Abstract: The concept of servitization provides major benefits both for the performing company and for the profiting customer. Thus, during the last years many companies were heading for this well-proven direction tempted by expectations, but have been possibly even not aware of some inherent challenges. Since there are some issues even threatening the existence of companies, and some other rather easy to overcome, it is by all means necessary to consider and deal with this matter. Hence, this paper provides an insight into pitfalls in servitization named “service paradox” and addresses corresponding managerial issues. To operationalize the challenges of servitization, this paper suggests a separation among internal back-end challenges and customer-facing front-end issues, which represents the applied framework for their examination. Besides, the matter of appropriate pricing and the inherent shift of risks towards suppliers are discussed. Finally, the last part concludes the analysis outputs and gives suggestions for the future strategies in the enterprise servitization.

Keywords: enterprise; service science; servitization; value co-creation; product-service-systems

1. Introduction

Servitization is driven by overall digitalization and advanced technologies [1–5]. Thus, this paper attempts to operationalize the challenges of servitization faced by agile enterprises in such dynamically changing and digitalizing environment. It advocates a separation among internal back-end challenges and customer-facing front-end issues, which represents the applied framework for their examination [6].

Since there are challenges that may affect a certain business, the first section strives to give a brief introduction on the consequences of failing in servitization and its precedent triggers regarding management issues [6]. Thus, the first subsection describes the service paradox, which embodies the implications of failure, while the second one deals with managerial issues stemming from diverging beliefs and perceptions [7–12]. The final section will elaborate an appropriate framework in order to examine the challenges and drawbacks in detail, which will be discussed in Sections 2 and 3.

1.1. The Service Paradox

Rolling back the options of servitization, the concept of servitization aims for a transition from a manufacturing company to a service provider [13–17]. This transition is driven by several intentions...
concerning financial aspects as higher profit margins, strategic matters like differentiation or marketing benefits from customer lock-in [17–26]. Despite this vast amount of advantages several firms fail in applying the servitization strategy and exploiting its benefits, which therefore is called the service paradox [27–31]. Accordingly, there are several reasons for this occurrence, which can be explained best by drawing the transition line of servitization shown in Figure 1 (adapted from [27]).

The process of servitization is a stepwise transition between two extremes of the continuum manifested on the one hand by the pure product manufacturer and on the other hand by the pure service provider [14,15,17,18,27,32]. In order to explore the service paradox, one has to align this transition of business activities with the corresponding share of revenues they account for [27,28,31,33].

Considering the player on one end of the spectrum, i.e., the pure manufacturer, the core product is the main source of his revenues, whereas the corresponding add-on services enhance the differentiation of the product in terms of a marketing strategy. The service provider in contrast operates the other way around by extracting the lion’s share of his revenues out of the offered service, whilst the related products only serve as add-ons [14,15,17,18,27,32]. In fact, companies executing servitization successfully are located somewhere on the transition line, depending on their business focus and on the applied options. Thus, services contribute a considerable share on total revenues. In fact, offering the wrong service or executing the right service in a wrong way will cause relatively high operating costs and will generate relatively low contributions to total revenues [27,28,30,31,33].

1.2. Management Issues

Essentially, the task of servitization is a task of implementing a new business model and strategy, which is a complex and comprehensive process [6,16,22,34–38]. Accordingly, [39] found that a vast number of expensive, well-intended strategies, finally failed in the execution phase, which represents a significant waste of resources that could have been used more profitably elsewhere. The omnipresent rapid change of business environments, which represents a tremendous challenge, characterizes by all means the strategic management process whilst implementing the derived strategies [6,39–43]. Thus, about 90% of companies fail to execute their scheduled strategies [6,37,44,45]. In fact, two decided issues occur rather frequently manifested on the one hand by the lack of executive’s knowledge concerning a systematic approach in order to identify and implement the right arrays of actions. On the other hand, an unmeant overestimation of own capabilities to deal with the inherent changes and challenges of servitization finally results in a lack of implementing the strategy [6,39].
Another management issue arises from the diverging ideas goods manufacturer and service provider. Hence manufacturer try to benefit from economies of scale, which therefore demands for standardization of production. Service providers, in contrast, have to customize their products to meet customer needs entirely to maximize their satisfaction [6,46–48]. Accordingly, manufacturer and service provider are striving for different goals, which also affect the design of service that is characterized by its diverging nature considering the straight product and fuzzy service [6,37,40,41,43,45,49]. In fact, the decision on a service-oriented strategy implicates necessary adaptations concerning organizational structures and processes [6,14,16,17,22,34].

1.3. Classification of Challenges

The barriers and issues hindering the appropriate implementation and execution of servitization are based on variety of grounds. Several authors elaborate this topic, ultimately revealing related results. Accordingly, the extensive literature review of [50,51] identified five characteristics consisting of (i) organizational culture, (ii) pricing, (iii) risk absorption, (iv) complicated customer demand, and (v) close cooperation. Additionally, several other researchers retrieved characteristics of servitization challenges by conducting case studies or interviews. There are also classifications of challenges regarding servitization manifested by marketing-, production-, delivery-, product-design-, communication- and relationship-challenges [13,40] as well as embedded product-service culture, delivery of integrated offering, internal processes and capabilities, strategic alignment and supplier relationships [35,52].

In order to provide a valid framework to systematize barriers and challenges, we suggest a classification to consolidate related findings. Based on [34,53], who derived a basic organizational structure for servitizing companies consisting of front-end customer-facing units and back-end units separated into product- and service-units, we make a distinction of barriers and challenges according to their appearance manifested by front-end and back-end activities. Table 1 illustrates the corresponding allocation of barriers among front-end and back-end activities.

| Approach | Front-End Activities | Back-End Activities |
|----------|----------------------|---------------------|
| [51]     | Pricing              | Organizational Culture |
|          | Risk Absorption      | Close Cooperation   |
|          | Complicated Customer Demand |
| [40,42]  | Marketing Challenge  | Production Challenge |
|          | Product-Design Challenge | Delivery Challenge |
|          | Communication Challenge |
|          | Relationship Challenge |
| [35,36]  | Delivery of integrated offering | Embedded P-S Culture |
|          | Strategic Alignment  | Internal Processes and Capabilities |
|          |                      | Supplier Relationships |

Table 1 reveals two confusions originating from the primary classification regarding the topic of relationships and delivery, since these terms are classified in diverging categories. According to [40,54], the relationship challenge draws on a lack of credibility between customer and service provider, whereas [35,36,55] identified challenges regarding the relationship between the company and its supplier. Finally, [40,42,56] engaged on the delivery challenge concerning internal organizational and structural issues, whilst [35,36,57] considered challenges regarding diverging service/value offering perceptions. Thus, these comparisons affirm the suggested classification, which serves as a framework in Sections 2 and 3.
2. Back-End Challenges

According to the structure of activities suggested in the Section 1.3, we examine in the following back-end challenges occurring internally within the company. In order to provide an introduction to this matter Section 2.1 discusses several issues concerning organizational structure. Thus, the subject of occurring costs referring to the given infrastructure is elaborated in Section 2.2. Since the adoption of organizational structure inherently affects internal processes, Section 2.3 provides a discussion on challenging supplier relationships.

2.1. Organizational Structure

The adaptation of a servitization strategy implies a transition from manufacturing to servicing issues within the company, which finally requires managerial considerations and decisions on the following interrelated tasks: establish (i) a separate service organization, that needs (ii) a common culture and mindset in order to provide a basis for appropriate (iii) information exchange.

These issues are discussed in the following [14,27,35,36,40,58].

Organizations applying servitization are faced with the need of acquiring new capabilities in order to compete in novel service markets. Thus, processes supporting design and transition from product to service have to be aligned to enable adequate service provision [35,36,59]. Since the customers with their current and future needs are the lynchpin of value co-creation, one has to build their organization around them in order to achieve success in servitization [22,34,60]. The corresponding necessity for an appropriate service infrastructure requires the establishment of a separate service organization to meet the goals set for the service strategy [22,34,37]. The execution of this task can be enhanced or eased by operating this unit according to an independent service organization, which therefore relies on performance measures regarding customer- and employee-satisfaction and general business success. Accordingly, [22,34] suggested a specific reconfigurable framework for company’s organizational restructuration, consisting of front-end customer-facing units, which are supplied by corresponding back-end capabilities, comprising of product units and service units. In fact, this three-part organizational structure is completed by a supervising strategic center to provide essential leadership. The allocation of this organizational structure is illustrated in the Figure 2 (adapted from [22,34]).

Figure 2. Three-Part Organizational Structure.

Within an established organization the behavior of its members is guided through a system of shared actions, values and beliefs, which is defined as corporate culture [37,61]. In fact, there also evolves a certain culture within the separate established service organization, which has to be aligned and guided by management in order to meet the desired service strategy. Since the underlying values of manufacturing and service are conflictive management is faced with a challenging task to align manufacturing’s efficiency and economies of scale with service-oriented innovation and
customization values \cite{14,27}. Furthermore, one has to expect internal resistance among employees due to misunderstanding or apprehension regarding infrastructural changes \cite{23,24,62} since company’s long-standing practices and attitudes are altered \cite{16,17,63}. Accordingly, the most important issue in terms of organizational culture management is to find the appropriate people, which acclaim to company’s strategic beliefs \cite{23}, and develop a certain passion for service, in order to meet and exceed customer expectations in providing excellence service \cite{35,36,64}.

Finally, one has to be aware of the inherent drastically rising demand of additional information executing servitization strategies \cite{41,65}. Accordingly, servicing a large installed base of products requires information concerning applied configuration modes, current conditions and other relevant data for maintenance \cite{66}. Difficulties in terms of accessing this information arise from very basic reasons like the lack of appropriate delivering of supplier documentation for their items, or short-term changes during installation without proper updating in documents \cite{40,42}. Thus, an accurate operation of delivery and information infrastructure accounts significantly for succeeding in servitization businesses, which will be discussed in the following subsection.

### 2.2. Costs and Infrastructure Issues

Considering the costs of executing and performing a servitization strategy, one has inherently to deal with both, customer satisfaction and productivity tasks. However, there is no company described in the literature yet whether these two goals are compatible or comprising trade-offs \cite{31,67}. In fact, the literature review conducted by \cite{67,68} revealed two diverging viewpoints considering this matter. Some research advocates that improved customer satisfaction enhances productivity through reduction of effort concerning the handling of returns, rework, warranties and complaint management. Another party negates the compatibility of customer satisfaction and productivity due to the increased costs regarding the improvement of product attributes and product design \cite{67,68}. The trade-off between customer satisfaction and productivity is furthermore manifested by the diverging approaches of customization and standardization, whereas customization in general maximizes customer satisfaction and vice versa \cite{69}. Customization and standardization are two mutually dependent, but in general often conflicting, characteristics of quality, which therefore account for different cost structures. According to common operations management literature, overall cost decline with an increasing degree of implemented standardization, whereas a growing degree of customization equally will cause growing costs in contrast \cite{67,70}. The interplay of the degrees of standardization and customization with cost is illustrated in Figure 3.

![Figure 3. Cost Structure of Customization and Standardization.](image)

In fact, the degree of customization or standardization is likewise limited by the nature of the conducted service offering, which therefore, may comprise substantial financial drawbacks. Considering distribution services one has to be aware of the relatively high fixed costs enabling a sufficiently broad distribution, which decreases profit margins considerably during lower demand periods. Similar non-elastic behavior occurs for maintenance services which require a large installed base in order to repay the costs for delivering the service \cite{71,72}. Accordingly, potential drawbacks of certain service types rely on the nature of its corresponding product, considering product design and development services that are still combined with complex and technologically intensive products,
which therefore do not generate high fixed costs like running a broad distribution network [30,40,42,73]. These findings refer to the research of [71,74], who conducted an extensive survey amongst servitizing manufacturing companies in order to identify challenges and reasons for bankruptcy, which are consolidated in Figure 4 [71].

Figure 4 [71] confirms the discussion above, whereas services requiring a large base of investments in infrastructure and therefore high fixed costs for operation (e.g., retail, maintenance or installation) tending rather falling victim of bankruptcy. Offering design and development services or systems and solutions remains in the end fairly beneficial for companies in comparison to providing retail and distribution services, maintenance and support services and installation and implementation services, accounting for the lion’s share of bankruptcy cases [54,55,71].

![Figure 4. Service Types with higher Potential for Bankruptcy.](image)

A study by Benedettini et al. (2015) [54] showed that there are more servitizing companies declaring bankruptcy than pure manufacturers, which relies to the lack of exploiting their financial benefits [54,55,71]. Corresponding to the service paradox discussed in Section 1.1 [27,33] pointed out that only 11.1 percent of manufacturing companies earn more than 40 percent of their revenue through services, while more than 35 percent of the companies only generate 10 percent of their revenue through services and are therefore struggling with the service paradox. According to [54,55,71] this is due to the fact that servitization indeed reduces some of the traditional risks affecting manufacturing firms, but at the same time introduces some new ones related to service business.

### 2.3. Supplier Relationships

Finally, considering back-end activities related to precedent suppliers it seems important to be aware of the inherent and necessary greater degree of cooperation. This is based on the occurring need for more comprehensive insights on problems and applications of customers [51,75]. Nevertheless, thinking styles and attitudes regarding supplier issues still tend to be the same as they were whilst generating product-centered value. Consequently, this hinders external frameworks from successfully supporting complex service offering, since the changes in relationships between the product-service provider and its customers are not reflected in the relationships with the provider’s suppliers [35,76,77]. One of the most important issues is the alignment of internal as well as external mindsets and understandings between collaborating parties. Therefore, a solid base for
know-how intensive information exchange has to be established, in order to provide outstanding service provision [40, 42, 78].

3. Front-End Challenges

This section refers to the other part of the basic organizational structure regarding the customer-facing front-end challenges. In fact, the source of front-end challenges stems from the underlying desired benefits of customers, which is discussed in the Section 1. Further challenges are constituted by appropriate pricing and the shift of risks due to emerging business models.

3.1. Derivation and Assessment

Referring to the introduction, it is intelligible that the concept of servitization implies several benefits and motivations for manufacturing companies, concerning financial, strategic and marketing issues [14, 15, 17, 24, 79]. Since the customer represents an important and essential source regarding value co-creation, which therefore constitutes the premise of servitization, it is crucial to focus on its perception concerning his own benefits and goals [80–82]. The front-end issues for manufacturing companies are manifested by the challenge to meet the benefits that customer desire and percep. According to the literature review of [80, 83] one can separate most customer expectations into two categories consisting on the one hand of increased performance due to productivity and quality and on the other hand a resulting decrease of costs. Considering maintenance of increased productivity and quality, the shift of risks from customer to the service provider, states a common approach, which in general is inherently applied with cost optimization [35, 36, 51]. Both considerations are discussed more in detail in the subsequent sections, after primarily elaborating approaches of assessing these customer benefits.

According to the above statements most challenges arise from the need to meet the expectations of customers, which therefore implicates that one has to understand the creation of value through the eyes of the customer and their corresponding evaluation. This stems from the increasing number of customers focusing on their core competences, which therefore demands for more integrated offerings and solutions [84, 85]. In fact, literature dealing with customer solutions identified diverging perceptions of quality between customers and suppliers, which confirms the need for evaluation. Beyond that, literature provides very limited considerations on this topic [86–88].

The common perspective regarding this, focused on the embedded dimension that finally declares a presence of product/service attributes, for which the customer is prepared to pay regarding to their supposed potential [82, 89, 90]. Although there is no company stand in literature regarding appropriate characteristics for evaluating service operations, it agrees ultimately that it cannot be measured by traditional product-based measures [27, 89]. Finally, [84, 91, 92] derived a very basic but comprehensive approach to evaluate after-sales services. Their approach is based on six subcategories regarding front-end activities consisting of installation, training, customization, support for use, consultancy and troubleshooting, which therefore account for total of 22 assessment items. This comprehensive checklist for the evaluation by front-end activities is displayed in [84].

3.2. Pricing

Since customers expect—beside increased productivity and quality—a reduction of operating costs, it is crucial for the supplier to offer appealing prices. Nevertheless, manufacturer would like to gain financial revenues from this serving activity as well, which is considered as one of the most critical challenges in servitization [19, 51, 87, 93]. However, according to [25, 94] most of services related to products are offered ultimately for free. The ratio of performance-based offerings is low (see Figure 5) [25].

Offering selected basic services for free may be an appropriate means of acquisition (see [95]), but in general services should be subject of a well-considered pricing strategy on competitive markets,
otherwise companies waive considerable revenue streams [25,30,96] and inherently suggest lower value of their offering [13,97,98].

![Figure 5. Revenue Modes of Service Provision amongst UK Manufacturers.](image)

In fact, customers appreciate the value of services more if they are with reduced costs. Since the offer of servitization is based on ownerless consumption, the effective pricing is ultimately a very delicate issue for companies. In order to deal with that, one has to consider by all means the whole product/service life cycle, to achieve reliable revenues [51,93,99]. The authors of [93] identified the same behavior regarding customer perception, which is illustrated in Figure 6 [93].

![Figure 6. Customer Benefit through Service Gain.](image)

Customers consider their own maintenance costs as well in order to reduce costs by saving on extensive maintenance obligations or intensive personnel training [80,100,101]. Figure 6 shows a typical life cycle of a product consisting of efforts generated before the purchase and therefore have to be taken over by the supplier, and costs occurring after the purchase of this product, which the customer has to bear. In fact, customer strive to reduce their after-sales cost, referring to installation, maintenance or dispose to a minimum. Accordingly, the challenge of suppliers is to provide a service offering that comprises the after-sales services, but still appears cheaper for the customer, than conducting the activity on its own. Customers will therefore profit from the service gain and likewise tied-in to the
supplier [93,102,103]. As a consequence, customers do not have to bear any fixed costs related to the ownership of machinery, and therefore profit from reduced risks since fixed costs turned into provisional variable costs [80,104,105]. Referring to this, Section 3.3 will elaborate on the shifts of risks and its implications, both for customers and suppliers.

3.3. Shifting Risks

Applying exemplarily servitization through performance-based contracting results in a transfer of risks from the customer to the service provider, who has to maintain proper operation of its devices as well as the expected output [35,51,77,80,106]. A very prominent example of shifting risks from the customer to the manufacturer is constituted by the Rolls Royce business model, “power by the hour”, offering a guaranteed and predefined amount of operation hours of their jet engines instead of solely selling them [107,108]. Another benefit regarding productivity and quality is settled by ideal allocation of customer financial resources, which bears distinctive effects concerning seasonal businesses and their sporadic usage of items [109,110]. Consequently, servitizing manufactures serving their businesses are likewise faced with instable income revenues [30,69]. Finally, customers may gain increased performance quality by embracing servitization offerings through exploiting latest technological achievements [111,112]. This constitutes on the fact that service providers strive to achieve customer satisfaction and simultaneously establish competitive differentiation through offering latest machinery, devices and/or equipment. Thus, the service provider has to deal with uncertainty concerning emergent or even disruptive technologies, which may decrease the market value of its offering [80,112,113].

4. Conclusions

Besides the vast advantages stemming from the application of an adequate servitization strategy, certain challenges and drawbacks may occur, which by all means have to be taken into consideration and measures are to be applied to diminish undesired effects. Moving along the transition line between the two extremes of a pure manufacturer and a pure service provider offers various opportunities to benefit from higher profit margins on services [6,21,93,114]. Though, many companies fail to take advantage of these opportunities, and therefore are struggling with the so-called “service paradox”, since the added services do not or not sufficiently contribute to total revenues.

One of the most distinctive challenges concerning servitization constitutes in managerial issues, since the complex and comprehensive implementation of a new strategy is a challenging managerial task in any case. Complexity is even intensified by diverging beliefs of goods manufacturers and service providers. Hence, manufacturers try to benefit from economies of scale, which demands for standardization of production processes and products per se. However, service providers, in contrast, have to customize their products to meet customer needs and raise the customers’ satisfaction with the product [6]. Therefore, based on literature we suggest a distinction between internal back-end challenges and customer-facing front-end issues to bring servitization into use. For back-end tasks we elaborate on organizational structure issues, considerations regarding the trade-off between customer satisfaction and productivity, as well as on supplier relationships. For front-end challenges we explain their derivation, since they mainly stem from precedent customer requirements. Moreover, a relevant pricing and the inherent shift of risks towards supplier are discussed in depth. Finally, the aim of a company applying servitization is constituted by gaining certain advantages concerning financial, strategic or marketing issues, through operating somewhere on the transition line on the product-service continuum [6].

The future of servitization is driven by innovative ICT (Information and Communication Technologies) technologies [115] and by enterprises investing into those technologies and exploiting the business potential coming along with those technologies. Services delivered via cloud computing, business analytics, or data mining are only few examples of recent technology-driven possibilities supporting and improving customer relationship management. Taking into consideration these aspects,
our further research tasks comprise the explorations on how and to which extent enhanced ICT technologies are influencing the development of servitization in enterprises. This research question could be tackled by a selective and stepwise approach using methods of case study research (e.g., [116]). A large-scale, systematized approach would suggest a modular research design by various criteria, for example by enterprise size (small and medium enterprises, large enterprises, multinationals etc.), by region (e.g., Eurozone, North America, Australia, etc.), or by sector (e.g., hospitality, logistics, automotive etc.).

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