability effects of servitization from a configurational perspective. The main concern of the configurational approach is the identification of constellations of organizational characteristics leading to superior performance (Zaefarian, Naudé & Henneberg, 2010). It has been widely used in organization research to explain why some companies succeed while others fail (e.g. Vorhies & Morgan, 2003; Sirmon & Hitt, 2009; Zaefarian, Naudé & Henneberg, 2010; Deng & Smyth, 2013) and explicitly addresses complex causality (Fiss 2007; Ordanini, Parasuraman & Rubera 2013).

The most commonly studied organizational attributes in configuration research are strategy and structure, as they have repeatedly been shown to impact on organizational performance in complex ways (e.g. Miller, 1987; Vorhies & Morgan, 2003; Storey & Hull, 2010). Elements of strategy and structure have been shown to be particularly critical for servitization performance as well (Fliess & Lexutt, 2019). The first step in the transformation from a product-centric to a service-centric business model (Kowalkowski, Gebauer, Kamp & Parry, 2017) is to assign strategic importance to the offering of services (Oliva & Kallenberg, 2003; Fliess & Lexutt, 2019). As “structure follows strategy”, refocusing the strategy on services comes with adaptations in the vertical and horizontal elements of organizational structure, i.e. the formal structure as well as integration mechanisms (Chandler, 1962; Mintzberg, 1990). Furthermore, a mismatch between strategy and structure has been attributed to be responsible for the service paradox (Gebauer, Edvardsson, Gustafsson & Witell, 2010), constituting the managerial decisions on strategy and structure particularly relevant to avoid the service paradox.

The configurational model in this study (see figure 1) hence contains strategic and structural conditions, for which previous results have, on the one hand, shown effects on servitization performance, but have, on the other hand, been contradictory, particularly interrelated, or generally ambiguous, indicating complex causality (e.g. Gebauer & Pütz, 2007; Antioco, Monaert, Lindgreen & Wetzels, 2008; Gebauer, Edvardsson, Gustafsson & Witell, 2010; Oliva, Gebauer & Brann, 2012; Eggert, Hogreve, Ulaga, & Muenkhoff, 2014), as further discussed in sections 2.2-2.3.

No previous study focuses on the service paradox or on the conditions examined in this study from a configurational perspective. Specifically, it remains unclear how factors that have been identified to impact on success, like the type of service offering, the existence of a clear service strategy, the existence of a separate service organization and a service oriented corporate culture, interact with each other in different ways in producing servitization success and failure. This study hypothesizes that different configurations of these conditions are sufficient for servitization performance; that the conditions display their causal effects in con-

junction with each other rather than independently; and that the configurations for the presence of performance are different from the configurations for the absence of performance.

- Insert Figure 1 -

2.1. Outcomes: service profitability and overall profit growth

In existing research, superior servitization performance is usually captured in terms of revenue or profitability, either at the company or at the service level. The effects of servitization on general company performance are usually measured in terms of overall revenue and profit levels (e.g. Eggert, Hogreve, Ulaga & Muenkhoff, 2011; Ambroise, Prim-Allaza & Teyssier, 2018) or overall revenue and profit growth rates (e.g. Kohtamäki, Partanen, Parida & Wincent, 2013; Böhm et al., 2017). Others consider service related performance in terms of service-related revenue and profit levels (e.g. Gebauer & Pütz, 2009; Oliva et al., 2012), service-related revenue and profit growth rates (e.g. Eggert et al. 2014; Parida, Rönnberg Sjödin, Wincent, & Kohtamäki, 2014) or share of service revenue (e.g. Bikfalvi, Lay, Maloca & Waser, 2013; Dachs et al., 2014).

Following the definition of Gebauer et al. (2005), the service paradox is conceptualized as an inability of the servitizing company to achieve higher profit from services, even though efforts to enhance the service business have been made. This might be because 1) the offered services are not profitable, or 2) the effects are not strong enough to impact overall profit growth. Discrepancies between achieving profit with services and overall profit growth are indicative of the service paradox (Gebauer et al., 2005). Furthermore, the causal mechanisms leading to service level and company level profitability are assumed to be different (Gebauer & Pütz, 2007; Gebauer, 2008), however they are not often examined together. In order to disentangle these effects and thus provide a fine-grained explanation of the service paradox, the two outcomes are analyzed separately and compared in section 5.

2.2 Strategy conditions: Focus of the offering on SSP and SSC, and existence of a formulated service strategy

Offering mostly services supporting the product (SSP), which "…ensure the proper functioning of the product and/or facilitate the client's access to the product" (Mathieu 2001a, p. 40), as opposed to mostly services supporting the client (SSC), which aim at supporting different processes, actions and strategies of the customer (Mathieu 2001a), or a combination of both, has strategic implications for the organization (Mathieu 2001a, Wang, Lai & Shou, 2018) and different effects on performance. Specifically, revenue and profit streams (Eggert et al. 2014) and firm profitability (Eggert et al., 2011) have been found to be affected differently by SSP or SSC, depending on their combination with different contingency factors. In a recent meta-analysis, both SSP and SSC are found to positively impact performance, however with SSC having a higher effect size than SSP (Wang, Lai & Shou, 2018). Forkmann et al. (2017) identify different configurations in which offering SSC as well as offering SSP leads to mutual

value creation through servitization, while only offering SSP is causally related to the absence of mutual value.

SSC also contain advanced services and performance based models, which are considered related to significant changes in a manufacturer's business model (Baines et al. 2017) and require different levels of service orientation (Mathieu, 2001b).

The fact that SSP and SSC affect performance differently and that their effects differ depending on how they are aligned with various other organizational contingencies indicates both equifinality and conjunctural causality. It is, however, largely unknown how the type of service offering relates to the absence of profitability as well as the other conditions in the model. Focus on SSP or SSC are therefore included as a condition in the configurational model, to clarify how SSP and SSC relate to the service paradox.

Another widely discussed question in servitization research is whether or not a formulated service strategy leads to higher performance (Fliess & Lexutt, 2019). Some posit that formulation and planning of a clearly defined service strategy is beneficial for servitization (e.g. Neu 2005; Gebauer et al., 2005; Gebauer & Fleisch, 2007; Oliva et al. 2012), while others argue that a more emergent type of strategy is preferable (Kohtamäki & Helo, 2015; Kowalkowski, Kindström, Alejandro, Brege & Biggemann, 2012). Gebauer et al. (2006) found that firms with high service revenue did formulate a deliberate service strategy. Fischer, Gebauer, Gregory, Ren & Fleisch (2010) argue that the existence of a clearly formulated service strategy is appropriate for exploitation of servitization, while an emergent umbrella strategy is better suited for exploration of servitization opportunities.

Strategy literature suggests that several contingency factors influence whether a rather planned versus a rather emergent strategy is to be preferred (e.g. Slevin & Covin, 1997; Neugebauer, Figge & Hanh, 2016), clearly indicating complex causality. In the servitization context it remains largely unclear, however, how clearly defined service objectives and strategy causally relate to the offering of SSP and SSC, the structure of the service organization, service culture, or to the presence and the absence of profitability. The existence of a clearly defined service strategy is therefore included in the configurational model.

2.3 Structure conditions: Existence of a separate service organization and service orientation of corporate culture

One key theme in servitization research is whether or not a separate service organization with profit and loss responsibility should be created (Fliess & Lexutt, 2019). Some argue that the creation of a separate service organization is an essential step in servitization (Gebauer et al., 2005; Neely, 2008) while others posit that integrating product and service business leads to synergies and is thus preferable (Neu & Brown, 2008; Visnjic & VanLooy, 2013). The existence of a separate service organization is particularly interrelated with service orientation and service strategy, as different degrees of service orientation, combined with different strategy-structure configurations, are found to lead to success, while mismatch can lead to failure (Gebauer, Edvardsson, Gustafsson & Witell, 2010; Ambroise, Prim-Allaza, Teyssier & Peillon, 2018). Service orientation is generally found to be higher in separated service organizations (Gebauer & Pütz, 2009; Gebauer, Edvardsson & Bjurko, 2010). The effects of the structure of the service business on financial performance, however, remains

unclear. Gebauer, Edvardsson, Gustafsson & Witell (2010) did not find an immediate effect of service structure on overall performance, while Oliva et al. (2012) found that the creation of a separate service organization positively mediates the relationship between managerial commitment to the service strategy and services' financial performance.

The inconclusive and interconnected results clearly indicate complex causality. No previous study has examined how structure relates to the absence of profitability. Therefore, the condition existence of a separate service organization is included in the configurational model.

Corporate culture is considered a soft element of organizational structure, serving as an integration mechanism between the structural elements of the organization (Ouchi, 1980; Kohtamäki et al, 2015). The importance of a cultural reorientation towards services is generally acknowledged in servitization research (e.g. Brax & Jonsson 2009; Salonen, 2011; Paiola, Gebauer & Edvardsson, 2012). Consequently, the impact of service orientation of corporate culture, in terms of the value described to services within the company and the extent to which management and employees behave in a service-oriented way (Gebauer, Edvardsson & Bjurko, 2010), on performance has received some attention (e.g. Homburg, Fassnacht & Guenther, 2003; Gebauer, Edvardsson, Gustafsson & Witell 2010). Service orientation of corporate culture has been found to directly and positively affect business performance (Gebauer, Edvardsson & Bjurko 2010). Kohtamäki et al. (2015) further demonstrate that service orientation of human resource management and employee behavior mediates the relationship between service offerings, revenue, and profits. However, also adverse effects can be observed, when high service orientation of corporate culture leads to an increased offering of free services and therefore to higher costs without the corresponding higher returns (Gebauer & Pütz, 2007). Uncontrolled cultural change can also result in a loss of identity and thus to failure (Probst & Raisch, 2005).

The interconnectedness with structure and strategy furthermore demonstrates that the relationship between service orientation of corporate culture and performance is characterized by complex causality and can thus better be understood in terms of configurations with other conditions. Service orientation of corporate culture, , is therefore included in the model.

3. Methodology

Even though the arguments for the complexity of causation surrounding servitization performance are strong, methodologically most of current research does not cope with the corresponding implications (Böhm et al. (2017), Forkmann et al. (2017) and Ambroise, Prim-Allaza & Teyssier (2018) are noteworthy exceptions). To address this discrepancy, fuzzy set qualitative comparative analysis (fsQCA) is applied in the present study. Contrary to the most widely applied statistical methods, fsQCA is capable of capturing equifinality, conjucturality, and asymmetry (Mahoney & Goertz, 2006; Woodside, 2015; Frösén, Luoma, Jaakkola, Tikkanen & Aspara, 2016). FsQCA identifies configurations of conditions that are necessary or sufficient for the occurrence of an outcome based on Boolean algebra and the set theoretic rules of logical minimization (Schneider & Wagemann, 2012). Differentiation between necessity and sufficiency is a central characteristic of complex causality (Ragin, 2008). Necessity means that an outcome cannot be achieved without the condition, while sufficiency means that whenever the condition is observed, the outcome is also observed (Schneider & Wagemann, 2012).

Data were gathered in an online survey of the German manufacturing sector in December 2017, addressing CEOs and higher management with extensive knowledge about the service business and financial performance of the firm. The German manufacturing industry is internationally competitive and is increasingly servitizing, with 25% of manufacturers also offering services (Neely, 2013). This number is comparable to the state of servitization in other developed economies (Neely, 2013), wherefore this context is deemed suitable for studying servitization in developed countries. 143 cases of companies belonging to the manufacturing sector and undergoing servitization were selected for the analysis. Table 1 illustrates the diversity of the sample, both in terms of sub-industry and of company size. To test for non-response bias independent sample t-tests for early and late respondents were conducted. No significant differences were found, so non-response bias appears not to be an issue in the sample (Hair, Black, Babin & Anderson, 2014).

- Insert Table 1 –

Operationalizations from the extant literature were used for the measures. The used measurement scales, items, loadings and composite reliabilities are found in appendix A. To assess the suitability of the latent constructs to capture the intended meanings, a confirmatory factor analysis was conducted, which resulted in satisfactory model fit, given the size of the sample and the number of constructs (Hair, Black, Babin & Anderson, 2014) ($x^2/df=72.627/41=1.77$; Comparative Fit Index (CFI)=0.967, Tucker-Lewis Index (TLI)=0.956, RMSEA =0.073, SRMR =0.037).

To transform the data into fuzzy set membership scores to be used in fsQCA they need to be calibrated (Ragin, 2008). Table 2 summarizes the applied rules for calibration. Calibration should always be informed by theoretical reasoning and the qualitative knowledge of the researcher regarding the constructs (Ragin, 2008). The detailed reasoning for the applied calibration rules are found in the online supplementary material.

The Set Methods (Medzihorsky, Oana, Quaranta & Schneider, 2016) and QCA packages (Dusa, 2007) in R are used for the assessment of necessary and sufficient configurations for the outcomes, in terms of superset and subset relations (Schneider & Wagemann, 2012). Following Schneider and Wagemann (2010) and Greckhamer, Furnari, Fiss, & Aguilera (2018), the analyses for necessity and sufficiency are performed separately, for both the presence and the absence of the outcomes. As QCA accounts for causal asymmetry, the absence of the outcomes, i.e. the absence of service profitability and of profit growth, are examined in separate analyses (Schneider & Wagemann, 2010). To avoid logical contradictions, both the Standard Analysis and the Enhanced Standard Analysis are performed, where required (Schneider & Wagemann, 2012).

For the analyses of sufficiency, inclusion consistency thresholds of .91 and .923 were set for the presence of service profitability and overall profit growth, and of .90 and .91 for the absence of service profitability and profit growth, respectively. All thresholds are well above the recommended .80 threshold and are supported by the data (Greckhamer et al. 2018, see truth tables in online supplementary material). A frequency threshold of 2 cases is applied, in order to avoid drawing conclusions from single cases (Fiss 2011; Greckhamer, Misangyi & Fiss, 2013). As robustness checks, analyses with different consistency and frequency thresholds as well as with different calibrations are conducted (Böhm et al., 2017). No major

differences in the results occurred, indicating that the presented results are robust (Schneider & Wagemann, 2012; Thomann & Magetti, 2017).

The utilization of counterfactual arguments in the analysis of sufficiency, in order to account for configurations of conditions that are not empirically observed, is one of the key strengths of fsQCA (Zaefarian, Thiesbrummel, Henneberg & Naudé, 2017). The detailed reasoning for the applied directional expectations is found in the online supplementary material.

- Insert Table 2 –

4. Results

The first step is the analysis for necessary conditions (Schneider & Wagemann, 2010). The existence of a clear service strategy and of a strong service orientation of corporate culture pass the consistency threshold of .9 for accepting statements of necessity (see Table 3). Skewness in the cases' memberships in the conditions or the outcome can lead to false statements of necessity and should therefore be examined closely (Schneider & Wagemann, 2012; Schneider, 2018). Figures 2 and 3 show neither skewed memberships nor quasi-constant conditions, which is also indicated by the high relevance of necessity (RoN) scores (.843 and .777, respectively). Since coverage is also considerably high (.871 and .831), the existence of a clear service strategy and a strong service orientation of corporate culture are accepted as necessary conditions for service profitability.

- Insert Table 3 –
- Insert Figure 2 –
- Insert Figure 3 -

A case can exhibit a formulated strategy or high service orientation but not service profitability, without that contradicting the statements of necessity. This means that service strategy or service orientation on their own are not sufficient for service profitability. Separate analyses of sufficiency are performed, table 4 summarizes the results, following the presentation based on Ragin & Fiss (2008), as proposed by Greckhamer et al. (2018). The Boolean notation of the solutions is given in the online supplementary material.

- Insert Table 4 -

Overall, five configurations are identified as sufficient for the occurrence of service profitability (1-5) and for the occurrence of overall profit growth (6-10) in the examined cases. Configurations 1-4 (for service profitability) and 6-9 (for profit growth) are identical, meaning that these configuration consistently lead to both service profitability as well as profit growth. Three configurations are sufficient for the absence of service profitability (11-13) and the absence of overall profit growth (14-16). All solutions pass the consistency threshold of .8 for sufficiency and display PRI scores over .5 (Greckhamer et al. 2018). The high solution coverage scores demonstrate the empirical relevance of the solutions, while all configurations

display unique coverage above 0, meaning that they all uniquely contribute to the solution (Schneider & Wagemann, 2012).

5. Discussion and Implications

5.1 The role of service strategy and service culture

The identification of a clearly formulated strategy as necessary for service profitability provides empirical evidence for the financial implications of a service strategy. This is in line with literature that emphasizes the importance of clearly defined service related objectives for servitization (Neu, 2005; Gebauer et al. 2006) and with Gebauer & Fleisch (2007), who showed that a systematic strategy formulation procedure, involving all parts of the company affected by the service strategy, positively impacts on service revenue.

The transition to services is a challenging change process (Kowalkowski, Gebauer, Kamp & Parry, 2017) that "requires managerial attitudes and approaches that may not be straightforward for a company with an historical focus on goods" (Benedettini et al. 2015, p. 967). Having clear service related objectives and a formulated strategy can help with managerial commitment, which is essential for successful organizational change (Kotter, 1995). Furthermore, the co-existence of the product- and service-business that comes with servitization is an important challenge (Lütjen et al., 2017), as it requires the internal alignment of several organizational factors of both business models (Neu & Brown, 2008). A clear strategic intent can help overcome these challenges, as it aids the integration of these diverse factors, making it easier for the organization to follow a common path (Lütjen et al., 2017).

It has been suggested that a clearly formulated strategy is more important at advanced levels of servitization (Fischer et al., 2010), where the company offers services extensively, and that in many instances servitization follows an emergent rather than a strategically planned process (Kowalkowski et al., 2012). This study shows that a clearly defined service strategy is necessary to achieve service profitability, regardless of the kind of service offering.

The identification of service orientation of corporate culture as a necessary condition for service profitability is in line with previous research that emphasizes the importance of service culture for servitization (Salonen, 2011; Kowalkowski, Gebauer & Oliva, 2017). It is generally acknowledged that the transition to services encompasses a cultural reorientation from transaction and manufacturing oriented to relationship and service oriented (Salonen, 2011; Kowalkowski, Gebauer & Oliva, 2017), while a positive relationship between service orientation and business performance has also been confirmed empirically (e.g. Gebauer, Edvardsson & Bjurko, 2010; Kohtamäki et al. 2015).

The differentiation between necessity and sufficiency made possible through fsQCA adds more nuance to the discussion. Since according to the statement of necessity, service profitability cannot be achieved without the presence of a service strategy and a service oriented culture, these two conditions play a central role in explaining the service paradox. Companies lacking any or both of these two factors will consistently not achieve high service profitability, regardless of how they design and align the other examined factors.

That, however, does not mean that overall performance is impossible without those two factors. Since no necessary conditions are identified for overall profit growth, it can be achieved also without the presence of a service strategy or service culture. Since overall profit growth

in servitizing companies can be achieved by many means that are not directly related to the service offering (e.g. good performance of the product business, competitive or environmental developments, cost reductions), it makes sense that no single service related condition is necessary for overall profit growth. The existence of a clear service strategy and strong service culture is, however, also beneficial for overall profit growth, as demonstrated by the analysis of sufficiency.

In terms of sufficiency, cases that display both a service strategy and service orientation consistently also display service profitability and profit growth (configurations 1 and 6, see also table 5). This means that, while both conditions are independently necessary for service profitability, they are sufficient for both service profitability and profit growth only when combined with each other. Comparing this to configuration 11, it becomes evident that the absence of these two factors is also sufficient for the absence of service profitability, when combined with a separate service organization. This further emphasizes the causal importance of service strategy and service orientation for the service paradox. It indicates that, in the examined cases, not only is service profitability consistently not achieved in the absence of service strategy or service orientation (necessity), but also the cases that display a lack of service strategy and service orientation consistently display a lack of service profitability as well, as long as there is a separate service organization (sufficiency, configuration 11).

Consequently, the lack of a clearly formulated service strategy or a strong service culture are identified as causal factors for the service paradox. At the same time, the simultaneous presence of these two factors is sufficient for both positive profit effects. Therefore, the following proposition is formulated:

Proposition 1: Servitizing companies should define a clear service strategy and display a strongly service oriented culture, in order to achieve positive profitability effects and avoid the service paradox. This applies regardless of the kind of service offering.

While establishing a service strategy and a service culture is a good starting point, it does not guarantee success. Another important aspect is the right match between the service offering and the structure of the service business, as discussed in the following section.

5.2 Success and failure with different kinds of service offerings

The results indicate that superior performance as well as the service paradox can occur with a limited service offering (i.e. the absence of both a strong SSP and SSC offering, configurations 2-3, 7-8, 12 and 14), a service offering focused on SSP (configurations 4, 9 and 15) as well as an advanced service offering containing SSC (configurations 5, 10, 13 and 16). Previous research usually suggests that superior performance can only be achieved if a critical level of service volume is achieved (Fang et al. 2008, Visnjic & VanLooy, 2013). Introducing too many new offerings, however, can also increase the risk of failure (Barnett & Freeman, 2001). The results of this study are in line with Benedettini et al. (2017), who showed that the performance impacts of service offerings depend on firm level contextual factors. The present study demonstrates that it is not as much the extent of the service offering that causes

success or failure, but the match or mismatch with structure and strategy, as has also been argued by Gebauer, Edvardsson, Gustafsson & Witell (2010).

A limited service offering means that there is no clear focus on neither SSP nor SSC. So both kinds of offering potentially co-exist, but are not being offered extensively. A limited service offering consistently leads to positive profitability effects, when combined either with a clear service strategy (2, 7) or with a separate service organization and a strong service culture (3, 8). There appears to be a substitution effect between formalized service strategy and a service oriented structure and culture, since both configurations are equally suitable in leading to positive profitability effects. Comparing this to configuration 12, however, it becomes clear that the factors causally responsible for the difference between the presence of service profitability and its absence, are the formulated service strategy and strong service culture. This is in line with their role as necessary conditions, and underlines their causal importance with a limited service offering. Their absence is related to the absence of service profitability, while the structure of the service organization is not causally relevant.

The structure of the service organization is, however, causally relevant for a lack of overall profit growth with a limited service offering. Comparing configuration 12 to configuration 14, we see that the absence of a separated service organization makes the difference between not achieving service profitability and not achieving overall profit growth.

The creation of a separate service organization has been argued to be an essential first step for servitization (Gebauer et al. 2005; Oliva et al., 2012), as it emphasizes the strategic intent and facilitates the consolidation of all offered services in one organization (Oliva & Kallenberg, 2003). By consolidating the services in one organization, the efforts for their deployment are concentrated and can thus contribute to overall profit growth, even if the total number of offered services is small. Furthermore, resistance to change and conflicts between the product and the service business are particularly likely to occur at early phases of servitization (Mathieu, 2001b), for which a limited service offering is typical (Oliva & Kallenberg, 2003). The creation of a separate service business early on is a way to prevent the existing product business and production-centered culture from inhibiting the success of the service business (Markides & Charitou, 2004; Christensen, Bartman & VanBever, 2016).

Since the existence of a separate service organization is either positively related to, or not relevant for, the presence of superior financial performance, and its absence is causally related to the absence of profit growth, the following proposition is formulated.

Proposition 2: Servitizing companies with a limited service offering should consolidate these offerings in a separate service organization, in order to achieve positive profitability effects and avoid the service paradox.

Configurations 4 and 9 are indicative for a product-oriented service offering. To achieve higher performance with such an offering, the service organization should be integrated (as indicated by the absence of a separate service organization in configurations 4 and 9) and combined with a strong service culture. An integrated service organization allows for spillover and synergy effects between product and service business, which are of particular relevance for the profitability of product-oriented services (Forkmann et al., 2017; Visnjic & VanLooy, 2013). It could furthermore be a way to facilitate the coexistence of distinct but synergistic product and service cultures (Story et al. 2017), and to allow for greater integration of the product and service elements in the hybrid offering (Ulaga & Reinartz, 2011; Stor-

backa, Windahl, Nenonen & Salonen, 2013). Conflicts between product and service business, which are often used as an argument for the creation of a separate service organization, are not as strong in these configurations, as the SSP-focused service business is closely related to the core product business (Fang et al., 2008). The strong service culture present in this configuration furthermore helps prevent possible conflicts (Matthyssens & Vandenbempt, 2008).

The importance of the right structure is further emphasized by the fact that in configuration 15, the existence of a separate service organization is causally relevant for a lack of overall profit growth, which can be explained by the costs of restructuring (Mathieu, 2001b; Benedettini et al., 2015) and inefficient knowledge exchange between product and service business (Forkmann et al., 2017). The service culture is not relevant for the absence of profit growth with a product-oriented service offering, clearly indicating that the causal factor responsible for success and failure in this configuration is the formal structure of the service business. Consequently, the following proposition is formulated.

Proposition 3: Servitizing companies with a service offering focused on product-oriented services should integrate the service organization into the product business, in order to achieve synergies and spill-over effects.

Finally, configurations 5 and 10 stand for an advanced servitization, where both SSP and SSC are offered extensively. Generally, a separate service organization is present in both configurations. The co-existence of two business orientations, as indicated by a strong offering of both SSP and SSC, necessitates the creation of a separate organization for services at this stage (Christensen, Bartman & van Bever, 2016; Lütjen et al., 2017). However, comparing this with configurations 13 and 16, it becomes evident that the existence of a separate service organization is not enough to avoid failure, as it is present in both configurations that are sufficient for the absence of service profitability (13) and profit growth (16).

Specifically, comparing configuration 5 to configuration 13, we see that the absence of a defined service strategy is what makes the difference between high service profitability and its absence with an extensive service offering. This is true even if a separate service organization is in place and regardless of culture, once again emphasizing the significance of a clearly defined service strategy for performance. The presence of clear strategic intent in these configurations facilitates the integration and co-existence of the otherwise competing business models (Markides & Charitou, 2004; Lütjen et al. 2017). This is of particular importance in these configurations, since offering process-oriented services requires particularly high levels of integration (Brax & Jonsson, 2009). Consequently, the following proposition is formulated.

Proposition 4a: Servitizing companies with an advanced service offering containing both SSP and SSC should create a separate service organization, to facilitate the co-existence of two business models in the same organization.

The importance of both service strategy and culture becomes clear also in configuration 16. While for the occurrence of overall profit growth, neither strategy nor culture are causally relevant (10), their absence is related to the absence of profit growth. Consequently, even

though these factors are not necessary for profit growth, they should still be present at all stages of servitization, as suggested in proposition 1.

Configuration 16 furthermore provides insight regarding the importance of offering product related services for overall profitability. Specifically, a process-oriented service offering (SSC) without a product-oriented service offering can lead to the absence of overall profit growth, if combined with a separate service organization and a lack of both service strategy and culture (16). While positive profitability effects can be achieved when offering only SSP, offering only SSC is related to a lack of profit growth. This could be because of the higher risks and costs of offering SSC. SSC generally require higher levels of internal integration (Brax & Jonsson, 2009) and therefore increase the costs of internal organization and control (Benedettini et al., 2015). Their offering also requires close cooperation with the customer and high levels of external integration (Mathieu, 2001b; Brax & Jonsson, 2009), exposing the company to greater environmental risks (Benedettini et al., 2015). Consequently, sufficient resources are necessary to be successful with SSC (Benedettini et al., 2017). It has been argued that these resources can stem from a profitable product-oriented service business (Salonen, Saglam & Hacklin, 2017). Recent research stresses the importance of product related services even in more advanced stages of servitization (Parida et al., 2014; Salonen et al., 2017), as manufacturers do not abandon their product business and the related services when advancing along the product-service continuum (Storbacka et al. 2013; Kowalkowski et al., 2015), but rather utilize the more advanced services to boost their core business, which still has the greatest impact on financial performance (Salonen et al., 2017). The present study is in line with this literature, which leads to the formulation of the following proposition.

Proposition 4b: Servitizing companies offering process-oriented services (SSC) should also offer product-oriented services (SSP), in order to balance out the higher risks and costs associated with SSC.

6. Conclusions and future research

Table 5 summarizes the previous discussion, by proposing three ideal-type configurations, through which servitizing companies can avoid the service paradox and achieve profitability through services. As necessary conditions for service profitability, the existence of a clear service strategy and service orientation of corporate culture are present in all ideal-type configurations (Proposition 1). The organizational structure, however, differs depending on the kind of service offering. Specifically, with a limited as well as with an extended service offering, a separate service organization is preferable (A and C, see also Propositions 2 and 4a). With a product-oriented service offering, however, the service organization should not be separated from the product business, in order to allow for synergies and spillover effects (B, see also Proposition 3). Finally, the extended service offering should consist of both SSC and SSP, in order to achieve positive overall profit growth (C, see also Proposition 4b).

These configurations can serve as a tool for managerial decisions, as managers of servitizing companies can identify the configuration that best represents their current situation, locate discrepancies and adjust accordingly, in order to avoid the service paradox and achieve profitability through services.

- Insert Table 5 -

This study adds to the scarce literature on the service paradox and servitization failure, by explicitly identifying causal mechanisms for the occurrence and non-occurrence of positive profitability effects from servitization. It is shown that, while in principle profitability can be achieved with a limited, a product-oriented, and an advanced service offering, a mismatch between the type of service offering and the structure of the service organization consistently leads to the service paradox in the examined companies. Consequently, this study demonstrates the configurational and complex nature of servitization performance and the service paradox, illustrating that being profitable with servitization is a matter of finding the right match between service offering and structure, rather than a matter of "the more the better".

Future research can add to this finding, by using different conceptualizations of service offerings (e.g. product-, use-, and result-oriented services, Tukker, 2004), specific service strategies that go beyond the kind of the service offering (Raddats & Kowalkowski, 2014) or by including other aspects of structure, which have received less attention in servitization research, like decision making authority, steepness of hierarchy and leadership styles. Strategy and structure are of course not the only causal elements of the service paradox. More research is required to shed light on the complex role of organizational capabilities, environmental conditions, or the customer organization in servitization success and failure as well.

This study provides empirical evidence for the financial implications of a clearly defined service strategy, as it is identified as a necessary condition for service profitability. This finding contributes to the discussion of planned versus emergent strategies in servitization (Kohtamäki & Helo, 2015; Kowalkowski et al., 2012). More research is needed in this direction, utilizing existing operationalizations of planned, emergent, and umbrella strategies (e.g. Slevin & Covin, 1997).

Finally, this study copes conceptually and methodologically with the complexity of servitization related profitability effects, thus demonstrating the advantage of adopting a configurational approach and set theoretic methodology. Future research should examine different servitization outcomes, like revenue growth, market share and firm value, from a configurational perspective. Also other aspects of servitization, like the decision to servitize, the adopted servitization strategy and the chosen servitization path should be studied configurationally.

Figures

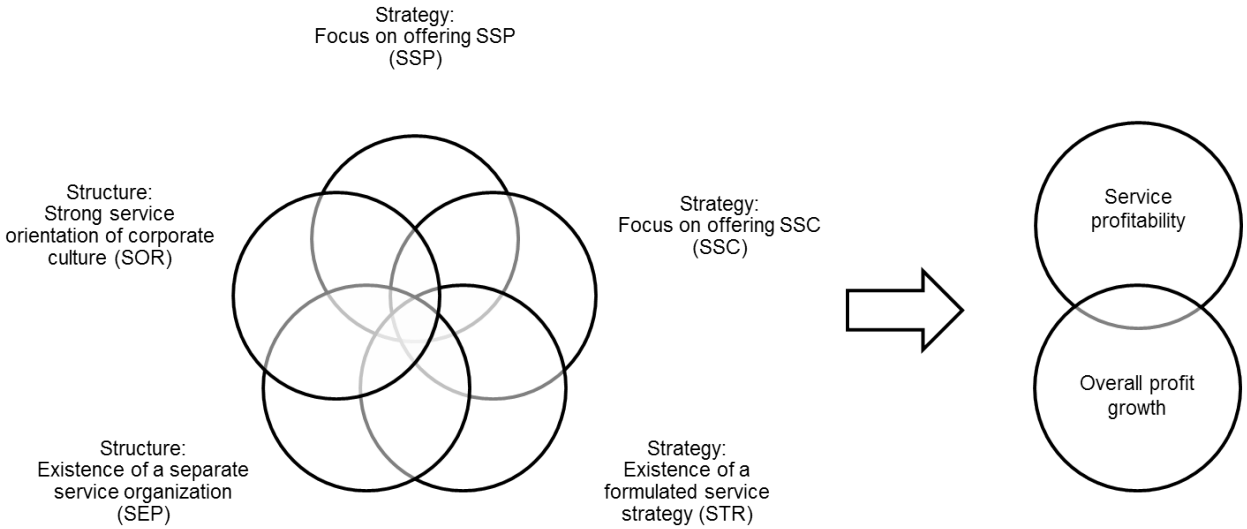

Figure 1: Configurational model

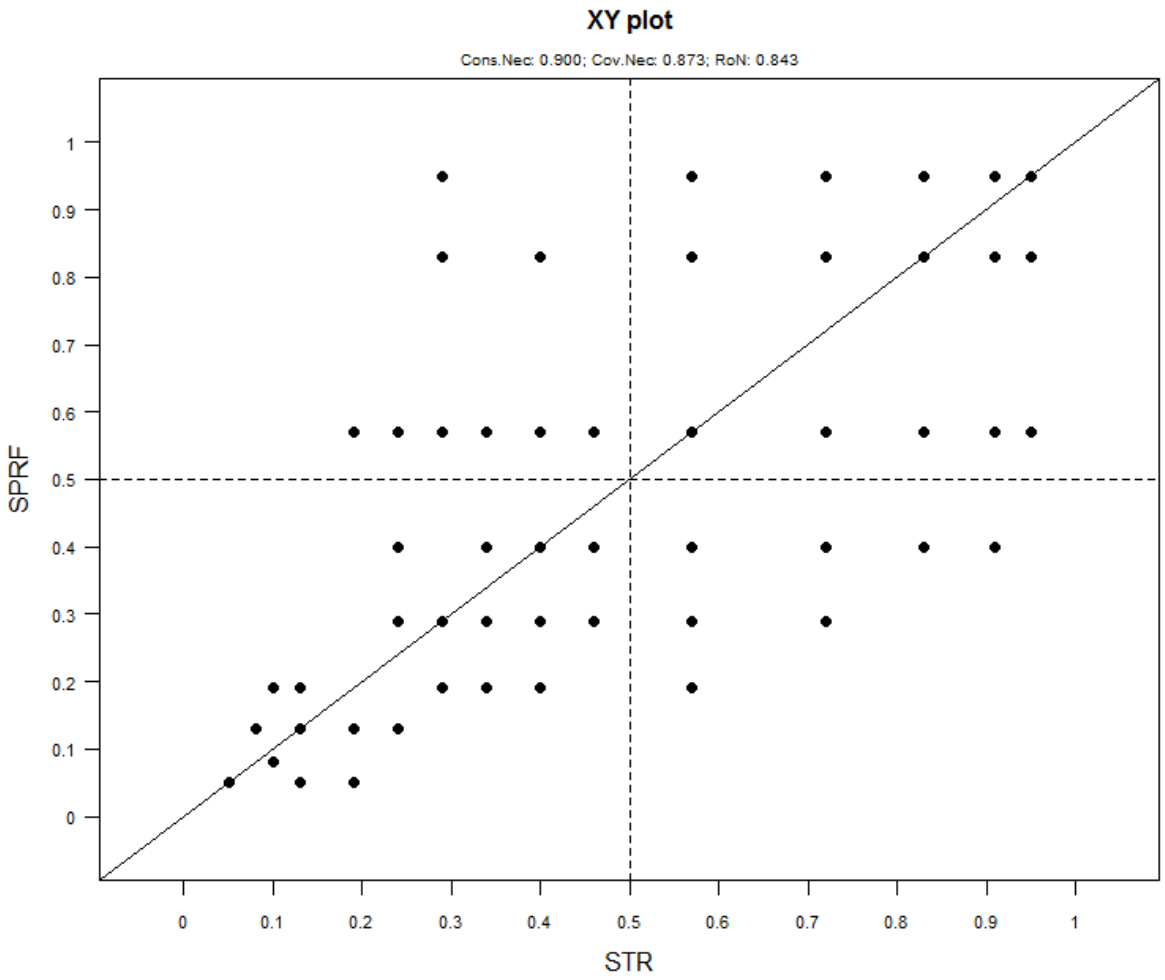

Figure 2: XY-plot necessity existence of a clear service strategy for service profitability

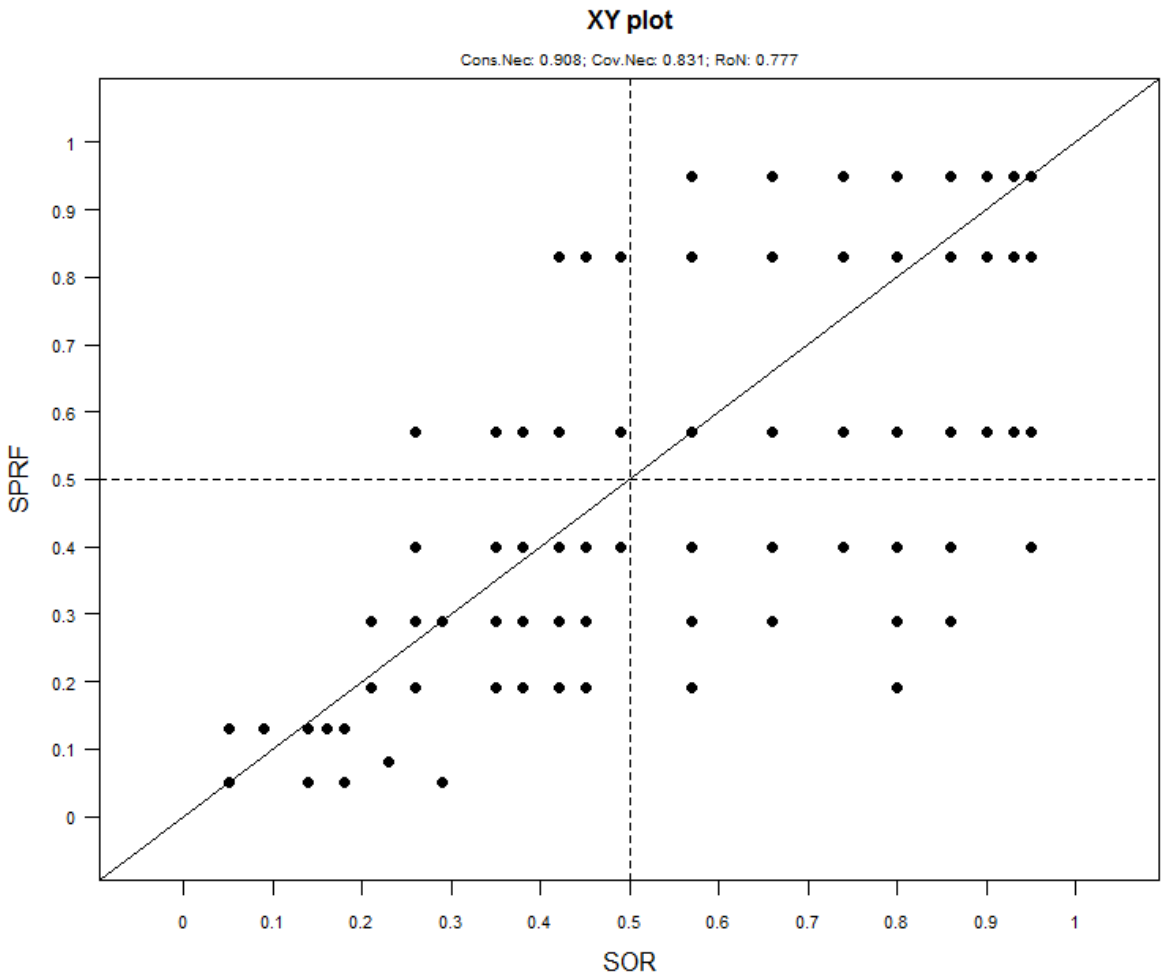

Figure 3: XY-plot necessity service orientation of corporate culture for service profitability

Tables

Industry	**Frequency**
Mechanical Engineering	28.7 %
Electrical Engineering	43.4 %
Automotive Industry	20.3 %
Chemical Production	7.7 %
Size	
Less than 250 employees	39.9 %
250-1000 employees	44 %
More than 1000 employees	16.1 %

Table 1: Sample characteristics

Construct	**Original Scale**	**Full membership (1)**	**Full non-membership (0)**	**Cross-over point (.5)**
Service profitability	5-point Likert scale	5	1	3.9
Overall profit growth	5-point Likert scale	5	1	3.9
Offering focused on SSP (SSP)	Summed (0-12)	12	0	2.9
Offering focused on SSC (SSC)	Summed (0-9)	9	0	1.9
Existence of a clear service strategy (STR)	5-point Likert scale	5	1	3.9
Existence of a Separate Service Organization (SEP)	3 binary items	Service business separated from product business, with profit and loss responsibility and no shared resources	Service business not separated from product business, no profit and loss responsibility, and shared resources	NA
Service Orientation of Corporate Culture (SOR)	5-point Likert scale	5	1	3.9

Table 2: Fuzzy-set calibration rules

Outcome	**Service profitability**			**Overall profit growth**		
Condition	Consistency	Coverage	RoN	Consistency	Coverage	RoN
SSP	.591	.780	.855	.594	.778	.853
ssp	.667	.682	.709	.677	.686	.712
SSC	.456	.809	.916	.470	.826	.923
ssc	.777	.663	.588	.771	.653	.581
STR*	**.900***	**.873***	**.843***	.845	.813	.785
str	.456	.647	.805	.505	.711	.835
SEP	.618	.694	.756	.660	.736	.783
sep	.607	.717	.788	.613	.718	.789
SOR*	**.908***	**.831***	**.777***	.871	.791	.738
..sor	.426	.661	.834	.473	.729	.863
Outcome	**Absence of service profitability**			**Absence of overall profit growth**		
Condition	Consistency	Coverage	RoN	Consistency	Coverage	RoN
SSP	.577	.561	.746	.587	.577	.753
ssp	.774	.582	.650	.774	.588	.653
SSC	.463	.605	.840	.453	.597	.838
ssc	.854	.536	.509	.868	.551	.517
STR	.662	.472	.564	.726	.523	.589
str	.821	.858	.912	.741	.782	.870
SEP	.675	.558	.683	.680	.568	.688
sep	.630	.548	.700	.684	.601	.725
SOR*	.704	.474	.528	.766	.521	.551
..sor	.749	.857	.922	.692	.801	.895

Table 3: Analysis of necessity

	Configurations sufficient for service profitability					**Configurations sufficient for overall profit growth**				
Conditions	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
SSP		○	○	●	●		○	○	●	●
SSC		○	○	○	●		○	○	○	●
STR	●	●			●	●	•			
SEP			●	○	●			•	○	•
SOR	●		●	●		•		●	●	
Cons.	.914	.918	.917	.911	.948	.852	.864	.913	.949	.899
PRI	.846	.821	.816	.724	.877	.735	.695	.799	.827	.787
Raw Cov.	.852	.579	.399	.344	.283	.800	.549	.400	.361	.305
Unique Cov.	.128	.025	.020	.005	.004	103	.028	.022	.011	.022
Solution Cons.	.868					.815				
Solution PRI	.775					.691				
Solution Cov.	.910					.889				

	Configurations sufficient for the absence of service profitability			**Configurations sufficient for the absence of overall profit growth**		
Conditions	**11**	**12**	**13**	**14**	**15**	**16**
SSP		○	•	○	●	○
SSC		○	●	○	○	●
STR	○	○	○	○	○	○
SEP	•		•	○	●	•
SOR	○	○		○		○
Cons.	.919	.938	.923	.936	.925	.912
PRI	.820	.829	.674	.581	.673	.551
Raw Cov.	.506	.577	.254	.410	.300	.228
Unique Cov.	.040	.144	.035	.190	.070	.027
Solution Cons.	.922			.903		
Solution PRI	.812			.628		
Solution Cov.	.685			.535		

Table 4: Sufficient configurations for the occurrence and the absence of service profitability and profit growth.

○ indicates the absence of the outcome, ● the presence of the outcome, empty cells mean that the condition is not causally relevant. Large symbols indicate core conditions, small symbols peripheral conditions.

	Ideal-type configurations for profitability through servitization		
Conditions	**A**	**B**	**C**
SSP	○	●	●
SSC	○	○	●
STR	●	●	●
SEP	●	○	●
SOR	●	●	●

Table 5: Ideal-type configurations for profitability through servitization

Appendix

Construct	**CR**	**Items**	**Loadings**	**Adapted from**
Service Profitability	.788	The services we offer are very profitable	.782	Oliva et al. (2012)
		A large fraction of our total profit is generated by our service business	.830	
Overall profit growth		Please indicate the development of the financial situation of your company over the past 3 years in terms of profitability (1=strong decrease-5=strong increase)		Böhm et al. (2017)
Business Orientation towards SSP		How actively do you offer the following services (0=not offered, 5 offered very actively)		Antioco et al. (2008)
		Product documentation		
		Product transportation/delivery		
		Product installation		
		Help desk/call center/customer service hotline		
		Product inspection/diagnosis		
		Product repair and spare parts delivery		
		Product upgrades		
		Product refurbishing		
		Product recycling and dismantling / machine brokering		
		Preventive maintenance		
		Condition monitoring		
		Process-oriented engineering (testing, optimizing and simulating)		
Business Orientation towards SSC		How actively do you offer the following services (0=not offered, 5 offered very actively)		Antioco et al. (2008)
		Financing services / Leasing		
		Management of spare parts		
		Process-oriented training (quality-driven including technology		
		Business oriented training (financially driv-		

		en/management training		
		Process oriented consulting (quality-driven including technology		
		Business oriented consulting (financially driven/management consulting)		
		Managing the customer's maintenance function		
		Research and Development services for customers		
		Fully managing customer's product-related operations (complete outsourcing and ownership of product by vendor)		
Existence of a formulated service strategy	.811	We have a clearly defined service strategy	.836	Oliva et al. (2012)
		We have clearly defined service business objectives	.815	
Existence of a Separate Service Organization		Our service business is separated from the product business (Yes/No)		Gebauer, Edvardsson, Gustafsson & Witell (2010)
		Our service organization runs with its own profit and loss responsibility (Yes/No)		
		Our product and service business essentially share resources with each other (REV) (Yes/No)		
Service Orientation of Corporate Culture	.910	Customer Service is one of the core values of our corporate culture	.726	Homburg et al. (2003)
		High-quality customer service is of similarly high importance to us as the quality of our products	.787	
		We understand ourselves not only as a supplier of products but as a provider of comprehensive performance bundles for the solution of our customers' problems	.752	
		Our employees are aware of the importance of a comprehensive and a high-quality customer service and they act accordingly	.734	
		Our concerns of the customers are of high importance for the employees	.832	
		Our employees have a distinctive service mentality	.779	
		Our employees engage strongly in the solution of customers' problems	.769	

Appendix: Operationalizations

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Supplementary Material

1. Explanation of calibration rules

Direct calibration (Ragin 2008) was applied for the outcomes service profitability and profit growth, as well as for the conditions SSP, SSC, existence of a service strategy, and service orientation of corporate culture.

The items for service profitability, profit growth, existence of a service strategy, and service orientation were expressed in a 5-point Likert scale. The end points of the Likert scale are used as thresholds for full membership (5 on the Likert scale) and full non-membership (1 on the Likert scale), and a 3.9 on the Likert scale as crossover point, meaning that cases that agree or fully agree (4 or 5 on the Likert scale) are considered to be more in the set than out, while cases that neither agree nor disagree, disagree or fully disagree (3,2, or 1 on the Likert scale) are considered to be more out of the set.

To calibrate the set memberships for SSP and SSC, information from Eggert et al. (2011) and Eggert et al. (2014) regarding the average number of SSP and SSC offered by German manufacturing companies, compared with the present data, was used. For a case to be considered more in the set of high focus of the service offering on SPP (or SSC, respectively), than out, it will have to actively offer an above average number of services in each category (Antioco et al., 2008). For SSP, the crossover point thus was set at 2.9 and for SSC at 1.9. Full non-membership was set at 0 services offered in the respective category, while full membership at all services offered (12 for SSP and 9 for SSC).

Theoretical calibration (Ragin, 2008; Basurto & Speer, 2012) was applied for the existence of a separate service organization. Organizations, in which the service business is separated from the product business, the service business has profit and loss responsibility, and no resources are shared with the product business, are considered to be fully in the set (1). Organizations for which the opposite is true are considered to be fully out of the set (0). To account for mixed forms, we considered firms where the service business is not separated from the product business, but has its own profit and loss responsibility; as well as businesses where the service business is separated from the product business, but does not have yet its own profit and loss responsibility, to be more in than out of the set (.67). 4 categories of membership were used, based on Basurto & Speer (2012): Fully out of the set = 0, more out of the set than in= .33, more in the set than out = .67, and fully in the set = 1. No cases were more out of the set than in, so no cases received membership .33. See Ragin (2008) for a detailed explanation of indirect/theoretical calibration.

2. Truth tables

Truth table for service profitability.
Consistency threshold at .91, above the suggested 0.8, supported by data, PRI over .5
All logical remainders are set to 0, to account for STR and SOR as necessary conditions (no counterfactuals containing the absence of either SOR or STR are allowed). Consequently, all 3 solution types are identical for service profitability

	SSP	SSC	SEPFS3	SOR	STR	OUT	n	incl	PRI
28	1	1	0	1	1	1	7	0.973	0.909
12	0	1	0	1	1	1	2	0.966	0.818
4	0	0	0	1	1	1	9	0.963	0.887
32	1	1	1	1	1	1	18	0.960	0.903
30	1	1	1	0	1	1	2	0.955	0.740
16	0	1	1	1	1	1	4	0.954	0.824
8	0	0	1	1	1	1	16	0.952	0.885
20	1	0	0	1	1	1	6	0.949	0.825
24	1	0	1	1	1	1	11	0.943	0.849
19	1	0	0	1	0	1	4	0.932	0.523
2	0	0	0	0	1	1	3	0.918	0.596
7	0	0	1	1	0	1	2	0.914	0.605
6	0	0	1	0	1	1	7	0.911	0.637
23	1	0	1	1	0	0	4	0.900	0.493
31	1	1	1	1	0	0	5	0.898	0.410
29	1	1	1	0	0	0	3	0.879	0.356
21	1	0	1	0	0	0	5	0.848	0.281
13	0	1	1	0	0	0	6	0.832	0.240
1	0	0	0	0	0	0	4	0.831	0.255
5	0	0	1	0	0	0	20	0.667	0.160
18	1	0	0	0	1	0	1	0.961	0.662
27	1	1	0	1	0	0	1	0.951	0.542
15	0	1	1	1	0	0	1	0.941	0.523
25	1	1	0	0	0	0	1	0.927	0.372
17	1	0	0	0	0	0	1	0.919	0.366
3	0	0	0	1	0	0	0	-	-
9	0	1	0	0	0	0	0	-	-
10	0	1	0	0	1	0	0	-	-
11	0	1	0	1	0	0	0	-	-
14	0	1	1	0	1	0	0	-	-
22	1	0	1	0	1	0	0	-	-
26	1	1	0	0	1	0	0	-	-

Truth table for the absence of service profitability.
Consistency threshold at .9231, above the suggested 0.8, supported by data, PRI over .5

	SSP	SSC	SEPFS3	SOR	STR	OUT	n	incl	PRI
13	0	1	1	0	0	1	6	0.947	0.760
1	0	0	0	0	0	1	4	0.942	0.745
21	1	0	1	0	0	1	5	0.941	0.719
5	0	0	1	0	0	1	20	0.934	0.834
29	1	1	1	0	0	1	3	0.933	0.644
31	1	1	1	1	0	1	5	0.923	0.556
19	1	0	0	1	0	0	4	0.923	0.462
23	1	0	1	1	0	0	4	0.903	0.507
2	0	0	0	0	1	0	3	0.878	0.402
7	0	0	1	1	0	0	2	0.868	0.395
30	1	1	1	0	1	0	2	0.867	0.236
12	0	1	0	1	1	0	2	0.848	0.182
6	0	0	1	0	1	0	7	0.844	0.363
16	0	1	1	1	1	0	4	0.781	0.156
20	1	0	0	1	1	0	6	0.749	0.137
28	1	1	0	1	1	0	7	0.722	0.079
4	0	0	0	1	1	0	9	0.701	0.100
24	1	0	1	1	1	0	11	0.677	0.145
8	0	0	1	1	1	0	16	0.621	0.098
32	1	1	1	1	1	0	18	0.614	0.054
25	1	1	0	0	0	?	1	0.957	0.628
17	1	0	0	0	0	?	1	0.953	0.634
27	1	1	0	1	0	?	1	0.942	0.458
15	0	1	1	1	0	?	1	0.935	0.477
18	1	0	0	0	1	?	1	0.924	0.338
3	0	0	0	1	0	?	0	-	-
9	0	1	0	0	0	?	0	-	-
10	0	1	0	0	1	?	0	-	-
11	0	1	0	1	0	?	0	-	-
14	0	1	1	0	1	?	0	-	-
22	1	0	1	0	1	?	0	-	-
26	1	1	0	0	1	?	0	-	-

Truth table for overall profit growth.
Consistency threshold at .9, above the suggested 0.8, supported by data, PRI over .5. row 1 is identified as a contradictory row (as also indicated by the PRI below .5) and therefore excluded from the analysis for the presence of the outcome.

	SSP	SSC	SEPFS3	SOR	STR	OUT	n	incl	PRI
12	0	1	0	1	1	1	2	0.970	0.849
20	1	0	0	1	1	1	6	0.967	0.877
19	1	0	0	1	0	1	4	0.956	0.708
16	0	1	1	1	1	1	4	0.953	0.830
32	1	1	1	1	1	1	18	0.949	0.878
30	1	1	1	0	1	1	2	0.946	0.668
29	1	1	1	0	0	1	3	0.944	0.619
2	0	0	0	0	1	1	3	0.943	0.625
28	1	1	0	1	1	1	7	0.940	0.785
8	0	0	1	1	1	1	16	0.937	0.845
7	0	0	1	1	0	1	2	0.932	0.674
6	0	0	1	0	1	1	7	0.925	0.631
31	1	1	1	1	0	1	5	0.921	0.579
1	0	0	0	0	0	0	4	0.911	0.419
4	0	0	0	1	1	1	9	0.911	0.693
24	1	0	1	1	1	1	11	0.907	0.725
23	1	0	1	1	0	0	4	0.893	0.406
13	0	1	1	0	0	0	6	0.891	0.449
21	1	0	1	0	0	0	5	0.881	0.291
5	0	0	1	0	0	0	20	0.779	0.348
18	1	0	0	0	1	?	1	0.982	0.816
15	0	1	1	1	0	?	1	0.972	0.781
25	1	1	0	0	0	?	1	0.962	0.562
27	1	1	0	1	0	?	1	0.952	0.635
17	1	0	0	0	0	?	1	0.952	0.492
3	0	0	0	1	0	?	0	-	-
9	0	1	0	0	0	?	0	-	-
10	0	1	0	0	1	?	0	-	-
11	0	1	0	1	0	?	0	-	-
14	0	1	1	0	1	?	0	-	-
22	1	0	1	0	1	?	0	-	-
26	1	1	0	0	1	?	0	-	-

Truth table for the absence of overall profit growth.
Consistency threshold at .91, above the suggested 0.8, supported by data, PRI over .5.

	SSP	SSC	SEPFS3	SOR	STR	OUT	n	incl	PRI
21	1	0	1	0	0	1	5	0.951	0.709
1	0	0	0	0	0	1	4	0.936	0.581
23	1	0	1	1	0	1	4	0.927	0.594
13	0	1	1	0	0	1	6	0.912	0.551
29	1	1	1	0	0	0	3	0.909	0.381
2	0	0	0	0	1	0	3	0.904	0.370
19	1	0	0	1	0	0	4	0.893	0.292
30	1	1	1	0	1	0	2	0.891	0.332
31	1	1	1	1	0	0	5	0.891	0.421
5	0	0	1	0	0	0	20	0.880	0.646
6	0	0	1	0	1	0	7	0.872	0.369
7	0	0	1	1	0	0	2	0.860	0.324
12	0	1	0	1	1	0	2	0.834	0.151
4	0	0	0	1	1	0	9	0.786	0.265
28	1	1	0	1	1	0	7	0.771	0.183
16	0	1	1	1	1	0	4	0.769	0.170
20	1	0	0	1	1	0	6	0.763	0.108
24	1	0	1	1	1	0	11	0.756	0.275
8	0	0	1	1	1	0	16	0.658	0.155
32	1	1	1	1	1	0	18	0.633	0.122
17	1	0	0	0	0	?	1	0.953	0.508
25	1	1	0	0	0	?	1	0.952	0.438
18	1	0	0	0	1	?	1	0.920	0.184
27	1	1	0	1	0	?	1	0.917	0.365
15	0	1	1	1	0	?	1	0.899	0.219
3	0	0	0	1	0	?	0	-	-
9	0	1	0	0	0	?	0	-	-
10	0	1	0	0	1	?	0	-	-
11	0	1	0	1	0	?	0	-	-
14	0	1	1	0	1	?	0	-	-
22	1	0	1	0	1	?	0	-	-
26	1	1	0	0	1	?	0	-	-

3. Explanation of directional expectations:

Based on the extant literature, the following directional expectations are formulated: service o rientation of corporate culture is expected to have a positive effect on both service profitabilit y and profit growth, as previous research has shown either positive or neutral effects of servi ce culture, regardless of how it is combined with other factors (Gebauer, Edvardsson & Bjurk o, 2010; Gebauer, Friedli & Fleisch, 2006). For service profitability, also the existence of a cle ar service strategy is expected to have a positive effect, as it is also identified as a necessary condition (see section 4), while no such statement can be made for overall profit growth. Simi larly, no directional expectations regarding focus of the offering on SSP, SSC, and the prese

nce of a separate service organization are formulated, as previous results on this have been contradictory (e.g. Antioco et al., 2008; Gebauer, Edvardsson, Bjurko, 2010; Gebauer, Edvar dsson, Gustafsson & Witell, 2010; Oliva et al., 2012).

4. Boolean expressions of solutions of analyses of sufficiency

Service profitability

Enhanced solution for service profitability.
All 3 solution types are identical, all conditions are core conditions.

	Outcome	**Service profitability**			
	Solution term	**Cons**	**PRI**	**CovS**	**CovU**
1)	SOR*STR	.914	.846	.852	.128
2)	ssp*ssc*STR	.918	.821	.579	.025
3)	ssp*ssc*SEP*SOR	.917	.816	.399	.020
4)	SSP*ssc*sep*SOR	.911	.724	.344	.005
5)	SSP*SSC*SEP*STR	.948	.877	.283	.004
	Solution formula SOR*STR + ssp*ssc*STR + ssp*ssc*SEP*SOR + SSP*ssc*sep*SOR + SSP*SSC*SEP*STR	.868	.775	.910	

Absence of service profitability

No enhanced standard analysis was required for absence of service profitability, as there wer e no contradictory rows in the truth tables.

Conservative solution for the absence of service profitability (identical to intermediate solutio n).

	Outcome	**Absence of service profitability**			
	Solution term	**Cons**	**PRI**	**CovS**	**CovU**
1)	SEP*sor*str	.919	.820	.506	.040
2)	ssp*ssc*sor*str	.938	.829	.577	.144
3)	SSP*SSC*SEP*str	.923	.674	.254	.035
	Solution formula SEP*sor*str + ssp*ssc*sor*str + SSP*SSC*SEP*str	.922	.812	.685	

Most parsimonious solution for the absence of service profitability

	Outcome	**Absence of service profitability**			
	Solution term	**Cons**	**PRI**	**CovS**	**CovU**
1)	sor*str	.919	.807	.679	.345
2)	SSC*str	.923	.708	.393	.059
	Solution formula sor*str + SSC*str	.910	.790	.738	

Intermediate solution for the absence of service profitability (identical to conservative solution).

	Outcome	**Absence of service profitability**			
	Solution term	**Cons**	**PRI**	**CovS**	**CovU**
1)	SEP*sor*str	.919	.820	.506	.040
2)	ssp*ssc*sor*str	.938	.829	.577	.144
3)	SSP*SSC*SEP*str	.923	.674	.254	.035
	Solution formula SEP*sor*str + ssp*ssc*sor*str + SSP*SSC*SEP*str	.922	.812	.685	

Overall profit growth

Enhanced conservative solution for overall profit growth (identical to intermediate solution).

	Outcome	**Overall profit growth**			
	Solution term	**Cons**	**PRI**	**CovS**	**CovU**
1)	SOR*STR	.852	.735	.800	.103
2)	ssp*ssc*STR	.864	.695	.549	.028
3)	ssp*ssc*SEP*SOR	.913	.799	.400	.022
4)	SSP*ssc*sep*SOR	.949	.827	.361	.011
5)	SSP*SSC*SEP	.899	.787	.305	.022
	Solution formula SOR*STR + ssp*ssc*STR + ssp*ssc*SEP*SOR + SSP*ssc*sep*SOR + SSP*SSC*SEP	.815	.691	.889	

Enhanced most parsimonious solution for overall profit growth (model ambiguity)

	Outcome	**Overall profit growth**				
	Solution term	**Cons**	**PRI**	**CovS**	**CovU**	**(M1)**	**(M2)**
1)	STR	.813	.686	.845	.091	.095	.093
2)	ssp*SOR	.859	.694	.589	.017	.029	.017
3)	SSP*SSC	.861	.716	.408	.017	.017	.020
4)	SSP*sep	.877	.684	.428	.006	.016	
5)	sep*SOR	.842	.630	.571	.004		.013
	Solution formula						
M1	STR + ssp*SOR + SSP*SSC + SSP*sep	.770	.635	.922			
M2	STR + ssp*SOR + SSP*SSC + sep*SOR	.770	.637	.919			

Enhanced intermediate solution for overall profit growth (identical to conservative solution). Solution terms 1-4 are identical to the solution terms 1-4 for service profitability.

	Outcome	**Overall profit growth**			
	Solution term	**Cons**	**PRI**	**CovS**	**CovU**
1)	SOR*STR	.852	.735	.800	.103
2)	ssp*ssc*STR	.864	.695	.549	.028
3)	ssp*ssc*SEP*SOR	.913	.799	.400	.022
4)	SSP*ssc*sep*SOR	.949	.827	.361	.011
5)	SSP*SSC*SEP	.899	.787	.305	.022
	Solution formula SOR*STR + ssp*ssc*STR + ssp*ssc*SEP*SOR + SSP*ssc*sep*SOR + SSP*SSC*SEP	.815	.691	.889	

Absence of overall profit growth

Conservative solution for absence of overall profit growth (identical to intermediate solution)

		Outcome	**Absence of overall profit growth**		
	Solution term	**Cons**	**PRI**	**CovS**	**CovU**
1)	SSP*ssc*SEP*str	.925	.673	.300	.070
2)	ssp*SSC*SEP*sor*str	.912	.551	.228	.027
3)	ssp*ssc*sep*sor*str	.936	.581	.410	.190
	Solution formula SSP*ssc*SEP*str + ssp*SSC*SEP*sor*str + ssp*ssc*sep*sor*str	.903	.628	.535	

Parsimonious solution for absence of overall profit growth (model ambiguity)

	Outcome	**Absence of overall profit growth**							
	Solution term	**Cons**	**PRI**	**CovS**	**CovU**	**(M1)**	**(M2)**	**(M3)**	**(M4)**
1)	SSP*ssc*SEP*str	.925	.673	.300	.051	.061	.063	.057	.056
2)	ssp*SSC*sor	.897	.506	.312	.028	.050	.050		
3)	ssp*SSC*str	.891	.444	.299	.000			.022	.030
4)	ssp*sep*str	.897	.469	.456	.022	.165		.157	
5)	sep*sor*str	.921	.556	.449	.026		.161		.161
	Solution formula								
M1	SSP*ssc*SEP*str + ssp*SSC*sor + ssp*sep*str	.882	.585	.594					
M2	SSP*ssc*SEP*str + ssp*SSC*sor + sep*sor*str	.887	.604	.589					
M3	SSP*ssc*SEP*str + ssp*SSC*str + ssp*sep*str	.886	.588	.566					
M4	SSP*ssc*SEP*str + ssp*SSC*str + sep*sor*str	.889	.598	.569					

Intermediate solution for absence of overall profit growth (identical to conservative solution)

	Outcome	**Absence of overall profit growth**			
	Solution term	**Cons**	**PRI**	**CovS**	**CovU**
1)	SSP*ssc*SEP*str	.925	.673	.300	.070
2)	ssp*SSC*SEP*sor*str	.912	.551	.228	.027
3)	ssp*ssc*sep*sor*str	.936	.581	.410	.190
	Solution formula SSP*ssc*SEP*str + ssp*SSC*SEP*sor*str + ssp*ssc*sep*sor*str	.903	.628	.535	