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# **Servitization in Manufacturing Firms**

Understanding the obstacles that determine service scope

Master's thesis in Management and Economics of Innovation

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## **Abstract**

With increased globalization, the threat of price-based competition has led to an upward trend of western manufacturing firms adding services to their product offerings, in an effort to deliver product-service systems (PSSs) that cover a wider range of customers' needs. In this transition towards more services, there are many firms that fail to develop successful systems, get stuck, or fall back in their original business. This study aims to investigate why some firms fail to servitize their offering when others do not. To develop the understanding of this discrepancy, this study is designed as a multiple case study with five manufacturing case firms. From the data collected in these cases, two major findings emerge. Firstly, a typology of PSSs that enables a connection between different types of obstacles and different PSS types is developed. Secondly, with the help of the typology in the first finding, it is found that a firm's relative position in the value chain has an impact on the range of attainable PSSs. Finally, the main implication of these findings is that manufacturing firms that have a distant position in the value chain relative to the customer should not try to develop certain PSSs. More specifically, such firms should avoid developing PSSs that have non-separable product and service components and primarily generate value for the customer that is charged for, unless they circumvent or partner up with the middleman in between themselves and the customer.

Keywords: product-service systems, servitization, servitization obstacles, servitization drivers



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# 1

## Introduction

During the last few decades, there has been a growing trend for manufacturing firms to add services to their product offering in an attempt to provide what commonly is referred to as product-service systems, integrated solutions, or hybrid offerings. The act of combining products and services has, in all likelihood, been around for centuries (Schmenner, 2009), but the process of adding value to the offering through services has been given awareness academically since Vandermerwe and Rada (1988) coined the term servitization. More recently, the trend of digitalization has opened new doors for what is achievable in the range of services, once again giving the term servitization increased attention (Porter & Heppelmann, 2014).

Whilst the literature suggests plentiful of reasons for manufacturing firms to add services to their offering, any servitization effort by a profit-driven firm, like any other activity carried out by such a firm, needs serving a purpose to be meaningful. Following the rationale of Smith and McCulloch (1838), a service that is being added to an existing offering needs to create value, and the firm needs to be able to capture this value. Otherwise, it would be irrational for the firm to carry out the service. Although this might seem obvious, it is fundamental for any servitization effort to ever have the chance of being successful.

With that being mentioned, the literature has historically been unanimous in stressing the advantages with adding services for manufacturing firms. Most authors, including Oliva and Kallenberg (2003), Davies, Brady, and Hobday (2006) and Gebauer, Friedli, and Fleisch (2006), emphasize the financial incentives such as higher profit margins and increased and more stable revenue streams that servitizing brings along, while Tukker (2004) stresses how firms can overcome ever more commoditized product markets through adding services, because of the enforced competitiveness and sustainability that services can generate. Similar to the latter, Baines, Lightfoot, Peppard, et al. (2009) mean that a move towards servitization can help firms differentiate and fend off competition from lower cost economies, and is thus striven after by more and more western manufacturing firms.

However, not all manufacturing firms trying to adopt services into their offering end up with a profitable outcome. In many instances, there are companies showing negative results in comparison to their non-servitizing competitors. Kastalli and Van Looy (2013) find that servitization often leads to negative financial results, especially for firms providing a moderate amount of services. This coincides with the results of Neely (2008), who finds that servitized firms on average are less profitable in comparison with

pure manufacturing firms. The discrepancy is explained through higher labour cost and higher cost of capital bound in products for servitized firms, which follows from the more specialized competency that comes with a higher degree of services (Neely, 2008).

In other instances, firms do not even manage to fully implement any service, and are hindered by obstacles that comes with the change of adding services. Sawhney, Balasubramanian, and Krishnan (2004), for one, describe how Intel's web-based service unit was cancelled only a short time after it was launched. Oliva and Kallenberg (2003) exemplify another servitization failure in Ford Motor Co.'s, who attempted to include services in their offering, but were hindered by their own dealer network. As shown by these authors, the potential value creation of PSSs is often countered by a bigger force working in the other direction, effectively hindering the value from being either created or otherwise captured by the service supplying firm. Previous research has acknowledged this fact and presented numerous different types of obstacles and challenges that firms either have to work on or circumvent (see e.g. Mont, 2002; Baines et al., 2007; Oliva & Kallenberg, 2003; and Martinez, Bastl, Kingston, & Evans, 2010). Nevertheless, research trying to explain why certain firms stumble upon these obstacles and other do not, is very sparse and thus initiated the research direction in this study.

Since the fundamental reason why firms deliver services is because they create value that the firm can capitalize on, it follows that obstacles to servitization are constructs that effectively obstructs either the value creation of the service, or the value capturing of said service. By continuing on the same train of thought, it becomes clear that the firms failing to deliver successful product and service offerings face certain obstacles to value creation and capturing. These obstacles stem from both the firms business' structures (Baines et al., 2007), but also from the actual services they try to implement. The latter part of the statement follows the rationale of Tukker (2004) and Ulaga and Reinartz (2011), who show that different product-related services are different by nature and require different resources and capabilities to deploy. With this quite obvious definition of servitization obstacles in mind, the question whether the obstacles stem from what types of services that are being implemented or from the business structure currently incorporated – or possibly from both simultaneously – arises. Moreover, if they stem from both simultaneously, what combination of business structure and service type sparks what obstacle? To fully investigate servitization obstacles and the origins of servitization failure, this study will try to answer the following research question:

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***RQ. How does different servitization obstacles affect the range of attainable service types for manufacturing firms?***

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This question will be answered through a qualitative case study research, initiated by and conducted in collaboration with the consultancy firm Goovinn. The study comprises interviews of representatives from five selected companies, all of which are manufacturing companies operating in, or in the vicinity of, Gothenburg. The case com-

panies operate across different industries but all have in common that they currently undertake an effort towards servitizing their offering. All case firms are, for confidentiality reasons, being anonymized throughout this report.

## **1.1 Purpose**

The purpose of this research is twofold. Firstly, this report tries to extend existing research on servitization and, in particular, serves to add to the understanding of why some firms fail in adding services to a product offering, while others succeed. Secondly, this report aims to be of practical use for manufacturing firms trying to servitize, by providing them with insights into how the range of attainable services is affected by their particular servitization obstacles.

## **1.2 Demarcations**

This study is bounded by a few demarcations. The geographical scope of the data collection of this study is limited to only include one country (Sweden), and one region within that country (vicinity of Gothenburg). This demarcation may impact the generalisability of the research, especially due to the claim by Baines et al. (2007) that Nordic countries tend to be more susceptible to servitization offers in comparison with other western countries. Furthermore, this study only investigates the servitization transition, which is defined as the transition where services are added and bundled with existing product offerings. The reverse transition – that service providing firms add products to their offering – is not treated in this study.

## **1.3 Report Outline**

This report will adopt the following structure: firstly, an overview of literature surrounding the field of servitization is presented. This part mainly covers prior research related to the three building blocks of the research background, namely obstacles, value creation and capturing, and different types of product-related services. Secondly, a method part in which the methodology used to conduct the study is described in detail. Thirdly, in the results chapter, the results from the data collection is carefully organized and framed to be coherent with the research question and to facilitate the analysis. Following this is the analysis chapter, which describes how the results are linked together to form the findings of this study. The analysis is then discussed in a discussion part, where implications for practice and ideas for future research is outlined and, finally, the analysis is synthesized and concluded.



# 2

## Literature Review

The following chapter comprises a literature review of the servitization phenomenon. It is initiated by introducing the most common terminology and definitions, along with a discussion around these. This is in turn followed by a review of how different product-service typologies, servitization obstacles and servitization drivers have been described historically in the literature.

### 2.1 Definition of a Service

For the concept of servitization to make sense, it is necessary to distinguish between services and products. Otherwise, the transition from offering products to offering a combination of products and services becomes non-existent and irrelevant in any discussion. Fortunately, the distinction between services and products is quite clear in most cases. Arguably, most people could differentiate between value present inherently within a physical good, and value present in an act conducted by a human being, that is a service. Occasionally, however, it becomes less clear. For example, Hill (1977) argues that services conducted on people (e.g. education) are quite different from goods, but that services conducted on goods (e.g. maintenance) are at times very similar to goods. If someone turns in a car engine to a mechanic and asks for it to be repaired, the value added on the product through transforming it into a functional engine is then referred to as a service. Yet, if the same mechanic buys the engine from the same person, fixes it and sells it back, the same act of adding value is then included in the product sold. In this case, the difference in ownership is what distinguishes between the service and the product. It becomes even trickier in the case of a supplier who re-packs its products in accordance to the customers' wishes, but the transition of ownership does not take place until after the act has been carried out. Is then the act of tailoring the offer a service, or is it merely an internal operation that finishes the product?

One of the earliest distinctions between services and products were made by Smith and McCulloch (1838), who defined one type of labour as 'productive', in which the result or outcome would be a physical good, and one type of labour as 'unproductive', where the value created from the labour would not be attached to some vendible commodity. Say (1846) builds on Smith and McCulloch's (1838) distinction and argues that a service, or 'unproductive labour', is in fact consumed at the same time as it is produced, unlike goods, which can be consumed at another point in time. Therefore, by applying these definitions of services and products to the servitization phenomenon, it is found that

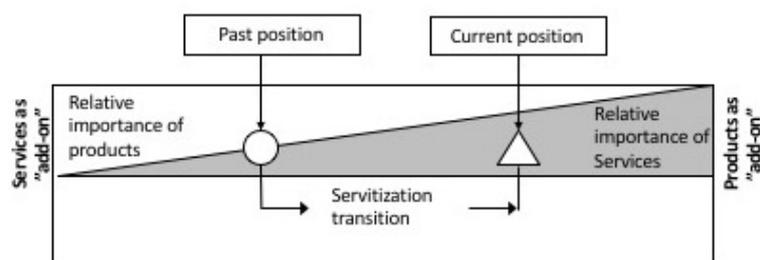
servitization is about adding an intangible component to the offering that is consumed and produced simultaneously.

## 2.2 The Concept of Servitization

The concept of servitization was coined by Vandermerwe and Rada (1988), who noticed a wave of firms starting to add services in their product offering. They claim that organizations had historically provided both types of transactions, but along with changes in the late 20<sup>th</sup> century, including deregulation, new technology, globalization and a tougher competitive climate, the involvement of both services and products in companies' business models has accelerated rapidly. After this initial observation of servitization, the academic society has taken some interest in the phenomenon, and different subareas of research have been established (see e.g. Quinn, Doorley, & Paquette, 1990; Mathieu, 2001; or Ward & Graves, 2005). These subareas are further elaborated on below.

### *The servitization continuum*

The servitization process can be described as a continuum, where on one side, the value stems purely from manufactured products, and on the other side it is solely extracted from services (Oliva & Kallenberg, 2003). The conceptual thinking around this model is based on Chase's (1981) dichotomy of service and product combinations, where the distinction lies within the degree of closeness to customer, which correlates with the degree of service focus (Oliva & Kallenberg, 2003). The servitization process is then a movement along this line from the the product side towards the service side (Oliva & Kallenberg, 2003). Neely (2008) expands on this notion and claims that the servitization process involves innovation of a firm's resources and capabilities so that a shift from selling sole products to products and services together can create joint value for the firm and its customers.



**Figure 2.1:** The servitization continuum. A transition to the right on the continuum implies that services gain more importance in the firm's total offering. This is generally achieved by adding services to an existing product offering. The figure is based on Oliva and Kallenberg's (2003) continuum.

### *Product-Service Systems*

Neely (2008) distinguishes between the servitization process and its eventual end result, which he denotes a product-service system (PSS). Similarly, the center of interest in the literature review of the servitization phenomenon by Baines et al. (2007) lies in the output of the servitization process, rather than in the process itself. As such, they mainly discuss what different research has been conducted in relation to PSSs. Basically, the PSS concept enables an understanding of how services interact with products to form a system to satisfy customers' needs (Morelli, 2006; Mathieu, 2001). Furthermore, the concept of PSSs is also widely used in research of sustainable consumption (Scholl, 2017).

### *Hybrid Offerings*

Yet another definition brought forward by scholars is the one of hybrid offerings, for example presented by Ulaga and Reinartz (2011). This term is closely related to PSSs, as it refers to the outcome of a servitization process (see the definition of Ulaga & Reinartz, 2011). One could see hybrid offerings as a subcategory of PSSs, since hybrid offerings has a stricter definition. To constitute a hybrid offering, the product and service should not only be bundled together, but should also provide a greater value when being offered together as compared to when being offered separately (Shankar, Berry, & Dotzel, 2007). In other words, the hybrid offering definition requires a synergy between the product and service when provided together. Brax (2013) puts hybrid offerings on a continuum, akin to the one of Oliva and Kallenberg (2003), and claims that hybrid offerings are a mix of products and services in which both are core components of the offering.

### *Integrated Solutions*

A fourth term brought forward in the academic literature is integrated solutions, which refers to a more sophisticated integration of products and services rather than just a bundling of them (Brax & Jonsson, 2009). In an integrated solution, the supplier aims to identify and provide a complete solution to customers' business issues, by incorporating services to design, finance, operate, or integrate a product or a system during its life-span (Davies et al., 2006). Davies (2004) adds that an integrated solution differs from more simple embedded services, such as maintenance or fault reporting; and comprehensive services, such as financing and operational services. Instead it comprises an integration of products and services in such a way that it meets a specific customer's needs (Wise & Baumgartner, 2000).

### *Terminology use in this report*

Throughout this report, it is intended to simplify for the reader by both setting clear descriptions of how the terminology is being used, and also incorporating a consistent use of terminology. As servitization is defined as a process or transition (Oliva & Kallenberg, 2003), this report will use that term whenever a shift from one state to another on the service and product continuum of Oliva and Kallenberg (2003) is being referred to. When referring to offerings, solutions or systems that have or will be developed through servitization, this report aims to use the term PSS, as it is the most general and most widely used term. This report views the PSS concept as a system, in which one or

more products are combined with one or more services. Sometimes the term service will be used in relation to PSS, when the service-component of the PSS is referred to. In some instances, the terms service and PSS can even be used interchangeably. To avoid confusion by the terminology, the reader is advised to interpret them similarly, because all services included in this study are in fact components of PSSs.

**Table 2.1:** Terminology surrounding servitization

<b>Product-service terminology</b>	<b>Authors (Year)</b>	<b>Definition</b>
Servitization	Vandermerwe and Rada (1988);	A wave of managers driving their firms into services to gain competitiveness;
	Neely (2008); Oliva and Kallenberg (2003)	A transition towards pure services on the continuum ranging from pure products to pure services
Product-service (PSS) system	Tukker (2004); Baines et al. (2007)	A system where products and services are jointly combined to fulfill a specific customer's needs
Hybrid offering	Ulaga and Reinartz (2011)	A bundle of products and services that provide greater value when combined than when being provided separately
Integrated solutions	Brax and Jonsson (2009)	A complex and sophisticated integration of products and services, which give rise to certain benefits

### 2.3 Typologies of Product-service Systems

A simple way to visualize and understand the differences between different types of PSSs and their properties, is to classify them into some sort of typology. This has been conducted by several authors in various fashions (see e.g. Tukker, 2004; Ulaga & Reinartz, 2011; or Frambach, Wels-Lips, & Gündlach, 1997). The following section aims to provide the reader with an understanding of different types of PSSs and how these have been treated in the literature.

Tukker (2004) categorizes PSSs into three groups: product-oriented PSSs, use-oriented PSSs, and result-oriented PSSs. The major difference between the categories is concerned with both the ownership of the product in the respective systems and whether the service relates to a pre-defined product or not. In use-oriented PSSs, the ownership of the product stays with the supplier of the system, who provides the product in the form of a service. In product-oriented services, however, the ownership of the product is shifted to the customer (Tukker, 2004). Result-oriented services are, in difference to user-oriented and product-oriented services not acting on a pre-defined product

(Tukker, 2004). To better understand this, the three categories of PSSs can be exemplified as follows: a maintenance service conducted by the manufacturing firm on a product it has previously sold is a product-oriented service, where the ownership of the product has changed before the service is carried out. A use-oriented service could, for instance, be a product leasing service, where the ownership stays with the manufacturing firm, and the customer pays for the access to the product. Finally, a result oriented service could be a pay-per-output model, where the customer pays for the actual output of a product that the customer owns (Tukker, 2004).

Uлага and Reinartz (2011) proposes a different typology, which is a two-dimensional classification of industrial services that in combination with products comprise hybrid offerings. The first dimension is contingent on the service recipient and separates between whether the service is oriented toward the supplier's good or the customer's process. In the second dimension, services are separated on the basis of whether the value proposition is input-based or output-based. More specifically, services are separated based on whether the supplier promises to performing a deed versus achieving performance. From these two dimensions, four different categories of services for hybrid offerings can be derived: product life cycle services, asset efficiency services, process support services, and process delegation services (Uлага & Reinartz, 2011). Product life cycle services are closely intertwined with the supplier's product, and aim to facilitate the customer's access to the product throughout its entire life cycle (Uлага & Reinartz, 2011). An example would be an inspection service. Asset efficiency services are also directed towards the supplier's good, but aim to achieve productivity gains from assets invested by customers (Uлага & Reinartz, 2011), such as preemptive maintenance. Process support services are, on the other hand, directed towards customers and, more specifically, aimed at assisting them in improving their own business processes (Uлага & Reinartz, 2011). An audit service is an example of such a service. Finally, process delegation services are defined as services to perform processes on behalf of the customers, such as fleet management services (Uлага & Reinartz, 2011).

Although these categories can not, straight to the point, be translated to fit into the servitization continuum as described above, with value stemming from manufactured products on one side and from services on the other, there are obvious similarities with for example Tukker's (2004) classification. According to Uлага and Reinartz (2011), the different categories of services for hybrid offerings are, in fact, typically entered into gradually, with most manufacturing companies starting with product life cycle services and potentially moving from these into asset efficiency services or product support services. Only after having consolidated positions in these three categories, a move into process delegation services is considered feasible (Uлага & Reinartz, 2011). Consequently, despite all suppliers not necessarily entering all of the different categories of services for hybrid offerings, it appears to be a sequential-like relationship in between them, where firms typically move from simple services for hybrid offerings to more complex ones.

A third typology of PSSs is the one by Frambach et al. (1997), who separate different product-service systems depending on whether they are relationship related or trans-

action related. This means that PSSs are separated based on whether they are in place to sustain an ongoing relationship between the supplier and customer, or to facilitate the transaction of the product in question. Transaction related product services are further divided into usage related presale product services, usage related post-sale product services, and purchase related presale product services, depending on when the service is utilized in relation to the transaction, and if the service is focused on facilitating the usage or the purchase of the product (Frambach et al., 1997).

There are evidently many scholars who have tried to categorize services and product-service systems for all kinds of reasons. In addition to the ones being mentioned, there are naturally plenty of other product-service typologies and service categories (see e.g. Parida, Sjödin, Wincent, & Kohtamäki, 2014; Kindström & Kowalkowski, 2014; Mont, 2002; or Gaiardelli, Resta, Martinez, Pinto, & Albores, 2014). Whilst most of these offer valuable insights into, for instance, the characteristics of different service types and what is required to develop them, none appears to pay much regard to servitization obstacles and how certain firms may be limited in their servitization efforts. Since servitization obstacles, by nature, are hindering firms in their efforts in adding services, there is need for a typology that pay regard to these obstacles. Only then can the dynamics of how firms are limited in what range of PSSs they can incorporate be better understood.

### **2.4 Servitization Obstacles**

The servitization transition is not always straightforward and simple. In almost every case study on the subject, the authors find the case firms in the respective studies to get stuck with problems they have difficulties solving (see e.g. Oliva & Kallenberg, 2003; Gebauer & Fleisch, 2007; or Baines et al., 2017). These obstacles have been observed and described in a multitude of studies, and a number of different classifications have been presented. One such classification can be found in the literature study of Baines et al. (2007), in which two categories of barriers to adopting PSSs are proposed: the first category includes obstacles that are intrinsic within the firms themselves; and the second category includes obstacles that are caused by the customer. Obstacles found within the firm comprise obstacles related to risk adoption, pricing, and structural change (Baines et al., 2007). Obstacles that are caused by the customer are instead related to resistance to ownerless consumption (Baines et al., 2007).

The first firm-bound obstacle, risk adoption, is inherent in the servitization process as the incorporation of certain PSSs result in that the risk is being shifted from the customer to the supplier (Baines et al., 2007). This increased risk for the supplier stems from the increased responsibility the firm assumes, by either promising its customers use or result focused outcome, takes command over parts of the customers' operations, or retains ownership of the product (Baines et al., 2017). There are several ways for the supplier to mitigate some of the risk. For instance, partnering together with a financial institute to provide renting services would allow the manufacturer to leave the ownership to a third party, and minimize the risk and cost that comes with binding loads of capital in finished goods.

With different components in the offering and a higher level of risk adoption comes the second firm-related obstacle as stated by Baines et al. (2007), which is the dilemma of pricing the PSS. Existing customers may often have different expectations of the price of the offering, thinking that the service should be provided for free, or at minimum cost (Parida et al., 2014). For the firm itself, a pricing that reflects the inherent value in the offering is a necessity for it to capture the value (Parida et al., 2014). Therefore, a divide between the customers' and the firm's expectations may appear, which may deter the firm from servitizing. Furthermore, another dimension of complexity is added to the divide as the firm often lacks experience in pricing services or solutions (Baines et al., 2007), which in combination with the increased risk associated with providing PSSs, may lead firms to overvalue or undervalue their offering (Parida et al., 2014).

The third type of intrinsic obstacle is that a manufacturing firm will require to fundamentally change their culture and organizational structure when incorporating services in their offering (Mont, 2002). For one, changing the internal structure from selling product to selling products and services, requires a change in firms' marketing functions (Mont, 2002). Fang, Palmatier, and Steenkamp (2008) claim that the cost of dividing the business into service and product-specific entities often outweighs the benefits early on in the servitization process. This can lead to confusion and conflict within the company as the different business cultures and structures exist within the same entity.

Finally, the assumption that customers are looking for the use of a product, rather than the ownership of it, does not seem to reflect reality (Mont, 2002). This gives rise to the customer-bound type of obstacle mentioned by Baines et al. (2007), which is customers' tendency to not value the use of a product or the fulfillment of a need as high as the ownership of the product. Besides, customers in different parts of the world have different attitudes towards the ownership of products (Baines et al., 2007). For example, people in countries such as the Nordics and the Netherlands are more flexible towards use or result-related PSSs (Baines et al., 2007). Therefore, the acceptance of PSSs where the product is owned by the supplier rather than the customer might be higher in these countries as compared to in other parts of the world.

Elaborating on the categorization of Baines et al. (2007), both Martinez et al. (2010) and Mont (2002) propose classifications that partly overlap the classification scheme of Baines et al. (2007), but also extend it. Martinez et al. (2010) find that obstacles can be divided into five different categories. These extend the categorization of Baines et al. (2007) by adding two other dimensions. Firstly, they provide insights on obstacles related to the alignment between the customer and the firm. These highlight the importance that all stakeholders have the same understanding of the service provision (Martinez et al., 2010). For example, Martinez et al. (2010) found that the service supplying firm, in some instances, understood the need of the customer, but that need was not acknowledged by the customer. Secondly, the categories provide understanding of obstacles related to the supplier relationships, which mainly incorporates how suppliers, upstream from the service provider, have to be included to a greater extent (Martinez et al., 2010).

Other obstacles are mentioned in Mont's (2002) paper, where the author argues that firms may find difficulties in finding alternative product use. New alternative product use often include elements of both production and consumption, and several stakeholders need therefore to partake in the development of the product and service system (Mont, 2002). Furthermore, there has to exist an infrastructure that can support the proposed PSS. Otherwise, the firm itself becomes obliged to establish a necessary supporting system, which may neither be simple nor affordable (Mont, 2002).

Despite a plethora of different categorizations of servitization obstacles, scholars seem unwilling to add any specific meaning to each of them. The usefulness of such categorizations in practise becomes limited, as firms may know all types of possible obstacles they could face after starting their servitization journey, but not what obstacles are relevant for them. The implication of this generic obstacle view proposed by academia is that firms can only address obstacles in a reactive fashion as they appear rather than proactively, or else they have to proactively trying to add a full package protection against all possible obstacles, which seem less plausible. A harmful consequence of a reactive approach to obstacles is that it can cripple the rationale behind which a decision to enter into PSSs is based upon. The reason for this is that a disproportionate amount of focus will lie upon the benefits of the PSSs.

**Table 2.2:** Type of obstacles brought forward in prior case study research

<b>Obstacles</b>	<b>Authors (year)</b>	<b>Description</b>
Risk adoption	Baines et al. (2007);	The supplier has to adopt the risk related to the products as they take responsibility for the usability or the result of a product
Strategic alignment	Martinez et al. (2010)	Lack of alignment between customers' and firm's understanding of the PSS
Pricing	Baines et al. (2007); Parida et al. (2014);	Price does not align with customers' expectations
Structural change	Baines et al. (2007)	Service business requires different organizational and cultural structures, but firms cannot find the rationale to separate them
Lack of support system or infrastructure	Mont (2002)	PSSs need a supporting infrastructure to work, which pose an obstacle if it does not yet exist
Conservative market behaviour towards ownerless consumption	Baines et al. (2007)	Customers do not necessarily value use of product higher or as high as the ownership of it

## 2.5 Servitization Drivers

To gain a better understanding of how servitization obstacles affect the value creation and capturing of different types of PSSs, it is important to understand the underlying intended value of the servitization, or in other words, the drivers behind a servitization effort. The literature suggests a number of reasons for manufacturing firms to commence into the business of providing services. Davies et al. (2006) state that services are attractive because of three reasons, all of which can be interpreted as financially driven: they provide continuous revenue streams, have higher profit margins and require fewer assets than manufacturing. Tukker (2004) highlights that combining tangible products and intangible services in a product-service system can generate enhanced competitiveness and foster sustainability. He argues that, as many product markets are becoming commoditized and competition price-based, adding services to the business model allows a firm to create competitiveness along three lines as they can: (1) offer an integrated and customized offering so that the clients can focus on core activities; (2) build unique client relationships and thus enhance customer loyalty; (3) innovate faster since they can follow clients' needs better.

Furthermore, servitization can enforce increased environmental performance, as discussed by Goedkoop, van Halen, te Riele, and Rommens (1999). They argue that a change in firms' business models towards services revises customers conception of ownership, which in turn encourages behavior and courses of action that decrease the environmental impact. Although not necessarily being connected to management and economic literature, this aspect has seemingly been ever more relevant as of late, not least from a customer perspective, with the increased attention to the rise of the sharing economy and its effects on the business environment.

While the spectrum of individual drivers of servitization evidently is spread along a number of different dimensions, the literature is relatively unanimous in defining the sets of factors that generally drive manufacturing firms to add services to their offering, and many authors propose the same or similar categories of servitization drivers. For instance, Baines, Lightfoot, Benedettini, and Kay (2009), Gebauer et al. (2006) and Parida et al. (2014) have categorized the drivers of servitization almost identically along the three lines of financial, strategic and marketing drivers. Similarly, Oliva and Kallenberg (2003) states economic arguments, competitive arguments, and demand driven factors as the main drivers for product manufacturers to integrate services in their core product offerings.

Financial drivers are primarily concerned with that services can generate increased revenues through prolonging the life-cycle of the installed base of products, higher profit margin and steadier revenue streams (Baines, Lightfoot, Benedettini, & Kay, 2009). Strategic drivers, or drivers enforcing competitive advantage, are commonly reinforced by that services provide a potential for differentiation. Services are more labor dependent and often require more customer intimacy, thus being more difficult to imitate. This is especially relevant in product markets that are becoming commoditized (Gebauer et al., 2006). Marketing drivers for servitization can be understood as a means

## 2. Literature Review

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of selling more products, and is often caused by increased customer demand for a more comprehensive offering (Baines, Lightfoot, Benedettini, & Kay, 2009).

All of the drivers mentioned above are rationales for firms to servitize at large. However, it seems more logical for firms to add services because of the value they see in a specific PSS, rather than in the servitization concept as a whole. Therefore, a grouping of drivers on an abstraction level that high gives little room to understand why firms choose a specific PSS. Instead it only provides insight into why firms pursue servitization at large. Authors that have tried to incorporate drivers on a service-specific level are Tukker (2004) and Ulaga and Reinartz (2011), who stress the benefits with different types of PSSs by linking them together with their value creation. Nevertheless, these studies fail to fully explain the suitability for different firms to pursue the various PSS types.

# 3

## Method

The following chapter aims to describe the methodological approach applied in this study and encompasses five major parts. Firstly, the rationale behind the literature review is explained, along with how it was carried out. Secondly, the reasons for conducting this study as a case study research are presented. Thirdly, the purpose of the data collection is described, along with how the data collection process was carried out and how the case firms and interviewees were selected. This is followed by an explanation of how the collected data was analyzed. Concluding this section is a discussion around the research quality.

### 3.1 Literature Review

This study was initiated by a literature review on the topic of servitization. The literature review was conducted to serve two main purposes: firstly, it aimed to map the historical and current research on servitization; and secondly, providing insights to how the topic historically has been methodologically approached and what different research techniques that have been used previously. While not being constructed according to a predefined framework or recommendation of any kind, the literature review process and its underlying rationale was influenced by the ideas of Hart (1998), who suggests that quality in a literature review is concerned with "the use of the ideas in the literature to justify the particular approach to the topic, the selection of methods, and demonstration that this research contributes something new." (p.1).

In relation to the first purpose mentioned above, mapping existing research helped the researchers in gaining an understanding of the development of the topic and how servitization relates to other similar phenomena as described in the literature. Perhaps most importantly, however, it made possible to distinguish what has been researched to date, and what was yet to be examined in relation to the subject of servitization, which in turn enabled for putting this research into context. The second purpose as stated above was simply concerned with identifying how to, in general, most effectively approach the research methodologically, and the data collection process in particular. Insights from the literature review influenced the choice of research design, which is described in the following section.

To build up the theoretical foundation, an extensive search and gathering of information about servitization was done. This was initially conducted through screening relevant articles and research papers found in databases such as Google Scholar, Web of

Science and Scopus. Relevant literature, meaning such literature that directly related to the research question or conveyed information that added to the researchers understanding of the topic, was found by searching for certain key words and phrases. For obvious reasons, the term servitization was a central key word when searching for relevant material, and it was partly used standalone, but more frequently as part of a search phrase together with terms such as "manufacturing firms", "process", "approaches" and "challenges". Furthermore, phenomenon such as "product-service systems", "hybrid offerings" and "integrated solutions" were searched for in a similar fashion.

Plenty of abstracts, introductions and conclusions were read, and articles that were assessed to be of further relevance to enhance the authors understanding of the topic and contribute to justifying the research question were read more carefully. This selection was based on personal judgement and credibility of the articles. Moreover, the articles that were assessed to be of further relevance were summarized and, finally, the most important information was categorized and compiled in an excel spreadsheet to allow for comparison of the different literature sources.

## 3.2 Type of Study

Servitization in the context of manufacturing firms has, as mentioned in the literature review, been discussed frequently in previous research. The literature suggests a number of drivers for manufacturing firms to move towards servitization (e.g. Baines, Lightfoot, Benedettini, & Kay, 2009; Parida et al., 2014; Gebauer et al., 2006), and plenty of researchers have tried to identify obstacles to servitization (e.g. Mont, 2002; Martinez et al., 2010) as well as attempted to categorize different types of services (e.g. Tukker, 2004; Ulaga & Reinartz, 2011). Yet, the suggested driving forces and servitization obstacles are not seldomly on a high level of abstraction and, more importantly, the relation between servitization obstacles and different types of services has not been given much attention in previous research. This lack of attention is especially noteworthy in the early phases of the servitization process.

Thus, the domain for the research subject and research question can, despite the frequently researched topic of servitization, be considered nascent and unexplored, which in turn provides support for the research to be done as a qualitative case study research. This is in line with Eisenhardt's (1989) assessment that case study research is well-suited in particular when existing theory seems inadequate. Edmondson and McManus (2007) similarly argue that studies of nascent character where little is known requires for more rich and detailed data, for instance in the form of interviews and open-ended questions. Conversely, using quantitative measures in a nascent context is likely to cause overinterpretation of statistical relationships and thus end up prove nothing (Edmondson & McManus, 2007).

### 3.3 Data Collection

As this study investigated how the range of attainable PSSs of different firms is affected by different servitization obstacles, it was important to gather data that explained what obstacles each firm face in relation to different PSSs. In other words, the data needed to answer the research question was data that informs about obstacles for different firms related to the PSSs they are currently developing, or already have developed. As servitization obstacles, by definition, obstructs proper provision of PSSs, and only lasts until they have been overcome, it becomes rational to study PSSs that are under development, where potential obstacles are present. Nevertheless, it is also interesting to study PSSs that already have been implemented, or if applicable, have failed. Those cases of PSSs would not only add to the understanding of obstacles and their relation to the different PSSs, but also provide insights into how the obstacles were overcome, or whether they could be overcome at all. Although PSSs that already have been developed seem like more feasible data points, it must be said that data of the past is always more blurry than data from the present. People may forget, not remember accurately, or sometimes produce explanations in hindsight. Therefore, this study aims to collect data from PSSs under development, PSSs that are up-and-running and PSSs that failed when being implemented.

#### 3.3.1 Selection of Case Firms

This study includes five case firms (see Table 3.1), all of which are manufacturing firms that are in the process of adding services to their product offering. All case firms are primarily conducting business in the vicinity of Gothenburg but operate in different industries. Since this research relied a lot on the data collection from interviews, all case firms were carefully selected based on a number of selection criteria. These criteria, along with the overall process of selecting appropriate cases, are described below.

As finding suitable research participants can be one of the biggest challenges of the research process (Easterby-Smith, Thorpe, & Jackson, 2015), identifying accessible and relevant interviewees with availability to set aside significant amounts of time, was of high importance during the initial phase of the study. Thus, the selection of case firms was done in collaboration with Goovinn, who posited knowledge of firms undertaking a servitization process as well as these firms' availability to set aside considerable amounts of time to take part in the study.

The main reason for conducting case studies was to facilitate observations of the phenomenon of servitization. Hence, all case firms had to be in the process of servitizing from the manufacturing side at the time of the study. From this follows that all case firms needed to have been product focused historically. The adopted approach of selecting firms can thus be said to be similar to a theoretical sampling technique, that is choosing cases based on their likelihood of offering theoretical insight. This selection process is in line with Eisenhardt's (1989) proposal that theoretical sampling is preferred over random selection when building theory from case studies. Additionally, the selection of case firms in this study follows Pettigrew's (1990) argument that firms

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in which the progress is transparently observable should be selected when studying a phenomenon within a single or a small number of cases.

As previously mentioned, this case study research includes five case firms. The reason for the choice of including five case firms is twofold. Firstly, including a fewer number of case firms could be associated with the risk of gathering insufficient amount of data and result in limited opportunities to identify commonalities and disparities in between the case firms. Choosing five case firms where the phenomenon is assessed to be transparent observable, would limit this risk substantially. Secondly, the selection of a larger quantity than five case firms was assessed to constrain the researchers' insight in each case firm, and potentially limiting each case firm's contribution to the study. Additionally, with the chosen data collection process, constituting interviews on multiple occasions with each case firm, adding more case firms would most likely have generated cumbersome volumes of data. The selection of five case firms is in line with Eisenhardt's (1989) recommendation of selecting between four and ten cases, to avoid lack of complexity and unconvincing empirical grounding on the one hand, and too complex and voluminous data on the other hand.

To allow for the iterative process between data collection and data analysis, each firm selected for inclusion in the study needed to be open for the engagement in follow-up interviews, be it with the same interviewee or a different one. To ensure each firm's commitment to follow-up interviews, availability for follow-up interviews was included as a condition for a firm to participate in the study, and communicated to each firm prior to the first interview round.

All case firms selected for inclusion in the study were conducting their business, at least partly, in the vicinity of Gothenburg. The primary reason being that the chances of having personal meetings with representatives from each firm were assessed to be increased if the geographical boundaries were limited.

With respect of the case firms, and to avoid potential loss of gradated information, all case firms have been selected so that none of the firms are competitors. Since all firms are operating in manufacturing businesses in the vicinity of Gothenburg, it was considered highly important to select case firms producing significantly different products and operating in separate industries, to avoid any concerns regarding competition. Not doing so could plausibly have caused interviewees to be more cautious and selective with what kind of information to share during the interviews, which in turn could have considerably impeded the process of collecting data.

The process of identifying suitable firms to include in the study was restricted by the requirement from Goovinn that at least some of the case firms had to be previous, current or potential clients of Goovinn. The reason behind the restriction was to enhance Goovinn's relationships with their clients with the help of this study. While this requirement somewhat limited the scope of potential firms to be included in the case study, the collaboration did, more than anything else, simplify the the selection process. Due to Goovinn's established relationships with firms undertaking the servitization process

and previous contact with relevant people to interview within the firms, the process of getting in touch with interviewees as well as scheduling interviews, a process potentially affiliated with obstacles, was relatively frictionless.

### 3.3.2 Selection of Interviewees

After the case firms had been selected, it was necessary to decide whom to interview in each firm. To facilitate good data and deep insight into the servitization process of the case firms, the interviewees needed to be informed about the firm's servitization efforts. Therefore, the interviewees needed to have an adequate position within the firm. This included a high enough position to be included in the strategical implication of implementing the PSSs, but also hands-on enough to know the daily work of the PSS development as well as the current situation of the development. Therefore, people in business development positions, most preferably with managerial responsibilities, were sought after. Furthermore, Goovinn, with their knowledge about the case firms, assisted in the selection of interviewees at the respective firms with recommendations of appropriate participants.

**Table 3.1:** Compilation over the firms and interviewees partaking in the study

Companies	Interviewees	Company Business	Customers
<b>Firm A</b>	Business unit development manager: service and products Business unit director Business unit supply-chain manager	Equipment manufacturer in the construction industry	Wholesalers and retailers. Not direct sales to the end users
<b>Firm B</b>	Business development associate: services Business development manager Strategy & business development manager: Global aftermarket	Power solution provider, mainly providing power-generating equipment for vehicles	OEMs, retailers, wholesalers and dealers. No direct sales to end customer
<b>Firm C</b>	Business unit manager: products Vice president Business development manager: service	Manufacturer and provider of additive manufacturing equipment and the input material, used in industrial manufacturing	Manufacturing firms (end users)
<b>Firm D</b>	Business development manager	High-tech software integrator	Manufactures, testers, or users of systems
<b>Firm E</b>	Global Marketing Director: Business unit Global Marketing Director: Business unit Global Director Sales Force Excellence	Manufacturer and provider of professional disposable products for the medical industry	End users and retailers

### 3.3.3 Data Collection Process

The data collection process primarily consisted of qualitative, semi-structured interviews with relevant people from the five different case firms, as described in table 3.1. The interviews were split into three different rounds, to facilitate analysis of the data not only after all interviews had been carried out but also in between the different rounds. Furthermore, the intention was to conduct the interview rounds with different representatives from each firm, to get a comprehensive picture of the respective firm's servitization efforts. Consequently, a total of three people from each firm were interviewed and each firm was represented in each interview round, with the exception of firm D. The process followed an iterative fashion, in which data collection and analysis of data were alternated. This approach is similar to what Easterby-Smith et al. (2015) refers to as grounded analysis, which aims at building theory from categories found in the data, as opposed to content analysis, which is "an approach that aims at drawing systematic inferences from qualitative data that have been structured by a set of ideas or concepts" (p.188). A further explanation of how this iterative process took shape follows in the data analysis section.

To establish contact with the case firms and the interviewees, all interviewees were contacted through email. Depending on the interviewee's relation with Goovinn, and whether he or she had been introduced to the study beforehand, the emails varied in terms of degree of information richness. Some interviewees were already introduced to the study, and thus primarily contacted with the purpose of introducing the researchers and scheduling an interview, whilst others were more or less unaware of the study, and thus also targeted with a one-pager including a description of the study and its purpose along with information regarding data collection and confidentiality agreements.

Prior to each interview session, interview preparations were done primarily in two areas. Firstly, public information about each firm, when available, was being read; and secondly, an interview guide was constructed. The initial interview guide was composed of two parts: the first part consisting of a set of questions aiming to clarify and complement publicly available information such as background of the firm and the interviewee; the second part constituted a set of questions that were formulated based on the research question. The interview guide was adapted and developed in between interview rounds as well as in between interviews within the same interview round. Some questions were removed or reframed based on the answers they yielded, and other questions were added.

The interviews conducted with the respective case firms were of semi-structured character in that open-ended questions were asked to allow for the interviewee to elaborate freely. The questions were based on the interview guide, but could be tweaked or framed slightly different depending on the context and setting of the interview (for details describing the different interview templates, see Appendix A). Moreover, the interview guide mainly served the purpose of helping the interviewers staying on topic and was not necessarily strictly followed. Contrarily, the interviewers were encouraged to follow leads from the interviewees that, in the course of the interview, were assessed

to be of further relevance. The rationale for conducting the interviews in this manner was to create a setting in which, first of all, rich and unbounded data could be generated; and secondly, the interviewees felt comfortable in sharing their interpretation and opinions about servitization in general and on the level of the firm in particular. Creating such a setting is by no means an easy task for an interviewer, and was thus preceded by preparation, as explained previously. Nevertheless, if done successfully, it coincides well with the view of Easterby-Smith et al. (2015) that semi-structured interviews can be appropriate for instance when trying to understand the respondent's view on a certain matter, along with their underlying reasons for holding that view.

Furthermore, the interviews were, when possible, conducted through personal meetings to allow for face-to-face communication. The reason behind this was, again, to generate as rich data as possible. This follows the logic that face-to-face communication generally is considered to be the richest form of information processing, for instance ahead of both telephone or written correspondence, as it allows for immediate feedback and possibilities to make interpretations beyond the spoken language (see for example Daft & Lengel, 1983). As such, personal meetings were valuable for the interviewers to interpret the respondents answers as accurately as possible to be able to ask relevant follow-up questions. Limited by the lack of time and availability, two of the interviews were forced to be conducted through telephone, resulting in that 13 of the 15 interviews were conducted through personal meetings.

All interviews were initiated by a few comments surrounding the practical aspects of the research project and the flow of the interview. Firstly, the researchers of this study gave a brief explanation of the research study and the concept of servitization, to illuminate the setting for the conversation. This was followed by a review of the confidentiality aspects of the study, with the aim that all interviewees should feel comfortable in sharing as detailed and rich information as possible during the interview. Finally, before moving on to the main topic of the interviews, all interviewees were asked for their consent of recording the interview, to allow for reviewing and transcribing of the interviews. All interviewees but one gave their consent to recording the interview, and thus, 14 of the 15 interviews were recorded.

### **3.4 Data Analysis**

After the conclusion of each interview session, all interviews that had been recorded were transcribed, which can be seen as the first step of the analytic process (Easterby-Smith et al., 2015). The transcription process was initiated relatively shortly after each interview was finished, that is the same day or within a few days, so that the researcher could have the interview fresh in mind when transcribing. The interviews were primarily transcribed by listening to the recording of the interview on slower speed, ranging from approximately half the speed to full speed, and writing what had been said simultaneously. As this process was time-consuming, alternate methods were tried, including transcribing tools such as Google Voice Recognition and transcription apps. In these cases, bulks of texts were generated automatically, and the researchers removed or changed text that had been misinterpreted by the transcribing tools, and added what

had been disregarded completely. This process proved to be equally or more time-consuming than the original process, and was thus abandoned for the transcription of subsequent interviews.

For the first few interviews, the transcribing followed the logic of simply writing what had been said during the interview, word for word. The primary reason for transcribing in this fashion was to get a transcription as accurate as possible, to later be able to quote the interviewee when needed. However, this appeared to be a cumbersome and overly time-consuming process, especially since the interviewers and interviewees intermittently had a tendency to speak in an incoherent way. Although this was likely due to the abstract and unexplored topics under discussion and therefore nothing peculiar, it nevertheless necessitated for the researchers to change transcribing style. After a few interviews, the transcribing process was therefore focused on formulating the essence of, rather than exactly, what had been said. Consequently, words without much meaning, such as informal words that are characteristic for spoken language, were disregarded. Also, longer paragraphs were occasionally paraphrased, when this could be done without much loss of information richness.

#### **3.4.1 In-depth Analysis**

The in-depth analysis was conducted in three separate rounds, in the same fashion as the data collection and transcription. This means that hypotheses and theories arose in between each interview session, and were disregarded or further investigated based on the result from subsequent interviews. This iterative process of collecting and analyzing data helped the researchers to develop their understanding of the context surrounding each case firm as the interview process proceeded. It also provided an opportunity to adjust the interview template in between the interview rounds, allowing for data gathering based on insights from analyzing data from previous interviews.

The process of analyzing the data in each of the three analysis rounds followed the process of grounded analysis put forward by Saldaña (2009). Saldaña (2009) explains the process of conducting grounded analysis as somewhat linear, where raw data is translated into code, which is bundled into categories, which are in turn linked together and form themes, that in all become a theory. Easterby-Smith et al. (2015) add to this view that the process is in fact much more iterative, with jumps back and forth between raw data, codes, categories, themes and theories.

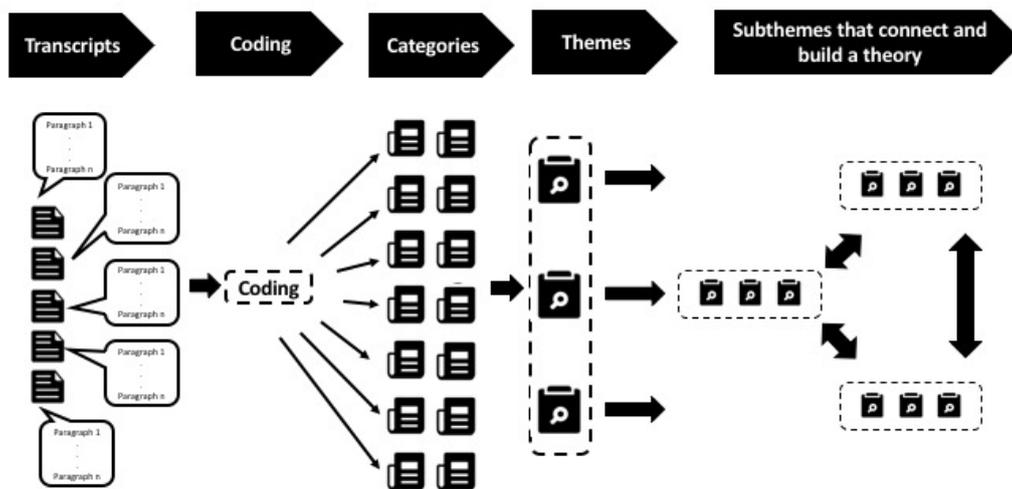
Following the idea of Easterby-Smith et al. (2015) and Saldaña (2009), this study started off by using the transcriptions as a foundation to start the analysis of the raw data that had been collected from the interviews. All transcriptions from the respective interview rounds were scrutinized, one by one, with the purpose of finding insights from what had been said during the interviews. All quotations, except ones that clearly were irrelevant and not linked to the research question, were interpreted, mostly one paragraph at a time, and labeled using short phrased codes. The codes were not predefined but named based on the content in each paragraph or coherent section. Subsequent quotations gave rise to new codes or, when applicable, were labeled with existing ones.

Once this process was finished for the first analysis round, the quotations had been divided into about 20 different categories, each with a different code name. In this study, each of these categories were represented by a document, in which they were filled with one or more quotes labeled with the same code. The categories were then bundled together on a higher level of abstraction into different themes. The themes were, similarly to the categories, not predefined, but in contrast to the categories, they were not only constructed based on content, but also guided by the research question so that there would be an apparent connection between the themes and the research question.

The rationale behind classifying the data into themes of a high level of abstraction was to allow for comparison in between the different firms. This was achieved in two steps through compiling the data in a matrix in excel, with themes on the horizontal, and the case firms on the vertical axis. In the first step, information about the themes from the respective firms was entered into each corresponding cell of the matrix. In the second step, the various pieces of information within the same theme were processed, resulting in sub-themes within the different themes. These sub-themes were then transferred to a new excel matrix, with the sub-themes on the horizontal axis, and the firms once again on the vertical. The cells, corresponding to one firm and one sub-theme, were then filled with color if the matching company could be linked to the respective sub-theme. This way of organizing the data significantly increased the lucidity and transparency of the data, and simplified the process of trying to identify similarities and disparities within the data.

The final step of the in-depth data analysis constituted sessions of discussion, or internal workshops, in which the compiled data, along with whiteboards and post-it-notes, were used as a base for discussion about interesting patterns, or the lack of them, in the data. These sessions were also used to identify shortcomings in the data.

The second and third analytic rounds followed the same structure as the first, with the difference that they built on top of what was already found in the first round. While the second and third round contained their share of transcription, and coding of new incoming data, the old concepts produced in prior rounds were taken into consideration. This allowed a firm-wise comparison on three levels, one for each round, and also a deeper and coherent dive into each individual case. Ultimately, these rounds resulted in patterns, both within cases but also cross-cases. Finally, in the third and last analytic round, the concepts were linked together to form a theory. The theory commenced as an explanation to why these patterns that were seen in the data arose. The explanation was not only found within the data, but much as well thanks to prior theory and insights on the concepts of services and PSSs. To understand how the analytic process was designed, a visual representation of it is presented in Figure 3.1.



**Figure 3.1:** The analytic process. Firstly, the transcripts were examined and each small coherent segment coded into a category. Secondly, the categories were looked into, resulting in that three major themes evolved. Within each theme, sub-themes were identified. The sub-themes from the different themes were found to sometimes relate to each other, which sparked a theory about the connection between the sub-themes. This process was not as linear as this figure suggests; instead, the process included constant jumps back and forth between the raw data, codes, categories, themes and theory.

### 3.5 Research Quality

Quality in qualitative case study research can be assessed based on how well it complies to four aspects of the research design (Gibbert, Ruigrok, & Wicki, 2008). Firstly, the research has to be valid, that is, it has to prove what it actually sets out to prove (Gibbert et al., 2008). This is denoted as construct validity by Gibbert et al. (2008). Secondly, it should be made sure that there are logical links between the conclusions drawn and the variables present, which is called internal validity by Gibbert et al. (2008). The third dimension is referred to by Gibbert et al. (2008) as reliability, meaning that the study has to be reliable. It stems from that other scholars must be able to trust the author, in that the data and results really are what they are claimed to be (Gibbert et al., 2008). Therefore, the research should also be repeatable, so that another scholar may test the conclusions and confirm or deter whether it is true or not. However, replicability is seldom possible in case study research as much of the data gathered in the original study is time dependant and will not be the same if gathered in the same fashion at another point in time. Fourth, the research should be generalizable, which means that the conclusions drawn can be transferred to another context (Eisenhardt & Graebner, 2007). Gibbert et al. (2008) use the term external validity to describe generalizability.

Another, but similar view is taken by Eisenhardt (1989), who states in her paper that robust theory should be parsimonious, testable, and logically coherent.

To achieve internal validity, this report used both within case and cross-case theory building and theory verification, to make sure that the theory was supported throughout all the cases taking part in the study and logically coherent with the data. Furthermore, this report used an iterative style of theory building, which means that the theory emerging from the first interview round was tested and honed during the subsequent interview rounds. This also allowed the researchers to test and validate the theory with the interviewees. Construct validity was mainly obtained through a selection of case firms in which a servitization process was currently taking place. This complies with the notion of the phenomenon being 'transparent observable' in the selected firms, which enables the paper to study the phenomenon it sets out to study. Moreover, the research question permeated the entire research implementation in such a manner that the entire design, from case selection to interview template construction to data analysis, were influenced by the research question, which was constantly overarching.

The reliability aspect of the study was partly taken into consideration through an adoption of a structured and well-defined data collection process. It was also partly incorporated in the presentation of the study, that is, in this report. Here it is important that the implementation of the study is transparent to the reader, who needs to be able to understand how the data was collected, and how that could have impacted the results. Furthermore, it is also important that a clear and transparent transition from the results to the conclusion is presented. That is why the data is presented firm-wise, and not in an aggregated fashion. This shows the reader both how the theory is valid within the data, but also that the results and conclusions are reliable. A disclaimer is though that this report has anonymized all the partaking case firms. This counters some of the transparency within the report, especially considering the results.

Finally, this report achieves generalizability to some degree through adopting a theory that is parsimonious. In accordance to Eisenhardt (1989), a parsimonious theory is, thanks to its simplicity and less idiosyncratic detail, superior to theories built up from single case studies. Moreover, through containing multiple cases this study design allows for a cross-case study comparison of the theory. This has been completed and thus promotes a wider generalizability, as the theory is valid for all the cases within the study. With that being said, the theory of this report possess a limitation to generalizability as well. All case firms are selected from a relatively small geographical region, and from a country where PSSs, according to Baines et al. (2007), are accepted to a much larger degree than in the world in general. Moreover, the sample was not purely theoretically collected, as it was selected in collaboration with the consultancy firm. While being convenient for the study and allowing more resources to be spent interviewing and processing the data, this sample was also more likely to be biased. As such, the sampling method can have impacted the ability for findings of this study to be generalized.



# 4

## Results

In this chapter, the results from the conducted interviews are presented. The results consist of descriptions of the respective case firm's PSSs along with the inherent drivers of these PSSs and the obstacles that they invoke. This includes both PSSs that are up-and-running and PSSs that are under development. Whilst this section includes a comprehensive presentation of the case firms' PSSs, it does not cover every single service from all of the case firms. Instead, it covers the services that the interviewees found most significant and, consequently, were most profoundly discussed during the interviews. As a consequence, some firms' more peripheral services are neglected.

The results are presented firm by firm to facilitate the analysis of the data. Following each firm and respective data presentation, a summarizing table is given. After the data from all firms have been presented, a compilation of all data is provided in Table 4.6

### 4.1 Case Firm A - Construction Equipment Manufacturer

Case firm A is an equipment manufacturer in the construction industry. Firm A's customers consist of wholesalers and retailers, who further distribute the products to the end user. Firm A does not sell any products directly to the users of its products.

#### 4.1.1 Servitization Drivers

Firm A currently has two types of services up-and-running that are sold together with their products. First of all, they offer a so called personalized service, meaning that firm A adds a personalized feature, chosen by the customer, to its measuring tools. In other words, each customer can get products with their personal stamp on. This service is aimed towards firm A's direct customers – wholesalers and retailers. The main driver for firm A to offering this service is to add distinguishable value to the product in an attempt to differentiate their measuring tools from competitors'. One respondent explained:

The main driving force would be what you mentioned earlier: it is about price. It is a commodity. It is mature. How do we protect ourselves? [...] It is about wrapping the product in services. It is not so much about pure services. [...] Instead, we can add services around our products, either for our customers, or for the end users.

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Essentially, this quote stresses how Firm A has added a simple product-oriented personalized service that increases the attractiveness of their measuring tools and thus the customers' incentive for buying the product. The value extracted from the service for firm A is, hence, mainly in the form of increased revenues from more product sales. Additionally, offering a more attractive product helps firm A avoid being involved in price based competition from low-price manufacturers.

Firm A's second type of service that they have up-and-running is a security inspection of their equipment. This service is offered to the end user of the equipment, and means that firm A goes out to the end users of their equipment and inspects whether the equipment maintains a quality in accordance with security regulations, or if it needs to be repaired or replaced. The security inspection aims, like the personalized service, to help differentiate the products. Again, this is primarily done in an attempt to increase the product sales, as illustrated by another respondent from firm A:

You can buy an inspection from us that is quite affordable in that it is not priced high in relation to our costs for providing it. It is rather easy to see that it is cheaper to let us do it in your place, because we have the competency. It also leads us to know how many [products] you should repair or replace with new ones. That gives data for a quotation to the closest retailer, who then sells our [products]. In doing so, we increase our sales.

It is clear from this quote that the respondent stresses that the main driver behind their security inspection is to facilitate their product sales, despite the fact that they charge for this service. This is primarily accentuated by the low pricing of this service, indicating that the increased product sales that the service enables for is more important than the financial surplus from the service in itself for the firm.

Firm A has, in addition to the up-and-running services, several ideas for potential services to add to its offering in the future, all of which could be considered to be in the idea phase of development. These include, for instance, product-use education, project tailored equipment sets and equipment leasing. The former one of these services is, similarly to the up-and-running services, driven by opportunities to increase sales of existing products. The latter two, however, are services that have no obvious synergy with equipment sales. For example, project tailored equipment sets is a service that would bundle together equipment from firm A with complementary products from other firms, into a set of equipment and products needed to finish a specific and predetermined project. These sets would be delivered to the project site, and thus aimed towards the end user of the products. The benefits would largely be found at the customers' end, who significantly would reduce costs related to planning, administering and purchasing all components needed for the project, allowing them to focus on what they know best: carrying out the project. Equipment leasing, simply meaning that the end user would rent the equipment from firm A instead of buying it from a wholesaler or retailer, would, similarly to the project tailored equipment sets, help reducing the cost for customers as they do not need to find use for the equipment during the whole life-cycle.

### 4.1.2 Servitization Obstacles

None of the respondents from firm A were able to pinpoint any major obstacles related to the services that are up-and-running nor to the service product-use education. However, in relation to the latter two services mentioned above – project tailored equipment sets and equipment leasing – firm A finds itself struggling with the common obstacle of logistical issues, as brought forward and explained by one respondent:

[To provide the project tailored sets] we would be interested in expanding our business through partnerships or acquisitions. [...] We could also include competitors when needed, if we were to take a holistic responsibility and provide our end customers with what they want. At the same time, it is far-fetched, to compete purely logistically with our own customers. It is within this area that they thrive, and grow the most. This is what they do; the right stuff, at the right time, in the best way. It is their business model, their reason to exist. That is not easy to compete with.

All three respondents from firm A agreed upon that the major obstacle for developing and providing most of their service-ideas is the logistic structure that is inherent in their current business model, and incorporated in the entire industry. For a potential leasing service, the respondents highlighted the difficulty to facilitate the renting process. For the project tailored equipment sets, the main problem was instead the inability to charge the customer for the service. The main reason for these obstacles is that Firm A is unable to provide any services through their first tier customers, who are in an aggregated and powerful position. However, firm A finds it far-fetched to effectively bypass their customers and provide services or PSSs through direct sales to the end user, as it would risk them loosing their major clients.

**Table 4.1:** Servitization drivers and obstacles for firm A

	Type of service	Drivers	Obstacles
<i>Up-and-running services</i>	Personalized service	Increased product sales	None
	Product security inspection	Increased product sales	None
<i>Services under development</i>	Product-use education	Increased product sales	None
	Project tailored equipment sets	Decreased costs for end customers	No channel to receive payment from end customer
	Product leasing	Decreased costs for end customers	No channel to facilitate the renting process

### 4.2 Case Firm B - Power Solutions Provider

Case firm B is a supplier of engines and complete power solutions. Their customers include OEMs (Original Equipment Manufacturers), who integrate firm B's power solutions in their products; wholesalers and retailers, who sell firm B's products further; and dealers who are business partners both for engine sales but also with a main responsibility of servicing and repairing firm B's products. Firm B does not sell any products directly to the user of the final application.

#### 4.2.1 Servitization Drivers

Firm B currently provides three types of services, two of which target the end user, and one of which targets dealers. The end-user-oriented services include support services and extended warranty. The support services allow the end customers to call firm B if they have any problems with their products and need to receive help and advice. The extended warranty service provides the end customer with a full coverage package if the products break down after the initial warranty has expired. The service provided to dealers is education about firm B's products. This education is a necessity for the dealer to be certified by firm B. The driver behind each of these services is the same, namely to uphold a competitive offering to be able to sell the products. In the case of the extended warranty service, one respondent proclaimed:

It is driven by competition rather than the end value for us and the end user. Well, it has a value for the end customer to some extent, but that was not the inherent driver behind it. The driver was that our competitors offer this and we need it to be able to sell our products.

Furthermore, firm B has recently set up a new division that, among other things, is in charge of developing and launching two new services. These services have similar characteristics as they are both enabled through new technology that allows firm B to monitor their products. One of the services is a remote diagnostics service aiming to simplify how a problem experienced by the end user should be tackled. This service allows firm B to provide end customers with direction of what to do and where to go if a problem with firm B's products arises. In many instances, this service helps clients to avoiding costs, as they do not have to bring the product into diagnostics at a dealer if the problem has a simple fix.

The main driver behind the remote diagnostics service is that it allows for reduced cost and more efficient operations for firm B. More specifically, this is achieved through that firm B can gather data about the end user and how they use the product, which in turn can be used in the following ways: (1) to reduce direct warranty costs through avoiding having to either send people out to fix the problem or bringing the product into repair; and (2) to place dealers and allocate inventory in a strategically optimal way. This is exemplified by one of the respondents:

Above all it is about warranty. It can be quite large amounts of money lost in warranty issues. Being able to reduce these cases by being proactive and by

being able to identify problems. [...] Also on the marketing side, by knowing where the products are, we also know where we need to have dealers and where we need to have spare parts. In turn, that means reduced inventory, or better availability of inventory at the right locations. Those are examples of things that have been successful at our sister company.

The other new service is a maintenance planning service. This service allows dealers to contact the end customers when their maintenance service is due, which effectively reduces the risk for unnecessary breakdowns and increases the frequency of visits to dealers certified by firm B. The primary driver behind the maintenance planning service is that it aims to increase the number of maintenance occasions to in turn increase the sales of spare parts, as explained by one respondent from firm B:

That is really the main point, that you will increase the frequency of the different service occasions. If the end users are supposed to service every 500th hour, they are likely to stretch it. The dealers do not know when the customer have used the equipment for 500 hours and instead the user will barge in when they have used it for 600-700 hours. If you instead can proactively inform: "Now it's time for service, shall we plan it for next week?", then you reduce the interval between each service and hence generate more service opportunities. This in turn allows us to sell more spare parts to the dealer.

Furthermore, both the maintenance planning service and the remote diagnostics service can generate values stemming from reduced costs in the customers' businesses, for example reducing penalty costs forced onto them after a breakdown of equipment. One respondent from firm B elaborates:

The customer benefits from that the product is up-and-running at all times. In the case of commercial vehicles, it is very clear. I mean, they loose money if they can't deliver according to their contracts.

Finally, firm B also have plans to incorporate leasing services into their business model. More explicitly, they are looking at the possibilities to provide pay-by-the-hour services targeting the end users of their products, in which the customer pays solely for the time they use. In practise, the customer would pay a fixed price that represents a minimum number of hours, and then pay a floating price in proportion to how much they use the product. The main driver for this service is possible savings for end customers in terms of reduced downtime of equipment, that firm B would charge for according to above.

#### 4.2.2 Servitization Obstacles

The up-and-running services have, according to our respondents not posed a lot of major obstacles to firm B. While they argue for that the implementations of these services probably were not entirely frictionless, they have a hard time to pinpoint specific obstacles for these services. Anyhow, these services have been up-and-running for such a long time that most obstacles have been solved over time. One obstacle that nevertheless still causes concern in relation to the extended warranty service and the

support services is that there is ambiguousness as to who is responsible for the development of these services in-house. More specifically, there is no entity in firm B taking full responsibility for the service and the development of it.

However, the services under development are associated with more complicated obstacles. For the remote diagnostics and maintenance planning services respectively, firm B finds itself struggling to realize the type of value explained above – values stemming from reduced costs in the customers' businesses – as they are unable to capture this value. This difficulty is further elaborated by one respondent:

They [the dealers] make money from the work, the hours. For us it is the spare parts that give direct revenue. [...] There is a clear correlation between them. Besides, our end customers are [the dealer's] direct customers. If these end customers are loyal to us, then it is obviously positive for our dealers. However, there have been discussions internally like: assume that you get paid directly from an end customer for a service and the payment is transferred through a dealer. Which dealer is getting the share? The one that is closest [to the customer]? How will you deal with the revenue sharing?

Furthermore, the respondents from firm B were also concerned with the complications to motivate these services, because they have difficulties to fully formulate the value. Put differently, they struggle with building business cases on them. Observe how one respondent puts it:

[...] when you need to install a platform only to [provide services] that you do not have, then you need a very heavy investment only to provide the first service. There we have difficulties, a little at least, to circumvent the dilemma, because we cannot fully formulate the value of the service. We don't realize how it will work out. Even if the business case would work out in the long run, we still have the mindset that the first service needs to cover the whole investment.

Concerning the development of the pay-by-the-hour service, it has been associated with obstacles. One representative from firm B claims that they are facing problems concerning how to handle the ownership of the equipment:

I would say that we are hindered by ourselves, that we are a tier-1 supplier and do not deliver a whole concept to the end customer. In some cases there is no problem when we are selling another spare part or when we are selling a new feature. Some things are directly aimed towards end customers today, that do not pose any difficulties. But in this case it becomes problematic, by the nature of our product being integrated into something. Because, then you cannot switch the ownership solely for this part [of the solution]. In the sense that we own [our product] and someone else owns the rest of the integrated concept.

In this quote, the respondent emphasizes the obstacles firm B faces because of their position in the value chain. She stresses that since the product is integrated into their

tier-1 customers' products, a renting service such as the "by-the-hour" PSS becomes very difficult, even close to practically unfeasible, to provide for a tier-2 customer.

Finally, all services that firm B intends to get direct revenue from are associated with problems due to their position in the value chain, as proclaimed by one respondent:

We have a problem solving [direct payment] since we do not have any direct revenue stream from end users today. We do not have that relation, but it rather goes through dealers.

**Table 4.2:** Servitization drivers and obstacles for firm B

	Type of service	Drivers	Obstacles
<i>Up-and-running services</i>	Product-use education	Necessity to sell products	None
	Extended warranty	Necessity to sell products	No one responsible for the service in-house
	Support services	Necessity to sell products	No one responsible for the service in-house
<i>Services under development</i>	Remote diagnostics	Reduced internal cost; Decreased cost for customer	No channel to receive payment from end customer; Difficult to build a business case
	Maintenance planning	Increased sales of spare parts	No channel to receive payment from end customer; Difficult to build a business case
	Product leasing	Decreased downtime cost for customer	Product is integrated in 1st-tier customers' products and the ownership cannot be separated

### 4.3 Case Firm C - Provider of Manufacturing Equipment

Case firm C is a manufacturer and provider of additive manufacturing equipment and corresponding input material used in industrial manufacturing. The firm mainly sells its products directly to the end user of the equipment.

#### 4.3.1 Servitization Drivers

Firm C has two types of services up-and-running: product-use education and maintenance on sold products. The product-use education is a service offered to customers who have bought products from firm C, and it aims to educate them in how to use the products most effectively. The main driver behind the product-use education service is to help the customers realize the advantageous properties of the technology. As firm C's products are highly technical, the customers often lack the skills to use them properly. Thus, product-use education is a necessity to create a valid business case for the customers and, consequently, needed to facilitate product sales for firm C.

Similarly, the customers often lack the skills to maintain and troubleshoot the equipment themselves, which makes the maintenance service a requisite to be able to sell the product. Furthermore, the maintenance service exist for a second reason: firm C is also selling input material, which is necessary for the products to function properly. To keep up the sales of this material, firm C is driven to keep their customers machines running at all times. One respondent explains the rationale for offering maintenance on products:

It is crucial to us. We need machines that are running high at the customers' sites. Partly because they have to stay satisfied, but also because we are selling [the input material] to them, and if they do not manufacture anything, they won't buy any [input material]. There is a direct link to revenue there.

Additionally, firm C has two services that are under development. One of these services is relatively close to being launched and is referred to as a validation service. This service means that firm C uses its experience of its technology to validate the customer's process in which firm C's product is being used, so that the process meets certain requirements and regulations. The validation service mainly targets current customers having bought firm C's equipment. The main value that this service generates is reduced time and effort to achieve a validated process on the customer's end. This validation of the process is needed to be allowed to produce certain products with firm C's equipment. In other words, time to market for the customer is reduced. Note for example one respondent:

If you look at the value for the client, it is about getting their [products] as quick as possible to the market. Because it is a quite long and complicated process, especially for small and medium sized companies who do not possess the competency themselves. It is about helping them to get to the market faster and with more quality, which leads to earlier revenues. It is big time-saver for them, and therefore also a lot of money.

The respondent evidently stresses the time aspect that generates value for the customer. Most demonstrably, this can be realized on the revenue side due to earlier revenues, but also on the cost side as it is cheaper for the customers to get help from firm C with validating their process than to do it themselves. Hence, this value is something that customers generally are prepared to pay for.

The second service under development is referred to as an optimization service. This service helps customers who want to optimize the output from their manufacturing equipment bought from firm C. In other words, it is solely focused on improving customers' processes. The main driver for this service is, as such, to provide the customers with better output from their processes at a lower cost. Observe the following quote:

Take our client in the UK [as an example], who wants to manufacture this part [...]. We have already helped them for free, because we have had a long collaboration with them. We devoted a number of hours to help them with optimizing the process for manufacturing the parts in batches of five. But now they want to optimize it for 10, 12 or 15 parts. Then we told them that it is time to have a discussion about payment, otherwise you will have to continue working with 5. These are discussions currently undergoing, but there was really no hard feelings due to us wanting to get paid for this service. Instead, they realize that we cannot give away plenty of working hours.

There are two takeaways from this quote. Firstly, the service had previously been provided for free to loyal customers. Secondly, firm C has to receive a direct payment for this service in order to capitalize on it. It has barely any other means of capturing the value of the service.

### 4.3.2 Servitization Obstacles

Firm C is facing a few obstacles concerning the development of services. Firstly, there is no real connection put in place between the service developers and the entity that is taking responsibility for the service after it has been launched. As such, this obstacle is common for all of firm C's services, but something that the firm largely has managed to circumvent so far. One respondent frames it as an administrative unit that needs to be set up when firm C has implemented and started to sell a certain number of services, as explained in the following quote:

There is essentially no one in charge of handling orders, there is no administration surrounding services. It might not be an obstacle, but it is something that we need to set up when we reach a certain number of offered services.

Secondly, firm C finds itself struggling with that their sales force is used to sell products rather than services, which according to one respondent can be a challenge for the firm:

One obstacle – and I can't resist being colored by my experience from my

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previous workplace, because this obstacle there as well – is that we have a sales force that is not used to selling services. Or more specifically, product-related services. So that is a big obstacle.

Furthermore, firm C has another obstacle in relation to their validation service and optimization service. This obstacle is concerned with that the firm finds it difficult to decide what to include in these services. Firm C wants to define these services into something easily understood and take a fixed price for them. Concerning the optimization service, they claim that it can be hard to distinguish between what is part of this service, and what should be included in the maintenance agreement.

**Table 4.3:** Servitization drivers and obstacles for firm C

	Type of service	Drivers	Obstacles
<i>Up-and-running services</i>	Product-use education	Necessity to sell products; Facilitate product sales	Lack of administrative unit; No experience in selling services
	Maintenance	Necessity to sell products; Increased sales of input material	Lack of administrative unit; No experience in selling services
<i>Services under development</i>	Validation service	Increased sales and reduced time-to-market for customer, captured through direct payment	Lack of administrative unit; Difficult to define what should be included in the service; No experience in selling services
	Optimization service	Increased efficiency in customers' processes, captured through direct payment	Lack of administrative unit; Difficult to define what should be included in the service; No experience in selling services

## 4.4 Case Firm D - High-tech Software Integrator

Case firm D provides high technology products that are a combination of software and hardware used to validate different systems. Firm D's customers comprise manufacturers, testers and users of systems, and firm D's products are mainly used to validate the functions of these systems. As such, firm D primarily sells their products to the end user.

### 4.4.1 Servitization Drivers

Firm D provides three types of services: support, which includes maintenance on sold products; installation; and product-use education. These services exist mainly because the products are in such an early phase of the technology life-cycle so that they seldomly are user-friendly enough to be used without support, installation and maintenance from the manufactures. Accordingly, firm D needs to offer these services together with their products for the products to be viable to sell.

Additionally, firm D is in the idea phase of developing a validation service. The service would be a way for firm D to re-package their products into a service, meaning that the customer would not tell firm D what products they want, but instead explain what results they wish to achieve. As such, firm D would evaluate the respective customer's systems and identify what kind of product offering they would need to achieve their desired result. In other words, the offering would be tailor-made in accordance with each customer's specific needs. This is being elaborated by our respondent from firm D:

In reality it works like this: our customers ask about the wrong things. They say that they want our [product], but in reality what they want is a service where we validate their system. That is why I say that it is a long process. When the customers come to me and say that they want this as a ground truth, it isn't a ground truth. In reality, they should ask: "Can you help us to validate our system inside of our [products] that will be produced in 2020?" They don't ask that, and when they don't ask about that service it is hard to drive through the change. [Our technology] is still very new, it is a new market, in which you have to drive change, but we are not that big.

In the quote, it can be seen that our respondent has figured out what the needs of the customers are, and how firms D's products are really used. Therefore, this service is brought forward to align firm D's offering with the needs of their clients to fully capture the inherent value in firm D's products:

Turning to the [customer industry], they do these data collection sessions, where they run the system for 2000 hours. They have put one engineer in charge and made sure plenty of people are attending. If we can secure this process, that the 2000 hours they invest, they also get 2000 hours of data. That nothing is lost along they way, which is a big risk in all of these. If we can secure that to 200 %, then it is also worth some extra cash. Because then,

they do not have to re-do this recording, which in turn may prolong the different product-phases and all other vital stuff in the [customers' industry]. There is a possibility to add an add-on service that they are willing to pay for.

The main takeaway from this quotation is that the value that drives the development of this service is the reduction of testing costs and the shortening of the time to market for the customers. This value would then be captured through direct payment from the customers, as there is no evident way for firm D to realize the value from this service internally.

### 4.4.2 Servitization Obstacles

When developing services, firm D is primarily struggling with two kinds of obstacles. These obstacles are common for all of the services in firm D. Firstly, firm D's organization is not yet used to selling services, and still lack some of the competency required to sell them effectively. Our respondent from firm C explains:

It is about competency – we need to build up competency to be able to do these things. It is about acquiring the right people, the people who are good at handling customers and explain the services in a way that is easily understood.

Secondly, firm D finds itself struggling with the difficulty to decide and define what to be included in their services, as elaborated by the respondent:

We have some difficulties in deciding what to include in the services. We send someone to the customer and when we are done the customer is satisfied. So it is difficult to define a service, it is easier to only deliver hardware and follow-up and verify that it is working as expected.

Firm D also faces another couple of obstacles related to their proposed validation service, the first one being the customers' cultural immaturity, meaning that customers are not able to express their needs accurately, which makes it harder for firm D to pinpoint and build a business case around this service. The second obstacle is related to the lack of competency as discussed previously, but extends into a difficulty concerning the responsibility of the service internally: which entity within the firm will be in charge? Note how the respondent formulates it:

It is a competency related question: is it supposed to be the responsibility of the department that faces the customer and performs installations? They are very good at it. Or should it be on the R&D-department? Because the R&D-department is also knowledgeable about the product. You inevitably need to grow one part, because it is quite resource-heavy to provide services. It is also quite hard to forecast. That is why I feel like the first new services needs to be clearly defined, because it is quite expensive to make this investment on staff and competency.

**Table 4.4:** Servitization drivers and obstacles for firm D

	<b>Type of service</b>	<b>Drivers</b>	<b>Obstacles</b>
<i>Up-and-running services</i>	Support (including maintenance)	Necessity to sell products	No experience in selling services; Difficult to define what should be included in the service
	Installation	Necessity to sell products	No experience in selling services; Difficult to define what should be included in the service
	Product-use education	Necessity to sell products	No experience in selling services; Difficult to define what should be included in the service
<i>Services under development</i>	Validation service	Decreased cost for customer and reduced time to market for customer, captured through direct payment	No experience in selling services; Difficult to define what should be included in the service; Difficult to build a business case; No one responsible for the service in-house

## 4.5 Case Firm E - Provider of Disposable Products in the Medical Industry

Case firm E is a manufacturer and provider of professional disposable products that are used in the medical industry. Its customers are mainly users of the equipment, but firm E does also partly provide their products to retailers.

### 4.5.1 Servitization Drivers

Firm E has two services up-and-running. One is a product-use education service, in which firm E educates its end users in how to use their products. For instance, firm E educates municipalities, which buy the products through a retailer, with this education. This service is most commonly carried out during major events, but can also be found online on firm E's product portal. This service exist because it is a necessity in order to sell the products. It is mandatory by regulation, which stipulate that product education must be carried out, as explained by one respondent:

It is a typical service that has always been there, and it is an extra requirement when we get procurement deals, for instance. We have an obligation to provide product education so that our products will be used correctly. Therefore, it is part of our implementation model to offer different kinds of education.

As illustrated by this quote, firm E is carrying out this service simply because they have to, and as a consequence, it has become part of their implementation model of new products. It is necessary to being able to provide their products.

The other service that firm E has up-and-running is referred to as a packaging service. This service comprises a tailor-made set sold to the customer, in which the customer can choose what combination of products they want, both from firm E and from other related firms that firm E has partnerships with. Firm E then manufactures and procures the necessary products for the set and then packages it so that each set can be used for one specific task, i.e. the products must be packaged in a specific order to optimize the process of carrying out the task for the customer. One respondent describes:

We sell a service in which the customer gets all the components they need for a [specific task] packaged in a set. It can be our components, but it might as well be components from other companies. We put all this together. Essentially what we do is that we transform a product into a service. Because we replace what the customer would have to do otherwise: buying all the components, receiving all the components, paying all the suppliers, and finally packaging everything together for each task. [...] Now you get this delivered as a service.

Clearly, the main value created from this service is the increased operational efficiency at the customer's end, such as decreased labour costs in un-packaging and purchasing,

as well as time saved, through having everything carried out by firm E. This is elaborated by one respondent at firm E:

This means that they can make several cost savings. Would they have had these components laying separately in stock, they would not know whether they have them or not, and they also have to order many different components that someone needs to go and collect from the inventory, and later make ready for the task. Then you most likely need a lot of staff, so that all procedures are done according to [requirements]. That is why we came up with this set that helps you prepare the task, it leads to that the task can be initiated much quicker, which in turn could allow you to perform perhaps one more task per day, depending on your frequency. Consequently, they could free time to potentially be used to take care of clients, or reduce overtime.

This value is captured by firm E in the sense that they can obtain a strong, differentiated position in the market, which allows for more products sold, but more importantly, a premium price for the products can be charged.

Besides the up-and-running services, Firm E is actively developing two new services: an audit service, and a standardization service enabled by a digital platform, hereafter named 'digital platform'. The audit service is meant to provide clients buying firm E's products an insight into whether they are using the products properly and to what extent they are supposed to be used. One of our respondents elaborates:

We have been able to prove, in a randomized study, that our [products] can reduce costs of [a certain side-effect] by up to 88 %. [...] If a [client of our customers] get affected by [this side-effect], our customers must either pay penalty fees or they have to pay for resolving the problem, which can take up to several years, and be quite expensive. [...] Therefore we have added a service as we see that: "Okay, these customers have procured our products, they have established a protocol, but we notice that not everyone is using it. Because they have this many customers and we are selling this many products, most likely they are not complying with the protocol, and that becomes a risk for them". We gladly help them make an audit."

The value obtained from this service is not captured through a direct payment from the customers. Instead, firm E sees a link between the compliance of protocol on the customers' side and increased sales of their own products. In that sense it is a win-win situation, where both firm E and the customer gains from the customer complying to the protocol. The same respondent describes:

They do not even have to pay us for this. It is a service that we carry out, because in the end we want to optimize the usage, the penetration of our products at this [client's site]. We already have a contract with these customers [to provide them with products], and then it is merely about how we make sure that... We have sold the products to you so that you will get a better outcome, you should decrease the number of [this side-effect] and thus

reduce the risk for getting financial penalties.

The second new service under development by firm E is the digital platform. Here, firm E is partnering up with an existing digital platform provider. Firm E contributes to the partnership by adding deep knowledge within the medical industry to the existing service, which was previously solely provided by the platform provider. The service is meant to standardize the customers' internal processes, in an effort to ensure both that they perform them in a better way, but also learn how they best are done. One respondent explains the rationale for the service:

What drives the cost is the time it takes for [our customers] using [our products on their clients]. If you can reduce that cost [i.e. the time] you can really save money. That is why we believe that a combination of high quality [products] and efficient professional education that changes behaviour - which makes you able to know what to look for, what to ask for, so that you don't have to take time to replace [the product] as frequently - is what in the end will give you the real cost-saving.

The value created from this service is threefold: Firstly, it reduces the cost significantly for the customers if they can optimize their usage of their time, which is directly captured by firm E by receiving payment for the service. Secondly, it generates possibilities for firm E to promote its products on the basis of what information is being entered into the digital platform, i.e. a targeted marketing opportunity for firm E to increase sales. Thirdly, it also generates internal values for firm E, as they, with the help of the platform, can gather usage data and consequently improve their products more effectively. Note how our respondent puts it:

It will pop up a recommendation on what product they should use depending on what phase their client's problem is in. If it is an existing customer to us, we of course want our brand to pop up. But to stay trustworthy, it has to be product neutral to some extent. If it is a customer who is using other products, we will still offer this solution. But we won't sell our products then, instead we only get sales from the actual service. What we do get access to, though, is the data surrounding the customers' clients and their progress, but also competitors products and how they work. This will be an extremely important source of information for us, for our R&D.

### 4.5.2 Servitization Obstacles

One obstacle firm E is up against when developing the digital platform PSS is the lack of technology competency. The firm has barely been working with digital technology previously, and to integrate their system into a partners application requires that firm E knows the basis of the technology, to fully being able to take advantage of the partnership and the synergies arising from it. Note how one respondent framed it after being asked what obstacles she saw to deliver the digital-enabled standardization PSS:

Capabilities. This is our first move into digitization. [Our new recruit] is the first one who is working with it. We have perhaps another guy at IT who

possess the competencies. That is why we are building competency within digitization. That is furthermore why we are partnering up with this company, because we do not have that competency ourselves. Software is not our core competency; we develop products.

Another obstacle firm E faces is the procurement process of their products. The respondents expressed the problems as the inability to sell a service-component to a product in a public procurement world, where compliance to specified requirements and price matters, rather than actual value provided from an offering. The reason behind the miss-match, and perhaps irrational customer behavior, is twofold. First, the procurement officers are often governed in a different way than the users. While the user may value quality, the procurement officers, on the other hand are often governed to strike the best deals. Secondly, the public procurement process itself form a structure where the customers may only select suppliers by pre-specifying what they need. Consequently, it is much easier for them to specify concrete and measurable things such as what properties the product should have rather than what the actual outcome from using the product will be. However, while mentioning this as an ongoing obstacle to roll out PSSs, one respondent continued by explaining that they had succeeded to convince customers in some instances.

**Table 4.5:** Servitization drivers and obstacles for firm E

	Type of service	Drivers	Obstacles
<i>Up-and-running services</i>	Product-use education	Necessity to sell products	Difficult to sell in public procurement
	Packaging service	Lower costs and time reduction for carrying our process for customer, which is captured by a premium price on product	Difficult to sell in public procurement
<i>Services under development</i>	Audit service	Increased sales of existing products	None
	Digital platform	Increase sales for firm E; Improved R&D; Decreased costs for customers, which is captured to direct payment	Lack of technical skills

#### 4. Results

**Table 4.6:** Compilation of all partaking firms' services, servitization drivers and servitization obstacles

	Firm A	Firm B	Firm C	Firm D	Firm E	
<i>Types of services</i>	Maintenance		X	X		
	Support		X	X		
	Installation				X	
	Product-use education	X	X	X	X	X
	Validation service			X	X	
	Optimization service			X		
	Packaging service					X
	Remote diagnostics		X			
	Maintenance planning		X			
	Audit service					X
	Product leasing	X	X			
	Extended warranty		X			
	Personalized service	X				
	Product security inspection	X				
	Project tailored equipment sets	X				
	Digital platform					X
	<i>Drivers</i>	Necessity to sell products		X	X	X
Decreased cost for customer		X	X	X	X	
Increased sales for customer				X		
Reduced time to market for customer				X	X	
Increase product or spare parts sales		X	X	X		X
Improved R&D						X
Reduced internal cost			X			
<i>Obstacles</i>	No channel to facilitate the renting process	X				
	No channel to receive payment from end customer	X	X			
	Product is integrated in 1st-tier customers' products and the ownership cannot be separated		X			
	Lack of technical skills					X
	Difficult to define what should be included in service			X	X	
	Difficulties to sell services in public procurement					X
	No one responsible for the service in-house		X		X	
	Lack of administrative unit			X		
	No experience in selling services			X	X	
Difficult to build a business case		X		X		

# 5

## Analysis

In this chapter, the analysis of the data is presented. The analysis is divided into two major parts. In the first part, a new typology of PSSs systems is presented, followed by an explanation of how this has been developed by combining insights from the literature and the collected data. In the second part, the aspect of servitization obstacles is added to the proposed typology, culminating in an analysis about how these obstacles affect different PSSs. Each part is concluded with a table describing the findings.

### 5.1 A new Typology of PSSs

As indicated in the literature review, there are many different classification schemes for services and product-service systems. Tukker (2004) divides PSSs into three categories on the basis of two premises: whether the ownership of the product shifts or not, and whether the service has a predefined product it relates to. He furthermore claims that these services lie on a spectrum, where the service content of the offering is shifting depending on the PSS category, making the spectrum of offers stretch from pure products to pure services. Ulaga and Reinartz (2011) proposes a two-dimensional classification, where one dimension distinguishes between whether the service primarily affects the product, or whether it affects the customer's process; whilst the other dimension makes a difference between whether the supplier promises to perform a deed or if the supplier promises a result. Frambach et al. (1997) separates between product-related services based on when they take place in relation to a transaction, and also whether the service is transaction-based or relationship-based. While all these schemes add to the understanding of how to successfully servitize, none of them appear suitable when exploring servitization obstacles and their impact on different types of services. The reason being that none of the schemes take servitization obstacles into consideration.

Therefore, in contrast to these classification schemes, we propose one that discriminates PSSs in two other dimensions. The first dimension is concerned with the inherent value of the service, and thus distinguishes between where the PSS primarily creates value and how this value is being captured by the PSS provider. This implies that PSSs will be separated based on the underlying business case that argues for its existence, that is, the driver or rationale behind it. The second dimension distinguishes between PSSs, where the service part corresponds to a product but can be separated from it, and PSSs in which the product part is a fundamental part of the service and can not be separated from it. With the proposed classification of PSSs, services can be put into the following two dimensions: (1) the value dimension and (2) the product

and service separability dimension. With this classification of PSSs, there appears to be more distinct patterns concerning how different servitization obstacles affect the different categories of PSSs.

### 5.1.1 The Value Dimension

The value dimension of the proposed typology of PSSs refers to where the value of the added service is generated, and how this value is being captured. Arguably, any service that is being added to a product offering to form a PSS needs to generate value to have a reason to exist. However, when the case firms explained their most important servitization drivers, it was clear that this value generally takes shape in two different ways. On the one hand, services can generate value to the customer that the service provider can capitalize on. This is perhaps how services most commonly are thought of. On the other hand, services can also generate value for the supplying firm, for example in the form of reduced costs or increased product sales. Obviously, value can be generated both for the customer and the supplying firm simultaneously, as exemplified by the remote diagnostics service of firm B, which generates value for both firm B and its customers.

Whether the service primarily generates value to the customer or to the supplying firm appears to, in turn, have an effect on how this value can be captured by the supplier of the PSS. Services that only generate value for the customer has to be capitalized on in the form of a monetary payment. As such, this is a transaction in which the value for the service is paid for with money, and thus referred to as a value that is being captured directly by the supplying firm. On the other hand, value that is generated for the supplying firm can not be charged for directly and are thus referred to as indirect. Following this reasoning, the value dimension can be divided into two categories: PSSs that generate value for the supplying firm that is captured indirectly; and PSSs that generate value for the customer that is captured directly.

#### *PSSs generating value for the supplying firm that is being captured indirectly*

The first category includes PSSs whose primary underlying value reside with the supplier of the service. A common feature of many of the services prevailing in the case firms in this study was that their reason for existence was to facilitate the sales of the respective firm's products. Occasionally, these services were even necessary for the products to be saleable, which coincides with the marketing driver of (Baines, Lightfoot, Benedettini, & Kay, 2009). For example, the supplier of high-tech integrated software (case firm D) explained how it had to provide installation, support and product-use education just to ensure that the products were being sold. Another example of a service that generates value within the supplying firm is Firm B's remote diagnostics service, which enables for decreased costs for themselves in the form of, for instance, reduced inventory and warranty costs.

While all services, including the ones mentioned above, unquestionably need to add some sort of value for the customer to be requested and saleable, the customer does not, as mentioned, necessarily pay the supplier for the service. As such, what further

distinguishes the services within this category from other services is that the inherent value of the service is not charged for but instead is primarily captured indirectly at the supplier's side. For instance, the rationale behind the audit service at the provider of medical disposable products (Firm E) is to increase the number of products sold to the customer being provided with the service. At the same time, the value generated through this service is actually twofold. Apart from the value already mentioned, the service also generates value in the form of decreased cost for the customer, by ensuring that they are complying with the protocol and reducing risk for penalties. However, Firm E does not charge the customers for this value; instead, the increased product sales that the service enables for is sufficient for firm E to provide this service. This means that the revenue gained through the service is not captured by the service itself, rather the service only accelerates revenue somewhere else in firm E's business model, and thus referred to as being captured indirectly.

*PSSs generating customer value that is being captured directly*

The other category of PSSs in this dimension includes services that are driven by value generated outside of the supplying firm and captured directly from the customer, typically through a direct payment. The value generated by these services mainly resides in the customers' businesses, either through decreased cost, increased revenue, or some other strategically improved aspect that can be materialized in higher profitability. Consider the optimization service of the supplier of additive manufacturing equipment (firm C). The value in this service is exclusively generated at the customer's end by reducing their costs and improving their operations. Conversely, there is practically no value created internally within the supplying firm. As such, the only way for firm C to rationalize the provision of this service is to capture the value directly from the customer. The payment should then reflect the value created for the customer.

Another example of a service that mainly generates value for the customer is the packaging service provided by firm E – the provider of medical disposable products. The value stemming from this service is the cost reduction the customers can realize by reducing staff to sort, package, procure and prepare the components included in the tailored sets offered by firm E. Furthermore, the customers can also benefit from more efficient operations as they can reduce the time of non value-adding activities for their high skilled workers, which otherwise becomes inevitable, as they cannot perform their main tasks while waiting for the project-specific components to be prepared. Recall the main driver – cost reduction at the customer's end – exemplified by one of the respondents from Firm E:

The customer realizes that if they do not work with [our tailored sets], it will take a long time to unpack this; the [project-site] will be held up for 15 minutes longer. We estimate that a normal project would save 15 minutes unpacking. That is quite expensive. Because then the [project-site] is unproductive for 15 minutes and you have 5-8 people working, who then also are unproductive. The time-saving, the flow within the process that is, motivate the premium price we charge.

The value is thus captured directly, through charging a premium price on the prod-

uct, which reflects the value added to the customer in the form of significantly reduced costs.

### *Usefulness of the value dimension*

The main benefit with the proposed dimension is that it includes the essential rationale behind the PSS, that is, the value it generates and how this value is being captured by the supplying firm. Previous classifications are useful as they provide insights to what position a firm is in, and how it can move to a strategically better one. This better position is, according to most researches (see e.g Baines et al., 2007; Ulaga & Reinartz, 2011; Parida et al., 2014), typically closer towards providing pure service content, which makes the recommendations quite one-sided. Tukker's (2004) scheme of three types of PSSs is great for understanding different benefits and detriments with different product-service ratios. Ulaga and Reinartz's (2011) scheme matches firms' resources with different service strategies and describes how to leverage the resources to pursue different strategies. However, none of these schemes gives the firm any insight into if the firm should go in a certain direction. By separating the services on the basis of whether their inherent value can be captured indirectly through internal gains or must be captured directly through customer gains allows firms to understand the possible revenue model for a given service as well as the feasibility of each service given the structural prerequisite of the firm.

### **5.1.2 The Product and Service Separability Dimension**

This study also found a disparity in the characteristics of the case firms' different PSSs. While not being explicitly discussed during the interviews, it was almost inevitable to identify a difference in interdependency between the product component and service component of the PSSs that were described by the interviewees. This difference manifested in whether the service component of the PSS can be detached from the product component and sold separately or not. Therefore, another dimension can be added to the new typology, that divides PSSs based on whether the service component incorporates the product in such a way that the product becomes a fundamental part of the service and must be sold as one offering.

#### *Separable PSSs*

The first type of PSSs in this dimension is the one where the product component can be separated from the service component. It means that the provider of the PSS may first provide the product and at another point in time provide the service. The service can be carried out to customers who initially bought the product, or even to customers further downstream in the value chain. One simple example is the product-use education type of service that most case firms provide. Consider firm E that provides product-use education to municipalities who buys their product through a retailer. In this scenario, the service is still closely connected to the product, but it is simultaneously clearly separated from it. Another example of a PSS in this dimension is the optimization service provided by firm C. Here, the customers of the firm may first purchase the manufacturing equipment from firm C, and then at a later point in time of the product's life cycle have firm C come to provide the service, which is to optimize

the process in which the product is used in a specified way. Furthermore, other services that can be placed in this category are the maintenance services, support services, validation services, the installation service, and the product inspection service, all in which the product component can be separated from the service component.

#### *Non-separable PSSs*

The other type of PSSs in this dimension is in stark contrast to the first one as it includes services where the product component cannot be separated from the service component. In other words, the PSS provider may not disentangle the product component from the service component since the nature of the PSS is such that the service entails the provision of the product. Recall the intended "by-the-hour" PSS of firm B. This service is a form of leasing where firm B would lend the customer its products and receive a payment on the basis of the customers' usage of the product. In this service, it is inherent that the product component and service component have to be sold together, since the very core of a leasing service is the provision of a product. Therefore a separation between the two components within this "by-the-hour" PSS is both theoretically illogical and practically impossible. Likewise, for the project-tailored equipment sets intended by firm A and the packaging PSS provided by firm E, the service component of each includes, by definition, the product component. Reflect, for instance, on the packaging PSS. The tailoring aspect that firm E provides in this PSS entails that the firm promises certain products and certain packaging structures, which means that each PSS sold includes a unique or at least customer specific product. Thus, the provision of this unique product is mainly what constitutes the service, and must therefore be totally integrated with the service component.

### **5.1.3 The New Two-dimensional Typology of PSSs**

Finally, this report proposes a typology of product-service systems that can be visualized in a 2x2 matrix (see Table 5.1). On the horizontal axis, PSSs are divided into those that mainly generate value for the customer and captured directly, and PSSs that mainly generate value for the supplier of the service and thus captured indirectly. On the vertical axis, PSSs are divided into those that can have its product component detached from the service component and those in which the product component and service component cannot be separated. Consequently, four different categories of PSSs have been established. These categories are seemingly not equally attainable for all case firms, making the connection to servitization obstacles interesting. This connection is further investigated in the following section.

## **5.2 Categories of Servitization Obstacles**

Prior studies on the servitization and product-service systems phenomena have listed and emphasized the impact of different obstacles to servitization. As mentioned in the theoretical background of this paper, Baines et al. (2007), Martinez et al. (2010), and Mont (2002) summarize and bring forth obstacles faced by firms trying to servitize their offering. However, prior research has failed to identify obstacles that relates to any specific type of service. Peculiarly, there are plenty of categorizations of product

**Table 5.1:** Two-dimensional typology of PSSs

Separability dimension	Value dimension	
	PSSs that mainly generate value for the service supplier that is captured indirectly	PSSs that mainly generate customer value that is captured directly
Separable PSSs	<i>Examples from cases</i> Maintenance Support Product-use education Audit	<i>Examples from cases</i> Optimization Validation Digital platform
Non-separable PSSs	<i>Examples from cases</i> Personalizing Remote diagnostics Maintenance planning	<i>Examples from cases</i> "By-the-Hour" Packaging Project-tailored sets

and service bundles and combinations, as well as numerous studies on obstacles. Nevertheless, research trying to combine these two in any way is sparse. Therefore, these findings aim to complement and advance established findings by suggesting that there are some obstacles to adopting product service systems that are general, but also some that are service-type unique.

### 5.2.1 PSS-general Obstacles

From the interviews, it becomes clear that some obstacles are affecting all services equally, meaning that they affect firms' abilities to provide services on a general level. Examples of these obstacles can be found in firms that have difficulties in defining the scope of the services, as was the case with firm C and D; are unable to delegate the responsibility for the services, which was clear in firm B and D; or lack of administrative unit, as in firm C. Put differently, these obstacles are non-discriminating to different types of services; instead, they can hinder a firm in developing any kind of service, regardless of the type of service. For example, the difficulty that no one is responsible for the service in-house for firm B and firm D, affects service proposals, of which some aim mainly to generate value for the supplying firm, some for the customer, some are separable and others non-separable. The underlying reason is that these obstacles affect how a firm generates value on a general level, that is both for the firm itself and for the customer.

The PSS-general servitization obstacles are obstacles that have been treated in prior literature (see e.g. Baines et al., 2007; and Mont, 2002), and do not, since they are general, affect the "range of attainable services" for any specific type of PSS. These obstacles are, hence, less interesting for the purpose of this study, and cannot provide any help in answering the research question. For that reason, these obstacles will not be further elaborated on.

### 5.2.2 PSS Type-specific Obstacles

In contrast to PSS-general obstacles, this study has found another type of obstacles, which are dependent on the type of PSS to be incorporated. The common feature of the obstacles in this category is that they seemingly only arise to firms residing in certain positions of the value-chain. It was found that firms who are selling through a middleman (typically a wholesaler, retailer etc.), that is, firm A and B (see Table 4.6), were occasionally not able to generate nor capture on the value generated for the customer by their respective PSSs. More specifically, the common denominator for these obstacles is that they affect PSS types in the bottom right quadrant of the proposed typology, that is, PSSs that generate customer value that is captured directly and have non-separable product and service components.

For example, firm A faces obstacles in its attempts to implement a leasing PSS and project tailored equipment sets. These obstacles include issues related to the logistics needed to provide the services. To elaborate, the respondents from firm A described how they could not carry out the leasing PSS or the project tailored equipment sets, because they lack the relationship with, and the channel to, their service targets, that is, the end customers. The value chain structure they were entangled in enabled the middleman (i.e. the wholesalers and retailers), to own the channel to the end customers and effectively eliminate firm A's possibilities to establish a business relationship with them.

Similar obstacles were observable for firm B when trying to develop the remote diagnostics and maintenance planning services, which are located in the bottom left corner in our proposed typology. Firm B did not find any means to capture the value generated for the customer by these services, and respondents from firm B stated that they were unable to transfer a direct payment through their dealer network, and consequently, they found themselves unable to capture the added value to the customer. The difference in this scenario, however, is that firm B were able to capitalize on the internal values being generated by these services, still making them rational to provide for firm B.

Firms that had a direct sales-relationship with their service target did, on the other hand, not encounter these problems (again, see Table 4.6). These firms were able to provide their customers with PSSs in which the service and product components were non-separable and the primary value generated for the customers and captured directly. For instance, firm E has been able to provide their up-and-running packaging PSS and capitalize on it through charging a premium price without any major obstacles.

It becomes clear that the value chain structure and the relative position of the firm and its service target becomes key in understanding why these firms face these obstacles. The reason behind this is twofold. Firstly, in a value chain structure where the service target is not in contact with the supplying firm, the supplying firm cannot capture the value directly from the customer. However, the firm may capture it indirectly in those instances where the value from the service is generated within the supplying firm. This

stems from the nature of services themselves. As Smith and McCulloch (1838) describe it in their well-known book 'Wealth of Nations', "unproductive labour" (i.e. services) does not end up in any valuable good that can be sold or stored. This fact led Say (1846) to incorporate intangible characteristics into the definition of services and the fact that it is produced and consumed simultaneously. Since a service cannot be stored, it cannot be sold to a middleman, who sells it to an end customer. Instead, it has to be sold and carried out directly to the recipient of the service. However, if the product itself is being sold through a middleman, it creates a separation of the product and service, which then no longer are intertwined. This separation leads to the firm being unable to capture, from the end user, the entire value the combined offering creates, as they solely provide the service. Put differently, the synergy the PSS aim to give rise to, is lost.

Secondly, it is also vital to understand the implication caused by the non-separability of these PSSs for firms without direct contact to the service target. Since services cannot be sold through a middleman, following the same rationale from Say (1846) as above, the non-separability of the product and service must indicate that the PSS should have to be sold as a whole to the service target. If that target is not the direct client of the PSS supplying firm, the supplying firm cannot sell the entire offering through a middleman to an end customer, as the service component cannot be stored. Neither can the supplying firm keep their existing channel and sell only the product component of the PSS through the middleman, and the service directly, as the two cannot be separated from each other. This implies that the firm supplying the PSS, needs to either change its position in the value chain, partner up with the middleman to establish direct contact with the end customer, or agree on some kind of trilateral agreement between the middleman, the end customer and themselves.

Ultimately, this study finds that firms with a position in the value chain that disallows them direct contact with the service target are unable to provide PSSs that both generate value for the customer that is being captured directly and are constructed so that the product component cannot be separated from the service component. This is visualized in in table 5.2, where this type of PSS has been circled to mark its infeasibility to be carried out for firms without a position in the value chain that allows direct contact with end customer.

**Table 5.2:** The relation between servitization obstacles and the two-dimensional typology of PSSs. The highlighted area reflects services that are infeasible for firms without a position in the value chain that allows direct contact with the end customer

Separability dimension	Value dimension	
	PSSs that mainly generate value for the service supplier that is captured indirectly	PSSs that mainly generate customer value that is being captured directly
Separable PSSs	<i>Obstacle examples from cases</i> Difficult to define what should be included in service Lack of administrative unit No one responsible for the service in-house No experience in selling services Difficult to sell service in public procurement Difficult to build a business case	<i>Obstacle examples from cases</i> Difficult to define what should be included in service Lack of administrative unit No one responsible for the service in-house No experience in selling services Lack of technical skill
Non-separable PSSs	<i>Obstacle examples from cases</i> Difficult to build a business case	<i>Obstacle examples from cases</i> No channel to facilitate the renting process No channel to receive payment from end customer Product is integrated in 1st-tier customers' products and the ownership cannot be separated



# 6

## Discussion

This chapter contains three major parts. Firstly, there is a discussion about the theoretical implications of the findings, that is, how they can add to existing literature. Secondly, implications for practise are discussed, and thirdly, limitations of this research and directions for future research are presented.

### 6.1 Theoretical implications

This study discusses the impact of firms' relative position in the value chain on the range of attainable PSSs. This is a rather new avenue of research that has gotten little attention in academia. A few researchers have partly stumbled on this subject. For example, Mont (2002) explains how there has to exist a social system, or an infrastructure that can support the PSS for it to be possible to carry out. One could argue that this supporting system or infrastructure entails a feasible position within the value chain. Nevertheless, a theory on that level of abstraction is quite imprecise and general, and consequently lacks applicability. Another body of literature that discusses the position in the value chain in relation to PSSs, is the one of Bustinza, Bigdeli, Baines, and Elliot (2015). They find that the position in the value chain and the organizational structure are important factors when selecting support services in servitization. However, in difference to our study, the study of Bustinza et al. (2015), argue for how the exact position in the value chain, rather than the relative one, affects the suitability for different service options. Consequently, the analysis of our study and the one of Bustinza et al. (2015) become fundamentally different.

### 6.2 Implications for Practise

The findings of this study provide insights into what types of services a firm successfully can implement depending on its business structure and position in the value chain. First of all, by understanding our typology, or more specifically the value dimension and the primary inherent value of different services, firms can get insights into the most suitable revenue model for a given service. This can, in turn, clarify what types of services that are most feasible and beneficial to develop given how the firm is currently set up. Furthermore, by understanding how the typology relates to servitization obstacles, firms can get insights into how their range of attainable PSSs is affected by their position in the value chain. As a consequence, this also enables them to take proactive strategical decisions, for instance to try to change their position in the value

chain to best prepare them for entering into a new space of PSSs.

Our findings are perhaps of most value to firms that are limited by the fact that they are selling their products and services through wholesalers, retailers, dealers or some other kind of distribution network. Our study identifies that non-separable PSSs that generate customer value, which is captured directly, are infeasible to offer with this kind of position in the value chain. As such, these firms are essentially left with two options as how to treat this limitation. Firstly, they can simply choose to keep their current value chain structure to maintain their relationship with their current distribution network and focus on providing the other types of PSSs. Secondly, they can choose to detangle from their present position in the value chain and sell directly to the end user. While this, according to our typology, allow them to venture into PSSs whose value is being realized externally and are non-separable, and thus opens up a new range of attainable services, it comes with a number of risks. For instance, selling directly to the end user is, effectively, a way to circumvent partners down the value chain, with which the relationships may become at risk. This can, consequently, cannibalize on their existing sales through these channels.

Nevertheless, our findings may also be useful for firms who are selling their products and services directly to the user. Firstly, our findings can advise these firms to put effort into protecting their current position in the value chain to maintain a competitive position as a PSS provider. Secondly, they can provide insights into what a potential move to a different position in the value chain entails. More precisely, our findings state that a move upstream in the value chain may impede the possibility to provide some types of PSSs. Therefore, a real options analysis of such moves in the value chain should also incorporate future limitations on service provision. Finally, our findings may also give these firms an understanding of the limitations of their partners and suppliers.

Naturally, these kinds of strategic decisions are delicate for managers and goes beyond evaluating what services to add. Nonetheless, understanding the value-based classification of services and the connection to the value chain structure enables for a proactive strategic approach, effectively eliminating the risk of venturing into a specific service just to realize that you have walked into a dead end of wasted investments and resources.

### **6.3 Limitations and Future Research**

Whilst our findings provide important insights in the areas described above, they are unlikely to provide a conclusive recommendation for when to venture into different types of services and PSSs and when not to. There are undoubtedly other factors influencing whether a firm successfully can enter into certain combinations of product and service offerings, some of which are previously covered by scholars. For instance, Ulaga and Reinartz (2011) discuss how a firm's resources and capabilities affect its range of attainable hybrid offerings.

Another factor that potentially can help explaining this phenomenon is degree of product complexity. It would be fair to assess that more complex products enable for a wider range of possible PSSs to venture into than simple ones, effectively implying that a firm with simple products find themselves in a difficult position to enter into sophisticated PSSs. On the other hand, complex products may require add-on services of simpler character for the product to be saleable, adding to the intricacy of the relation between complexity of product and possible product-service systems. This was, for instance, partly the case in firm D in this study.

Similarly, product and market maturity may add to the dynamics of the feasibility of different product-service systems. It seems plausible that products having reached the mature stage of the product life-cycle offer different servitization opportunities than completely new products that incorporate ground-breaking technology. Along the same lines, adding services to a product offering is likely to pose different problems depending on whether the market is mature or not. For instance, it may be more difficult to change customer behaviour on a mature market than on an immature one, effectively making services concerned with a shift in ownership, such as a leasing service, less feasible on the latter type of market.

Finally, this study is subject to limitations concerning the generalizability of our findings. Some of these limitations open up possible paths for future research. One such path for future research could be an empirical validation of firms' servitization efforts to quantify the proposed effects of different value chain structures. Additionally, studies similar to this could be conducted in different geographical settings or with firms operating in other industries, to help further corroborate or rectify our findings.



# 7

## Conclusion

This study has been conducted to help the academic and business world in understanding why some firms fail in adding services to their offering to provide product-service systems (PSSs), and others succeed. The perspective this study has taken is to look into the different obstacles a manufacturing firm may face when adding services. As such, the study has identified the connection between a firm's position in the value chain and the feasibility to deliver different types of services. Firstly, this study has constructed a new type of service classification scheme that facilitates the answer to the research question: *How does different servitization obstacles affect the range of attainable service types for different manufacturing firms?* This classification scheme separates between PSSs in two dimensions. One dimension separates between PSSs that generate value for the supplying firm that is being captured indirectly within the supplying firm, and PSSs in which the values are generated for the customer and captured directly, that is, through a direct payment. The other dimension separates between PSSs where the product component can be separated from the service component of the PSS, and those where it cannot.

Secondly, this study shows that a firm's position in the value chain creates obstacles that only obstructs those PSSs that both generate value for the customer that is captured directly, and have non-separable product and service components. The explanation is that for PSS supplying firms with a position in the value chain that gives them no direct contact with the service target, it is difficult to capitalize on their offering if the PSS aims to solely bring value to the customer. Furthermore, the non-separability dimension of the product and service components of the PSS makes the supplying firm unable to provide the product through a middleman and the service directly to the service target.



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# A

## Appendix 1

In the appendix, the different interview template used for the interview are displayed. There were small individual differences between the templates for each case firm, but the all followed the same structure for each round. Below, the three structure types used for respective round are displayed.

### A.1 Interview Template for round one

#### **Important to mention in the beginning of the interview:**

- Describe the background of the study
- Ask if it is okay to record the interview
- Discuss confidentiality aspects

#### **Background: [10 min] [Acc 10 min]**

1. We have talked with our supervisor, and made our own research about what you do, but would you please tell us briefly about your view of [the company] and how you operate?
2. What is your role and what are your general tasks and responsibilities?
3. Can you describe the life-cycle of your products; that is, from purchasing to that the customer scraps it?
  - (a) What parts of the life-cycle are you actively involved in?
  - (b) What type of customers do you have?
  - (c) Who are your main competitors?

#### **Servitization efforts: [30 min] [Acc 40 min]**

4. The reason to us being here is to discuss your efforts to integrate services into your product offering. Could you elaborate on your thought around this?
  - (a) What is your role in this process of going towards a service mind-set?
5. What services do you provide as of today? *Suggest a that the interviewee makes a visual representation of a timeline/time plan and what they have done so far. Ask for milestones.*

*(For each service - iterate)*

6. What did you need to do to introduce [each service]?
  - (a) Did you have to change something structurally within the company? [e.g. production, logistics, HR, marketing, new processes]
    - i. Has the production changed or will it change?
    - ii. Will you or have you acquired any new competences?

- (b) Were your relations with suppliers affected? c. Were your relations with customers affected?
- 7. What obstacles did you encounter?

**Future services: [10 min] [Acc 50 min]**

- 8. Have you started any new organizational units that work with services and servitization?
  - (a) How did you go about setting it up?
- 9. How do you work with the development of new services?
  - (a) How is it different from what you did previously?
- 10. Looking at your plans for the future: what services are you working with as of now?
  - (a) What kind of offering do you expect to have in the end?
- 11. What do you think you need to do to be able to be able to offer [the services they mention]?
- 12. What obstacles or challenges do you expect to be up against [for each service]?
- 13. What type of data will you need to be able to offer these future services?

**Servitization drivers: [10 min] [Acc 60 min]**

- 14. Why did you start developing [each service]?
- 15. How did you come up with the idea to add [each service] to your offering?

*[For each service]*

- (a) Where did the idea come from? i. Who came up with it?
- (b) What parts of the company is involved in adding services?
- (c) Who took the decision to start develop it?

**Additional questions: [5 min] [Acc 65 min]**

- 16. Is there anything else we should have asked today that you want to bring up?

**For future interviews: [2 min] [77 min]**

- 17. Who else should we talk to at [the company] about servitization?

## A.2 Interview Template for round two

### 1. What is your role at [company name]?

## Servitization drivers

### 2. What drivers do you have to servitize?

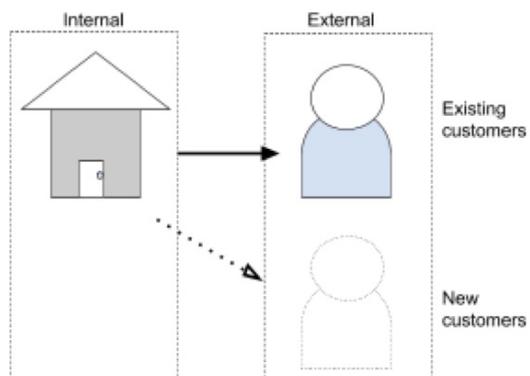
Potential follow-up questions:

- Cost driven?
- Are there any internal drivers?
- Are there any drivers related to acquiring new customers?

**Do you see any special target group for the new services you develop?**

*Aim with above questions:*

- Figure out if the servitization efforts are internally or externally driven
- Unravel the link between drivers and servitization strategy
- Investigate if services are aimed at existing or new customers



### 3. What is your primary servitization driver?

*Aim:*

- Establish relative importance among drivers
- Establish the most important driver

*Provoke if necessary ("So closeness to customer is more important for you than steady revenue streams?")*

## Current situation and goals

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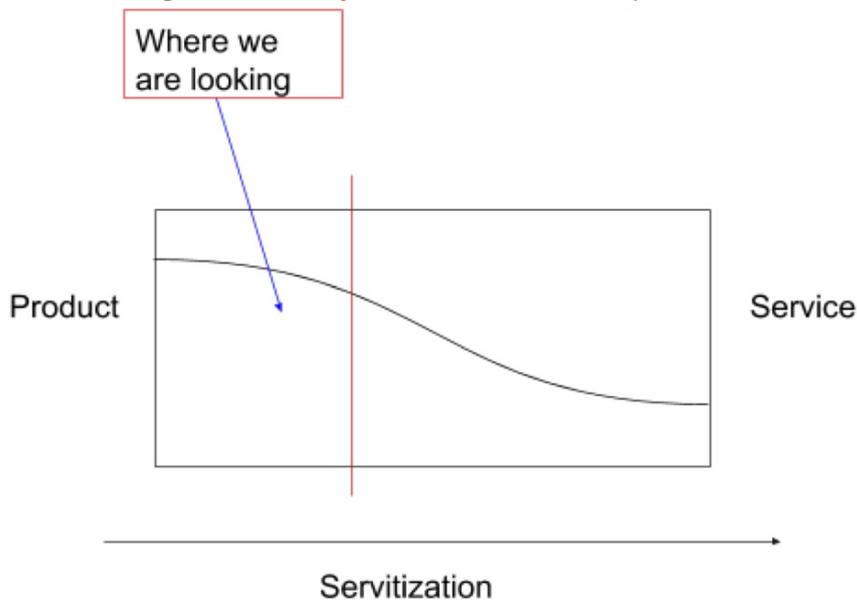
### 4. What is your share of products and services today?

- Measured in revenue or profit

*Provoke if necessary to get a hint (i.e. "so 30 % then?")*

**Aim:**

- Investigate where they are in the servitization process



### 5. Where do you want to be in one year?

**Aim:**

- *Establish if there exist a detailed plan for how to proceed*
- *Sort out their objectives for the foreseeable future*

### 6. Where do you want to be in five years?

**Aim:**

- *Investigate if there is a long-term plan or vision*

### 7. What is your objective?

**Aim:**

- *Establish where they want to end up. Is it 100% services? 50%?*
- *Establish if they want to deliver a complete solution rather than a product*

# Obstacles

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## **8. What obstacles do you have when adding services?**

- Internal (structural, organizational)
- External (laws, middle-men, value chain)
- Technical (competency, digital, access to data)

*Aim:*

- *Unravel what obstacles they have*

## **9. How do you solve the obstacles you encounter?**

*Aim:*

- *Identify strategies to take on the obstacles*

## **10. What obstacles have you overcome?**

*Aim:*

- *Identify strategies to take on the obstacles*

## Current servitization efforts

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### 11. In relation to services, what do you do today?

- Do you have any service currently under development?

*Aim:*

- *Investigate current strategies*
- *Investigate how they operate to achieve their objectives*

### 12. In relation to [a specific service], what initiatives have you taken to develop it?

- Restructurings
- Financing

*Aim:*

- *Investigate how they develop new services. More specifically, how they solve structural issues, how they make sure that the operations are aligned with the services under development, and how they finance it*

### 13. What competency do you need to develop services?

*Aim:*

- *Investigate the importance of acquiring the right competencies*

### 14. How do you intend to capture the value and capitalize on your services?

- Revenue model
- Challenges with changing revenue model?

*Aim:*

- *Establish how they intend to capitalize on the services. Do they intend to charge for the service in itself or will it generate other values such as increased product sales?*

### A.3 Interview Template for round three

## Inherent value in the service

---

#### 1. What services do you currently have up-and-running?

*Aim:*

- *Establish what services they have*
- *Make sure that we have identified/covered all services*
- *Sort out what services the interviewee has most knowledge about*

#### 2. What services do you have in your pipeline?

*Aim:*

- *Investigate what services that are under development and other service ideas*

#### 3. Wherein is the value of the service? [go through all services that have been mentioned in previous questions]?

*Aim:*

- *Verify/rectify our current model*

Company/Internal      Customer/External

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# Obstacles

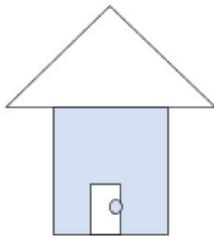
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## 4. What obstacles do you have when it comes to adding services?

- Internal (structural, organizational)
- External (laws, middle-men, value chain)
- Technical (competency, digital, access to data)

*Aim:*

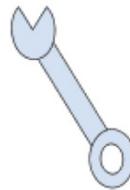
- *Investigate what obstacles they think they encounter*
- *Investigate why they see them as obstacles*



Internal



External



Technical

## 5. What are the most apparent obstacles?

*Aim:*

- *Identify ranking of obstacles*

## 6. Are there any obstacles directly related to [a service they want to develop]?

*Aim:*

- *Try to find and categorize obstacles that are related to specific services*
- *Try to identify relation between value chain and where the inherent value of the service is located*
- *Investigate if there are obstacles that only are connected to certain services*

## 7. How do you take on the obstacles that you have identified?

*Aim:*

- *Identify strategies and actions to take on obstacles*

## 8. What obstacles have you been able to overcome?

*Aim:*

- *Identify strategies and actions to take on obstacles*