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Navigating Manufacturing Firms to Service-led Business Models:

A multi-case study from the capital goods industry

Marin Jovanovic

Supervisors:

Gustavo Morales Alonso

Universidad Politécnica de Madrid, Spain

Mats Engwall

KTH Royal Institute of Technology, Sweden

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Author: **Marin Jovanovic**

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marin.jovanovic@alumnos.upm.es

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Abstract

This thesis tackles an increasingly popular phenomenon – servitization of manufacturing – a growth opportunity for industrial firms through a service-led business model. However, implementing a servitization strategy in industrial firms triggers multifaceted challenges and requires further research.

The thesis builds on extensive studies of world leading multinational capital equipment manufacturers that develop a successful service business model. The dissertation builds on three closely interconnected studies. The first study is an in-depth exploratory case study of a Swedish industrial firm by cross-comparing two servitization initiatives—one that was highly successful, and one that was less so. The second study juxtaposes 10 worldwide subsidiaries of the same Swedish industrial firm to compare and contrast how the servitization process unfolded. This study focuses on the management of service capability development, as well as the management of emerging tensions between the product business units and service business units. The third study extends the research scope by analyzing four industrial firms that successfully developed advanced services (e.g. outcome-based contracts). Finally, the fourth study focuses on 12 case studies of product providers that shifted to open business models.

This thesis contributes to the servitization literature and business model literature by demarcating three business model archetypes for industrial firms: product business model, service business models and outcome business model. This thesis unpacks the content of the business model elements that underpins business model archetypes as well as the configuration and the relationship between the business model elements.

Keywords: servitization, service transition strategy, service business models, outcome-based contracts

Resumen

Esta tesis aborda un fenómeno cada vez más popular: la servitización de la fabricación, una oportunidad de crecimiento para las empresas industriales a través de un modelo de negocio enfocado hacia los servicios. Sin embargo, la implementación de una estrategia de servitización en las empresas industriales desencadena importantes desafíos no resueltos a nivel de gestión, lo que demuestra la importancia de la investigación en este ámbito.

La tesis se basa en estudios exhaustivos de los principales fabricantes multinacionales de bienes de equipo que tienen actualmente un modelo de negocio exitoso basado en servicios. El discurso de la presente tesis doctoral se basa en tres estudios estrechamente interconectados. El primer estudio es un estudio de caso exploratorio en profundidad de una empresa industrial sueca mediante la comparación cruzada de dos iniciativas de servitización, una que tuvo mucho éxito y otra que tuvo menos. El segundo estudio yuxtapone 10 filiales mundiales de la misma empresa industrial sueca para comparar y contrastar cómo se desarrolló el proceso de servitización. Este estudio se centra en la gestión del desarrollo de la capacidad del servicio, así como en la gestión de las tensiones emergentes entre las unidades de negocio de productos y las unidades de negocio de servicios. El tercer estudio amplía el alcance de la investigación mediante el análisis de cuatro empresas industriales que desarrollaron servicios avanzados con éxito (por ejemplo, contratos basados en resultados). Finalmente, el cuarto estudio se enfoca en 12 casos de estudio de proveedores de productos que cambiaron a modelos comerciales abiertos.

Esta tesis contribuye a la literatura de servitización y la literatura del modelo de negocios mediante el estudio de tres modelos de modelos de negocios para empresas industriales: modelo de negocio de producto, modelos de negocio de servicio y modelo de negocio de resultado. Esta tesis descompone el contenido de los elementos del modelo de negocio que sustenta los arquetipos del modelo de negocio, así como la configuración y la relación entre los elementos del modelo de negocio.

Palabras clave: servitización, estrategia de transición de servicio, modelos de negocio de servicio, contratos basados en resultados

Disclaimers

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1. Introduction

1.1. The servitization of manufacturing

Almost 60 years ago a famous Harvard Business School professor Theodore Levitt said that, "People don't want to buy a quarter-inch drill. They want a quarter-inch hole!". This shift in the customer's mindset has been evident over the last 20 years as customers have increasingly put focus on benefits of a product-in-use. The literature on servitization often cites cases of how GE and Rolls Royce shifted away from selling jet engines to airlines to selling flying hours (Batista et al., 2016). Similar models have been evangelized by Xerox (pay-per-copy), Hilti and Caterpillar (fleet management service), and Electrolux (pay-per-wash) (Gebauer, Haldimann et al., 2017). For such service agreements, the providers guarantee availability and reliability rather than a product delivery (Visnjic et al., 2017).

There are a number of examples of service-led business model transformations in traditional manufacturing and, in particular, in capital equipment manufacturing. For instance, KONE moved away from selling elevators and escalators to planning and implementing the best possible people flow, that is, to provide the shortest transit and to minimize passenger's waiting time. Caterpillar and Hilti entirely redefined the value proposition from sales of professional equipment and tools to improving the customers' operations and on-site productivity. Rolls Royce has epitomized the use of data-driven insights to provide the outcome-based contracts - TotalCare® service agreements. Similarly, Atlas Copco provides remote monitoring and energy-consumption optimization services for their compressors. Finally, John Deere has gone even further, and moved from selling agriculture machinery to providing precision agricultural solutions based on machine learning and AI that help farmers scan fields, assess crops, and eradicate weeds.

Moreover, the grand challenge of the "post manufacturing" world is to embrace the shift from the traditional manufacturing to knowledge-intensive service sectors that support manufacturing as well as innovation (Chesbrough and Spohrer, 2006). Today, the service sector accounts for around 80% of the U.S. gross domestic product (Basole and Rouse, 2008). The increasingly global economy coupled with economic and technological

progress in the low-cost countries has put firms in developed countries under pressure (Baines, Lightfoot, Benedettini, et al., 2009a; Neely, 2008). In particular, premium manufacturers are becoming increasingly commoditized (Neely, 2013). They have been forced to find new ways to differentiate their offerings as customers' willingness to pay premium prices weakened significantly due to an increasingly large number of fair alternatives (Gebauer et al., 2011). Today, evidence from telecom-equipment industry show that China's companies leveraged on self-developed technologies in order to catch up with the Western corporations (Fan, 2006). In that respect, several scholars have argued that "changes in technology and competition have diminished many of the traditional roles of location" (Porter, 2000). A much-cited study of over 10,000 manufacturing firms in 25 countries worldwide showed that around 30% of global manufacturers offer some type of services, while for US manufacturers that number was almost 60% (Neely, 2008). Moreover, in a replicated study from 2011, service provision in China's manufacturing companies surge from 1% in 2007 to just under 20% in 2011 (Neely et al., 2011).

In academia, the term "servitization" is often referred to Vandermerwe and Rada (1988), who argued that contemporary product-centric firms need to offer bundles of products, services, support, self-service and knowledge. Vandermerwe and Rada (1988: 19) coined the term "servitization" to describe the need to provide bundles "of customer-focused combinations of goods, services, support, self-service, and knowledge." Since then, the servitization field recoded an exponential growth in terms of research output (see Figure 1). Yet, Kowalkowski et al. (2017) argue that the servitization field is well established but that the "research domain is still in a theoretical and methodological nascent stage". In line with this assertion, several scholars have observed that research on servitization is very fragmented (Baines et al., 2017; Baines, Lightfoot, Benedettini et al., 2009b; Eloranta and Turunen, 2015). Servitization scholars mainly use the case study methodology to explore the challenges revolving around how industrial firms should achieve service growth (Kowalkowski, Gebauer and Oliva, 2017). During the last three decades, both academics and practitioners have argued that product firms should complement their product business with services in order to increase competitiveness (Baines et al., 2017; Kowalkowski, Gebauer, Kamp, et al., 2017; Rabetino et al., 2018).

In addition, when industries mature and firms face difficulties in differentiating their offerings, services represent a prominent strategic response (Teece, 1986). For instance, firms such as IBM, Caterpillar and Atlas Copco have reported a rapid growth of the service revenues (Cusumano et al., 2015; Visnjic Kastalli et al., 2013).

Figure 1. Research output on servitization (Kowalkowski et al., 2017)

On the other hand, industrial firms face market saturation, since the volume of products that are already in operation leaves little room for further growth—often referred as the “installed base argument” for servitization. In particular, for every new capital equipment product, such as civil aircrafts, there are 15 already in operation; for trains, that ratio is 1 to 22 (Neely, 2013), for elevator and escalator manufacturers, the ratio is 1 to 19 (Kowalkowski and Ulaga, 2017). The long-lasting product life cycle makes service business a much more attractive growth strategy than selling a new installed base. Thus, manufacturers are particularly attracted to invest in services that could potentially remedy the long product sales cycles (Cusumano et al., 2015; Quinn, 1992), but also provide higher margins and more stable revenue inflows (Eggert et al., 2014; Wise and Baumgartner, 1999) as well as increase customer loyalty (Fang et al., 2008). It is argued that, on average, servitization enhances provider’s profitability due to retention of customers (Worm et al., 2017).

Over the last decades, the value added activities in the manufacturing sector have gradually shifted away from the production and assembly of physical products to pre-production R&D collaborations (Huikkola et al., 2013) and after-sales service innovation (Mina et al., 2014) (see Figure 2). Consequently, the value creation potential for

manufacturers is increasingly downstream, in the service space (Davies, 2004; Wise and Baumgartner, 1999).

Numerous cases show that advances in information and communication technologies (ICT) facilitate servitization (Coreynen et al., 2017; Opresnik and Taisch, 2015). Recent developments, such as digitalization, have brought an exponential acceleration of automation, connectivity and increases in efficiency (Cenamor et al., 2017; Porter and Heppelmann, 2014). Digitalization capabilities enable firms to seize service potential by leveraging operational data from machines, engines or entire fleets (Lenka et al., 2017). All of these inputs allow manufacturers to deploy better services and develop new ones (Chesbrough, 2011).

As the industrial products are becoming increasingly complex (Raddats et al., 2016), it gives providers an advantage to expand their organizational boundaries and internalize the product-related service activities (Santos and Eisenhardt, 2005).

On the other hand, industrial customers increasingly put focus on the supplier-customer relational processes (Tuli et al., 2007). Customers also assess their own resources as well as how well the product and service components are integrated (Macdonald et al., 2016; Nordin and Kowalkowski, 2010). Servitization allows industrial customers to focus on their own core capabilities (Nordin and Agndal, 2008) and to turn capital expenditures (CAPEX) into operational expenditures (OPEX) what gives them additional business flexibility (Kowalkowski and Ulaga, 2017). Industrial customers are also trying to reduce the supplier base and have multiple needs fulfilled by a single provider (Ye et al., 2012). This not only reduces the transaction and search costs, but also leverages on the complementarities and interoperability between different products and services (Visnjic et al., 2016).

Taking into account the aforementioned aspects, service business became an attractive growth opportunity for manufacturers, especially for those operating in business-to-business (B2B) markets (Kowalkowski and Ulaga, 2017). Consequently, many manufacturers have embarked on developing organizational capabilities and processes that create value for customers through a service business model (Kindström and Kowalkowski, 2015; Storbacka, 2011; Visnjic Kastalli et al., 2013).

Figure 2. Smiling curve (Shih, 1996)

Consequently, it is clear that the servitization of manufacturing can be multifaceted, with various factors determining how this strategy will be unfolded in practice (Kowalkowski et al., 2015). For some firms, servitization has been an incremental expansion (Kowalkowski et al., 2012) while for other firms it required a change in the entire business model (Barnett et al., 2013).

1.2. Structure and outline of the thesis

In Chapter 2, the theoretical background of the dissertation is presented concluding with the research dissertation research questions. Chapter 3 is devoted to the research design and methodology and elaborates on the four studies that are included in this dissertation. Chapter 4 synthesizes the findings and discusses them in the perspective of the overall research of the dissertation. Chapter 5 outlines the broader contribution of the dissertation to the theory as well as the managerial implications.

2. Theoretical background

In this section, the theoretical background of this dissertation is presented. First, the phenomenon of servitization is introduced as a research field. Next, servitization is conceptualized as a business model change. Furthermore, three key elements of business models are presented in the context of servitization, value proposition, value creation and value capture. Finally, the problematization and the servitization business model challenges have been presented in order to arrive to the research questions included in this thesis.

2.1. Servitization as a research field

According to Rabetino et al. (2018), the existing servitization-related research can be categorized into three distinct, but very interconnected, communities: the service science community, the product-service systems (PSS) community, and the solution business community (the servitization mainstream).

The service science community builds heavily on the service-dominant logic (SDL) model (Vargo and Lusch, 2004; Wilden et al., 2017) and research revolving around relationship marketing, service marketing and the concept of value co-creation and value co-production (Parry et al., 2012; Parry and Tasker, 2014; Smith et al., 2014; Vargo et al., 2008). Among these scholars the “service system” is frequently conceptualized as a core unit of analysis (Maglio and Spohrer, 2008). Among industrial marketing scholars, servitization is often conceptualized as “service infusion” (c.f. Brax, 2005; Gebauer et al., 2011; Kowalkowski et al., 2012). Additionally, marketing literature uses the customer benefits perspective and conceptualizes servitization as “hybrid solutions” or “customer solutions”—a combination of products and services that create more customer benefits than if they were available separately (Reinartz and Ulaga, 2008; Shankar et al., 2009; Tuli et al., 2007; Ulaga and Reinartz, 2011).

The product-service systems (PSS) community emerged with the early work of Mont (2002), who focused on the environmental aspects of servitization. This stream of PSS literature focuses largely on the notion of “dematerialization” and designing the PSS in order to lower the environmental burden (Tukker and Tischner, 2006). Recently, this stream has often supported the “circular economy” in which the manufacturer, along with

partners, engages in the sharing, leasing, reuse, refurbishment and recycling of the products (Bourguignon, 2016; Kortmann and Piller, 2016; Tukker, 2015).

Operations management (OM) scholars are present simultaneously in both the PSS and the solution business (SB) communities (Rabetino et al., 2018). In that respect, Neely (2008) and Baines et al. (2007) connect these two communities. OM scholars have focused on the operations strategy for servitization in general (Baines, Lightfoot, Peppard, et al., 2009) and performance-based contracts in particular (Datta and Roy, 2011). Others have connected the PSS and business model literature (Adrodegari et al., 2017; Reim et al., 2016). For instance, Spring and Araujo (2009) explored the business model perspective as an integrating concept.

The solution business community, the mainstream of servitization research, was influenced heavily by the early work on complex product service systems (CoPS) and project-based literature on integrated solutions (IS) (Brady et al., 2005; Davies, 2003, 2004). Scholars usually take the resource-based view (RBV), stating that servitization requires new resources, skills and competences (Eloranta and Turunen, 2015) as well as capabilities (Ceci and Masini, 2011).

This community has largely focused on the transitional aspects of servitization (e.g. service transition) in manufacturing (Oliva and Kallenberg, 2003). In particular, characteristics of this transition have been explored in numerous studies (Böhm et al., 2017; Jacob and Ulaga, 2008; Kowalkowski et al., 2015; Lütjen et al., 2017; Matthyssens and Vandenbempt, 2010; Parida et al., 2014). In this community, the manufactured product has been central to the provision of integrated solutions in which firms began to expand the scope of product offerings and include various services (e.g., maintenance, finance, consulting) in order to capture the life cycle profits associated with servicing the installed base (Davies, 2004; Rabetino et al., 2015). Extensive focus has been placed on advanced services (Baines and Lightfoot, 2013), performance-based contracts (Kim et al., 2007; Selviaridis and Wynstra, 2015) or outcome-based contracts (Ng et al., 2009).

In addition, the community has explored the nuances of the returns on service investment (Benedettini et al., 2015; Fang et al., 2008; Kohtamäki et al., 2013; Visnjic Kastalli and Van Looy, 2013), the relationship between servitization and product innovation (Visnjic et al., 2016), the antecedents of servitization (Antioco et al., 2008; Josephson et al., 2016),

value drivers (Forkmann, Henneberg, et al., 2017b; Visnjic et al., 2017), and firm-level challenges (Martinez et al., 2010, 2017; Matthyssens and Vandenbempt, 2008).

2.2. **Servitization as a business model change**

Servitization could be conceptualized as a business model change for industrial firms, a shift away from a product-centric to a service-led business model (Adrodegari et al., 2017; Adrodegari and Saccani, 2017; Kindström and Kowalkowski, 2015). For a majority of industrial firms, technological innovations enabled this expansion into services (Chesbrough and Rosenbloom, 2002). For instance, firms were able to collect data from their engines or machines and help customers identify operational inefficiencies and include such promises under the service agreements (e.g. Xerox) (Chesbrough, 2011). However, the technological innovation alone is often insufficient, and must be coupled with an adequate business model change (Baden-Fuller and Haeffliger, 2013; Casadesus-Masanell and Ricart, 2010; Chesbrough, 2007).

Business model innovation represents a new dimension of innovation that may complement the traditional product and process innovation (Massa et al., 2017). While there are numerous interpretations of what the business model is (Wirtz et al., 2016), there is a strong consensus that business models play an important role in the competitiveness of the firm (Massa et al., 2017; Zott et al., 2011). The business model is often conceptualized as a framework (e.g. 'canvas' by Osterwalder and Pigneur, 2010), a cognitive devices that simplify organizational reality (Baden-Fuller and Morgan, 2010; Martins et al., 2015), an activity system design (Zott and Amit, 2010), or even “stories that explain how enterprises work” (Magretta, 2002). More broadly, the business model describes the firm’s value proposition, how the firm will orchestrate activities to create and deliver that value, and how the firm will capture (c.f. appropriate¹) a part of the created value (Birkinshaw and Ansari, 2015; Tongur and Engwall, 2014).

¹ See Ryall (2013) for discussion on value capture and value appropriation.

Service transformation in industrial firms is often associated with business model change. Brax and Visintin (2017) argue that “servitization of manufacturing is conceptualized as a change process whereby a manufacturing company deliberately or in an emergent fashion introduces service elements in its business model”.

Thus, servitization requires a business model change, introduction and reconfiguration of the underpinning elements of the business model (Adrodegari and Saccani, 2017; Barquet et al., 2013; Forkmann, Ramos et al., 2017). Consequently, the business model change is related to the content, dynamics and internal fit of the key elements: “value proposition,” “value creation” and “value capture” (see Figure 3) (Siggelkow, 2002). Demil and Lecocq (2010) highlighted the transformational view of a business model as the most important.

Figure 3. Relationship between servitization strategy, service business models and business model elements

2.3. **Business model elements in servitization**

Several servitization scholars serve as boundary spanners connecting the servitization field with the wider research on business models (Adrodegari et al., 2017; Reim et al., 2015; Storbacka, 2011; Storbacka et al., 2013; Suarez et al., 2013; Visnjic et al., 2016, 2018; Visnjic Kastalli et al., 2013). Herein, service business model “means that the supplier commits to improving customers' value-in-use, so assuming greater responsibility for the overall value-creating process as compared to product-centric, transaction-based business models” (Kowalkowski, Gebauer, Kamp, et al., 2017).

The concept of the “business model” became widely popular in both academia and practice in the mid-2000s as a conceptual tool to describe the business logic of a firm (Osterwalder, 2004; Osterwalder and Pigneur, 2010). The most famous contribution came from Osterwalder and Pigneur (2010), who with their “business model canvas” defined nine building blocks of business models: customer segments, value propositions, distribution channels, customer relationships, revenue streams, key resources, key activities, key partners, and cost structure. Schön (2012) grouped the components in three aggregate dimensions: value proposition, revenue model and cost model (see also Teece, 2017). Johnson et al. (2008) had a similar take on key business model elements: value proposition, profit formula and key resources and capabilities.

Even if there is no common agreement on exactly how to depict a business model, the following three key elements have received substantial support in most business model research (c.f. Birkinshaw and Ansari, 2015; Tongur and Engwall, 2014): the value proposition element, the value creation element and the value capture element. The value proposition lays the foundations of the business model. It establishes the firm's offer to customers that is competitive in the market and fulfills customer needs. Value creation describes the so-called “cost model” and resources, capabilities, structures and processes to support the development and deployment of the service offering. Finally, value capture shows the profit formula of the value proposition.

Drawing on this view, servitization in this dissertation is understood as a business model reconfiguration process composed of changes within and between the three key elements: value proposition, value creation, and value capture. The way these elements have been discussed in servitization research is described in the following section.

Value propositions: from basic to advanced services

The value proposition is a strategic tool that is used by a firm to communicate how it aims to provide value to customers (Payne et al., 2017). In other words, it represents firm's market offering (Johnson et al., 2008). Marketing scholars argue that "value literature has evolved from a focus on resource exchange and value in exchange to an emphasis on resource integration and value in use" (Eggert et al., 2018). In that respect, the servitization literature closely follows this trend with three broad categories of services offered by industrial firms: basic, intermediate and advanced services (Baines and Lightfoot, 2013).

Manufacturers have traditionally provided aftermarket services based on production competences, such as spare parts (Lele, 1986). They have been an important source of revenues for manufacturers with a higher profit margins relative to products (Cohen et al., 2006). Goffin and New (2001) found seven types of aftersales services: installation, user training, documentation, maintenance and repair, online support, warranty and upgrades. It is important to highlight that the notion of bundling products and services is not very novel and that servitization has antecedents that date to around 150 years ago (Schmenner, 2009; Spring and Araujo, 2009). Yet, for most of the aftersales services, firms still followed the product business model logic. Consequently, basic services are considered only those that are product-oriented, standardized and traded in a transactional way (Uлага and Reinartz, 2011). In other words, basic services are input-based and oriented towards the product (Kowalkowski and Uлага, 2017).

Baines and Lightfoot (2013) define the second category of service offerings for manufacturers as intermediate services, such as scheduled maintenance and overhaul services. These intermediate services focus on the maintenance of the product in order to maximize the product's operational use. Industrial firms often support the installed bases over the entire life-cycle, so these services are also conceptualized as life-cycle service offerings (Rabetino et al., 2015). Uлага and Reinartz (2011: 15) defined product life cycle services as "services that facilitate the customer's access to the manufacturer's good and ensure its proper functioning during all stages of its life cycle, whether before, during, or after its sale". The logic behind such approaches is to support the installed base and

“capture life cycle profits associated with servicing an installed base” (Davies, 2004: 731). Intermediate services are oriented toward the product condition and usually include some type of service contract (Baines and Lightfoot, 2013). Intermediate services usually capture the higher portion of service potential through complementing spare parts with other services that include service labor (Jovanovic et al., 2016; Visnjic Kastalli et al., 2013).

Finally, the most advanced services are focused on capability delivery and include becoming an availability and performance provider (Kowalkowski et al., 2015) and models based on risk and revenue sharing (Gebauer, Saul, et al., 2017). Rolls Royce epitomized such advanced services with the concept of power-by-the-hour, Michelin with pay-per-kilometer, Xerox with pay-per-copy or Electrolux with pay-per-wash (Gebauer, Haldimann et al., 2017). Advanced services help to manage the customer’s processes more broadly, not just the product (Mathieu, 2001). Advanced services are also classified as process delegation services since the provider performs processes on behalf of the customer (Kowalkowski and Ulaga, 2017). Advanced services underline the outcome, rather than prescribing how it will be delivered or which resources and capabilities are required (Kim et al., 2007; Sumo et al., 2016). One of the main characteristics of such contracts is that they are long-term oriented and performance- and outcome-oriented (Batista et al., 2016; Ng et al., 2013). In this respect, some scholars make a distinction between asset efficiency services (focused on the performance outcome) and process support services (focused on the customer’s process) (Kowalkowski and Ulaga, 2017; Ulaga and Reinartz, 2011).

Value creation: from value-in-exchange to value-in-use

Value creation is one of the central themes in the strategic management and the marketing research. The concept of ‘value’ is multidisciplinary and it could be created by an individual, an organization, or society (Lepak et al., 2007). At the organization level of analysis, there are two main perspectives: value-in-exchange and value-in-use (Bowman and Ambrosini, 2000; Eggert et al., 2018). In the traditional value-in-exchange perspective, providers create, communicate and deliver value to customers (Eggert et al., 2018). In this approach, the customer is considered to be a passive recipient of the value (Day, 2011). In the value-in-use perspective, the value creation establishes or increases the consumer’s valuation on the benefits of consumption (value-in-use) (Priem, 2007; Ulaga, 2003) what resonates with the S-D logic of the use value (Lusch and Vargo, 2014; Vargo and Lusch, 2004).

Product manufacturing and basic services create value by value-in-exchange. Resources and capabilities are firm-driven and value is embedded within the product and transferred to the customers (Eggert et al., 2018). Moreover, resources and capabilities for delivering such services are completely on the product provider side, developed independently from the customers. Intermediate services are also firm-driven but the greater emphasis is put on the customer relationship building and customer experience of using the product. Finally, advanced services fully mirror the value-in-use concept of value creation where value is co-created and a result of shared knowledge between actors (see Figure 5) (Eggert et al., 2018; Kowalkowski, 2011).

Figure 4. Servitized value proposition and value creation
(based on Eggert et al., 2018)

Consequently, the value for industrial firms migrated from the ‘old’ product business model that supports basic services towards the (service-led) business model that creates more value for the customers (Hacklin et al., 2017; Slywotzky, 1996).

For industrial firms, changes in the external competitive environment triggered the need to reconfigure resources and capabilities in order to enable a sustainable competitive advantage (Teece et al., 1997). In order to develop new services, industrial firms need to reconfigure their existing capabilities and add new ones (Ceci and Masini, 2011; Ulaga and Reinartz, 2011). In particular, industrial firms need to integrate manufacturing and service-oriented capabilities (Davies, 2004; Windahl et al., 2004).

Sousa and da Silveira (2017) related servitization capabilities to the broader organizational capability literature (e.g., Helfat and Winter, 2011) by framing services as “new organizational processes” (Sampson and Froehle, 2009). They defined servitization capability as a “manufacturer’s ability to carry out the management (design and delivery) of the service processes it offers, repeatedly and reliably” (Sousa and da Silveira, 2017).

Servitization scholars also recognize the need to align the servitization strategy and organizational structures (Gebauer, Edvardsson et al., 2010; Raddats and Burton, 2011). Consequently, the success of the servitization is dependent on organizational structures that support such service extension (Bustinza et al., 2015; Galbraith, 2002; Raja et al., 2018). In order to accommodate the servitization, firms usually opt for a front-end/back-end model in which the front-end units are responsible for the delivery of the customized

offerings, and back-end units are focused on standardizing the components of the offering (Ceci and Masini, 2011; Davies et al., 2006; Raja et al., 2018).

Servitization scholars have mapped out different distinctive service capabilities necessary for servitization (Paiola et al., 2013; Ulaga and Reinartz, 2011). For instance, operational capabilities relate to the back-end processes that could build services efficiently and effectively (Pawar et al., 2009; Storbacka, 2011). For instance, product operations capabilities may be used to improve service processes in maintenance, repair, and replacement (Chase and Garvin, 1989). Operational capabilities are also related to process knowledge, process optimization, and process operations (Windahl and Lakemond, 2010). Cohen et al. (2006) explored customer-focused metrics that can help determine how efficiently a firm creates value for its customers, and internally-focused metrics that can quantify the way a firm uses its resources. Similarly, scholars have explored the connection between back-end and front-end capabilities in the provision of integrated solutions (Davies et al., 2006).

Furthermore, it has been argued by several scholars that sales- and marketing-related capabilities are important success factors in the growth of services (Gummerus et al., 2017; Worm et al., 2017). In particular, scholars have recognized that the services sales function is significantly different from the product sales function (Kindström et al., 2015; Sheth and Sharma, 2008). Reinartz and Ulaga (2008) have stressed the need for a service-savvy sales force. Sales and marketing capabilities are important during the transition from the service-for-free to the service-for-fee model (Witell and Löfgren, 2013). Sheth and Sharma (2008) have found that changes triggered by servitization are manifested in changes in the selection, training, and recruitment of salespeople. Finally, Ulaga and Loveland (2014) found that firms need to get deeply involved in order to set the sales organization for hybrid product-service offerings.

Additionally, researchers have explored digitalization capabilities and the concepts of big data (Opresnik and Taisch, 2015) and the internet of things (Rymaszewska et al., 2017) as enablers for servitization. In particular, such emerging technologies could address the well-known trade-off between efficiency-effectiveness (Porter and Heppelmann, 2014). Coreynen et al. (2017) have found digitalization capabilities to be an important factor in overcoming the barriers for providing advanced services.

In the case of advanced services, several authors argue that resources and capabilities do not belong only on the provider side, but are developed interactively with partners (Raddats et al., 2017; Story et al., 2017) as well as customers (Macdonald et al., 2016; Tuli et al., 2007) and require a high degree of system integration (Davies, 2004; Davies et al., 2007). Thus, for advanced services, firms increasingly rely on partners and adopt an “open business model” in order to provide new activities that are outside their core competence (Visnjic et al., 2018).

Value capture: from cost-plus to value-based pricing

Past research has suggested that manufacturers embarking on servitization will need to change the pricing strategies, the bundling options, the revenue models and the payment mechanisms (Rapaccini, 2015). In particular, marketing scholars have identified cost-, competition- and value-based pricing strategies. Basic services, such as spare parts, are priced using a cost-based strategy, sold separately (unbundled) in a transactional way (Oliva and Kallenberg, 2003; Ulaga and Reinartz, 2011). Moreover, basic services are usually priced according to a price list (Guajardo et al., 2012). As far as the channel strategy, manufacturers often partner with distributors in order to stimulate sales of basic services (Weber, 2000). Basic services call for economies of scale and geographical coverage, in which distributors play a crucial role (Jovanovic et al., 2016). On the other hand, advanced services favor channel disintermediation (excluding the intermediary) or vertical integration (acquisition of the intermediary) (Xing et al., 2017).

It is also necessary to consider the effect of product-service bundling (Kienzler and Kowalkowski, 2017; Sharma and Iyer, 2011). Marketing scholars argue that bundling is a viable option only if it creates greater value for the customer (Stremersch and Tellis, 2002). Product-service bundling creates added value for the customer in terms of one-stop shopping (Visnjic et al., 2016; Ye et al., 2012), reduced risk (Howard et al., 2016), improved reliability (Guajardo et al., 2012) or even innovation (Sumo et al., 2016). Scholars recognize that in some cases product-service bundles should be unpacked if some components are superior in the market or have a high degree of modularity (Steiner et al., 2016; Wilson et al., 1990). Consequently, bundling product and services requires taking into consideration the characteristics of the elements in the bundle as well as its business context (Kienzler and Kowalkowski, 2017).

For advanced services, value-based pricing applies (Hinterhuber, 2004; Liinamaa et al., 2016). Firms also use the variation of value-based pricing called outcome-based pricing, which involves pricing based on realized outcomes for the customer (Sawhney, 2006). In this case, the remuneration “is linked to either the product use or other operational and financial performances” (Rapaccini, 2015).

2.4. **Servitization challenges and research gaps**

A business-model perspective addresses diverse aspects of the organizational transformation required for servitization (Kindström and Kowalkowski, 2014, 2015). First, a business-model perspective gives a more complete picture of how to accommodate the shift from basic services (e.g. spare parts) to advanced services (e.g. performance-based contracts) (Baines and Lightfoot, 2013). Moreover, configurational aspect of the business model could give a perspective on how business model elements interact and lead to a higher firm performance (Aversa et al., 2015; Forkmann, Henneberg, et al., 2017a).

Second, servitization has been often discussed in terms of a repositioning along a product-service continuum (Oliva and Kallenberg, 2003). However, recent studies call for the “need to break free from the product–service continuum discourse” (Kowalkowski et al., 2015). For instance, for a number of customers, firms keep the product business model that includes product-oriented basic services, parallel to more sophisticated services (Kowalkowski et al., 2015; Windahl and Lakemond, 2010).

Third, scholars also explored the notion of competing with dual business models (Markides and Charitou, 2004; Markides, 2013) or even a business model portfolio (Aversa et al., 2017). Accordingly, scholars started to unpack the challenges related to management of tensions between the existing and the new business models (Sund et al., 2016; Winterhalter et al., 2016).

Fourth, advanced services tend to be developed only with the strategic customers with whom the provider has a long history (Kowalkowski et al., 2015). Similarly, other scholars have also argued that a very few product providers have made a complete transformation to the most advanced services (Storbacka et al., 2013) as such services require a considerable up-front investment in setting up the entire service business model (Visnjic et al., 2017). Providers tend to “industrialize” such advanced services, standardize and scale them down in order to offer them to the larger customer base (Kowalkowski, Gebauer and Oliva, 2017). In addition, several authors have suggested that some products are more difficult to accommodate to advanced services as they do not make a viable service business model for the firm (Jovanovic et al., 2016; Storbacka et al., 2013). Advanced services bring greater risks in terms of committing to

performance/outcomes providers do not have a full control of and that may affect their profitability over the period of the service contract (Hou and Neely, 2017; Visnjic et al., 2018).

Fifth, industrial firms often struggle to reconfigure their business model, which comes as no surprise since over 70% of organizational transformation efforts fail (Beer and Nohria, 2000). A number of empirical studies of servitization have shown that many industrial firms struggled with servitization (Fang et al., 2008; Gebauer et al., 2005; Kohtamäki et al., 2013; Suarez et al., 2013; Visnjic Kastalli and Van Looy, 2013), or even risked bankruptcy (Benedettini et al., 2015). For instance, Kohtamäki et al. (2013) found a non-linear impact from a firm's service offering on sales growth. Similarly, empirical results from Visnjic Kastalli and Van Looy (2013) also revealed a positive but non-linear relationship between the scale of service activities and profitability.

Finally, the relationship between servitization and the firm profitability has been widely studied (Worm et al., 2017). However, the main approaches included measuring the service offering in order to assess the performance outcomes of servitization. For instance, scholars operationalized service offerings by measuring the service ratio (service revenues in total revenues) (Fang et al., 2008; Josephson et al., 2016; Suarez et al., 2013) or the number of different service offering types (Eggert et al., 2014; Homburg et al., 2002). However, focusing on the value proposition alone may not entirely reflect the firm-level antecedents that potentially moderate the servitization process (Valtakoski, 2017).

2.5. **Research purpose and research questions**

Taking into account the aforementioned challenges product firms are facing when they shift to service-led business models, the purpose of this dissertation is to explore the implementation of servitization strategy from the business model perspective:

How do manufacturing firms transform the business model towards service-led business model?

The dissertation is split into four research questions that target different aspect of the implementation of the servitization strategy in product firms.

First, RQ1. looks at the product preconditions that may impede or assist firm's effort to servitize its product business models. The rational for such research question is that not all products may form a viable service-led business model.

- RQ1. How do product preconditions affect the service business models?

Second, RQ2. is unpacking the process of service capability building for a product firms that may allow the firm to develop and deploy advanced services. The process perspective of building service capabilities is an important one as product firms face trade-off when investing in such capabilities. The underlying question is: which activities should be prioritized at the beginning of the servitization journey and which activities make more sense to be developed later.

- RQ2. How do product firms build service capabilities for service business models?

Third, RQ3. is looking at the business model and the value creation literature with the aim to discover value drivers for service business model (in particular outcome business models). While in the traditional product manufacturing, much of the activities are driven either by efficiency and effectiveness. Yet, in the context of e-businesses, we have seen more proliferated value drivers such as, novelty, complementarity and lock-in. RQ3 aims at the servitization context in order to explore value drivers.

- RQ3. How do product firms create value with the service business models?

Finally, RQ4. is looking at the interplay between servitization strategy and service (outcome) business model and how they jointly create value. Herein, the challenge is to explore how business model is changing as product firms develops more sophisticated service offerings. In other words, how changes in the value proposition affect the business model changes. In the Figure 5 the overall outline of the thesis is presented (see Figure 5).

- RQ4. How the interplay between service market strategy and service business models jointly create value for the firm?

Figure 5. Structure of the thesis

3. Research design and methodology

3.1. Overall research design

The research was carried out in four empirical studies, which slightly diverges from the logical structure of the dissertation:

- The first study started in mid-2014, when I acquired the access to study servitization at the Swedish subsidiary of a multinational capital equipment manufacturer (the corporation is referred to as Alpha).
- The second study at Alpha was conducted in mid-2015, and the scope of the research was expanded by conducting interviews at 10 national subsidiaries of Alpha coupled with Alpha's service performance data.
- The third and the fourth study included a cross-case analysis of qualitative data from twelve companies previously collected by two co-authors (see Table 1) (Assoc. Prof. Ivanka Visnjic and Prof. Andy Neely).

3.2. Research method

Taking into account that the research questions are exploratory, a case study research design has been applied for all studies in the compilation with a grounded theory approach to data analysis (Strauss and Corbin, 1997). Case studies were chosen since they are useful for generating rich field-based insights into key managerial actions and organizational processes (Yin, 2009), as well as collecting fruitful observations about complex processes (Eisenhardt and Graebner, 2007). In addition, case studies were selected as a primary research method since they deepen the understanding of the phenomena and support the building of new theory (Eisenhardt, 1989). Moreover, case studies are generally considered appropriate in management literature for answering "how" questions about a contemporary set of events over which investigators had little or no control (Yin, 1994,) and generating multiple observations on complex relational processes (Eisenhardt & Graebner, 2007).

All case studies (Studies 1, 2, 3 and 4) addressed industrial firms, in particular capital equipment manufacturers, since most of the servitization first-movers accounted for in the literature come from this sector (Davies et al., 2007; Kowalkowski et al., 2011;

Storbacka et al., 2013; Visnjic Kastalli and Van Looy, 2013; Windahl and Lakemond, 2010). According to the literature, the context of capital equipment manufacturing is where the shift to servitization occurs most frequently and takes its most advanced forms (Neely, 2008). Moreover, services are strategically very important in this sector due to the maturity of the industry and its significantly long product lifecycles (Cusumano et al., 2015).

Next, the choice of the companies under study was deliberate. For Studies 1 and 2, Alpha matched well with the criteria since it is a global leader in the manufacturing of high-value industrial equipment. Moreover, Alpha has developed a portfolio of service offerings, such as spare parts, maintenance, repair and advanced service contracts. In addition, the author of this dissertation was also able to obtain employee-level access to the company's premises, since the corporate leadership had an interest in the research topic (Yin, 1994).

In Study 3 and Study 4, the empirical base extended to four equipment manufacturers that developed advanced services in terms of the length, scope, and complexity of the service contracts. In order to enhance the generalizability of findings, companies from other sectors that developed the outcome-based services have been also included (see Table 1). Thus, Study 3 and Study 4 focused on “advanced” outcome-based providers and the undermining elements in the adoption of such outcome business models.

Case company	Sector	Study
1	Capital equipment manufacturer (<i>Alpha</i>)	1, 2
2	Aerospace and Defence Equipment and Solution Providers (<i>Rolls Royce</i>)	3, 4
3	Train and Train Manufacturer (<i>Bombardier</i>)	3, 4
4	Construction Equipment, Services and Consulting (<i>Caterpillar</i>)	3, 4
5	Train and Train Manufacturer (<i>Hitachi</i>)	3, 4
6	IT Hardware, Software and Consulting Services	4

7	Construction and Maintenance Services	4
8	Consulting Services and Solutions	4
9	Aerospace and Defence Equipment and Solution Providers	4
10	Utility Equipment and Services (Water)	4
11	Utility Equipment and Services (Energy)	4
12	IT Hardware, Software and Consulting Services	4
13	Construction and Maintenance Services	4

Table 1. Case companies and the corresponding studies

3.3. **Research setting and sampling**

The company examined in Studies 1 and 2, Alpha, a world-leading provider of industrial equipment, maintained its leadership position for over a century by designing and selling capital equipment products that range from industrial tools to construction and mining equipment. For the majority of its customers, these products represent investment goods that will form a part of their production units for years to come. For instance, estimates indicate that the total lifecycle cost of the equipment exceeds by about eight times the cost of the initial purchase of the equipment.

At the same time, the competitive landscape was evidently changing for Alpha. The competition from the lower-cost countries threatened to existing Alpha's position. However, Alpha was regarded as the premium product provider with the highest quality standards. Consequently, the Alpha's leadership decided to focus on servitization in order to create even more value for its customers and differentiate the offering.

In Study 1, the focus was put on the cross-comparison between two servitization initiatives at Alpha's Swedish subsidiary. Study 1 had an 'insider-outsider' design and an ethnographic-inspired approach (Bartunek and Louis, 1996). I was the 'insider' with the employee-level access to the Alpha's premises and my principal supervisor and co-supervisor were the 'outsiders'. The setting was particularly fruitful, since the Swedish subsidiary of Alpha had already managed to develop advanced service contracts with

their industrial compressors division at the beginning of Study 1. Moreover, Alpha replicated the structure and approach that enabled the industrial compressors division to reach some of the most advanced forms of servitization (performance-based contracts) with its construction equipment division. However, Alpha's management struggled to replicate the success with their construction equipment division. Thus, Study 1 explored the challenges attached to the operational environment and product complexity factors that may impede the shift to servitization.

In Study 2, the focus was on ten different subsidiaries of Alpha, motivated by the fact that Alpha used a national subsidiary to implement the product and service strategy in the local market and, to do so, the subsidiary had to have its own service capability base (Daft, 2007). That was particularly useful, since it enabled us to get close to the actual activities related to the service capability base development. Focusing on the subsidiaries within one corporation and one business division was helpful as it was possible to observe variations in the process of service capability base development across different subsidiaries and, at the same time, "control" for homogeneity with respect to the product, services, as well as the base organizational structure on the level of subsidiaries (Cook and Campbell, 1979).

For several reasons, the focus of Study 2 was on the industrial compressors business division. First, the total lifecycle cost of such equipment exceeds by far the cost of the initial purchase of the equipment. As a result, Alpha management was very motivated to embrace the service potential of such equipment. Second, in a number of subsidiaries, Alpha has already successfully introduced advanced service contracts for their compressor business, such as availability and performance-based contracts.

While Alpha subsidiaries were accountable for the implementation of the service strategy in their local market, the subsidiary had considerable autonomy in terms of how this was accomplished. Therefore, while the servitization strategy and organizational framework used to implement the strategy were similar across the subsidiaries, the subsidiary capability profiles differed significantly. This resulted in variation in terms of subsidiary choices (processes), as well as success at the subsidiary level. Consequently, while Alpha built a very successful overall service strategy, its subsidiaries achieved diverse levels of success in executing this service strategy.

In Study 3, four exemplary cases of outcome-based contract providers were selected. In order to enhance the ability to compare and contrast the development of advanced services (Flyvbjerg, 2006), cases include two manufacturers from the train sector, Hitachi Rail and Bombardier Transportation, and two manufacturers from the engineering goods sector, Caterpillar and Rolls Royce. Our case selection was deliberate and representative (Yin, 1994), since these companies are the epitomes in terms of offering outcome-based contracts and advanced service contracts in general.

In Study 4, twelve cases of outcome-based contract providers were selected. In order to enhance the ability to compare and contrast the interplay on how service market strategy and service (outcome) business model co-evolved (Flyvbjerg, 2006).

3.4. **Data collection**

In Study 1, the field study lasted from February 2014 to July 2014, with some additional interviews conducted in 2015. Data were collected from three primary sources: semi-structured interviews with informants within the two divisions, observation of day-to-day operations in each division, and archival data from internal company documents, such as organizational charts, quarterly update reports, customer lists, and marketing reports. In each division, interviews began with the management and progressed to the rest of the organization to include employees in diverse roles, using the snowballing technique of interviewee identification. Overall, 19 informants, which included technicians, engineers, technical support specialists, and managers, provided a comprehensive picture of each division and its servitization journey. In addition, several field visits were conducted at the service workshops where the divisions provided repair, maintenance, and overhaul services. Finally, two major industrial contractor's representatives were interviewed who used the products of both divisions to complement and verify the picture provided by company informants.

Position in the organization	Main data gathering technique	Main triangulation technique	Desired purpose
General Manager Construction Technique	1 Interview; Annual report; Meeting handouts; Official website	Interview with contractors; Financial statements	Building understanding service strategy and goals for the future
Construction Technique Services Manager	3 interviews; 1 workshop; Internal portal; Meeting handouts	Financial statements	Overview of service-driven organizational restructuring, manufacturing equipment business specificity, competitors and current status of service development
Sales Support Service	4 interviews; 1 workshop; Internal portal; Financial statements	Observations (field visits) Financial statements	Insights about service contracts, online sales, service development constraints, service culture
Key Account Manager	1 interview	Observations (field visits); Interview with contractors	Understanding relationship with distributors, rental companies and contractors (end customers)
Construction Technique Services Sales	3 interviews; 2 workshops; Service contracts; Invoices; Price lists; Financial statements	Observations (field visits); Interview with distributors	Understanding service process handling (customer-intermediaries- manufacturer), relationship with distributors and rental company, spare parts selling strategy, service agreements strategy, warranty and extended warranty strategy, service dependencies on diversity of product (product portfolio), inter- industry flow (small firms versus big firms)
Road Construction Equipment Sales	1 interview	Observations (field visits)	Understanding high value equipment, handling services for high value equipment, existing and future strategy for warranty, extended warranty and servicing existing install base
Keep fit Manager	1 interview	Observations (field visits)	Understanding “Care plan” strategy

Service Center Manager	1 interview; 1 workshop	Observations (field visits)	Workflow in the service center, responsibility and
Portable Compressors/Generators Technician	1 interview	Shop floor (field visits)	Technical specification, possible product accessories, common malfunctions and consumables
Soil Roller Technician	1 interview	Shop floor (field visits)	Technical specification, possible product accessories, common malfunctions and consumables
Asphalt Master Construction Technique Scandinavia (Nacka)	1 interview	Observations (field visits)	Understanding this newly created position responsible for fast response in case of high value product (paver) breakdowns, paver is critical function for contractors (end customers), leveraging on competence/knowledge about product, direct relationship with customers
Contractor CTO 1	1 interview; Official website	/	Understanding major road construction contractor, relationship with industrial equipment manufacturer and distributors, strategy for equipment
Contractor Purchasing Manager 2	1 interview; Official website	/	Understanding major road construction contractor, relationship with industrial equipment manufacturer and distributors, strategy for equipment

Table 2. Interview list and data sources for Study 1

In Study 2, Alpha subsidiaries were selected on the basis of maximum variation (see Table 3) in performance indicators acquired from Alpha management. By comparing subsidiaries that vary in terms of performance, we expected to learn from the differences in subsidiary choices regarding the process of service capability development. As argued by Dosi et al. (2008), capability is a fairly large-scale unit of analysis. While “skills” are reserved for the individual level, the term “capabilities” is used for the organizational level. For instance, the skilled service sales person still needs to learn the particular product, service and technical specifications after joining an unfamiliar firm.

Consequently, the exercise of capability involves an organized activity (Dosi et al., 2008). As a result, the assessment of the capabilities was performed by focusing on managerial actions around modifying personnel (job descriptions) and introducing new processes and/or structures (Felin et al., 2012; Salvato, 2009). Thus, the focus was on the managerial actions that shaped the assets the firm possesses and the evolutionary path they adopted (Augier and Teece, 2009). For this purpose, Study 2 primarily used interviews with subsidiary managers and executives and combined this with the archival data and observations performed during subsidiary visits and corporate headquarters (Yin, 2009).

Since Alpha management approved the study, we were able to freely select and contact interviewees ourselves (Pratt, 2009). In the next step, 22 telephone interviews were conducted lasting approximately one hour each. All 22 interviews were tape-recorded and transcribed. For each of the ten subsidiaries, the general manager and service business line manager were interviewed. We started with the Service Business Line Managers (SBLM), as they were responsible for resource allocation, coordination and the orchestration of the service business. Next, we interviewed the subsidiary's General Manager (GM) as they had an overview of both product and service business units. Finally, the management at Alpha headquarters level were interviewed (CEO and President of Service Division) to acquire the external perspective of the subsidiary's service organization. The insights acquired during Study 1 were used as a basis for a semi-structured interview protocol used in a subsequent step (Kvale, 1996). The interview protocol was designed in three main sections. First, all informants were asked to provide general information about their role and career in their organization to set the context. Furthermore, we inquired about the history of the subsidiary in order to become familiar with Alpha's terminology (Fontana and Frey, 1998). Afterward, the focus was on the managerial actions related to changes in personnel, roles, processes and structures. We asked which of the changes had the most impact on each of the three indicators of service performance (service coverage, service portfolio advancement and service efficiency). Then, we asked question regarding the conflicts and tension between product and service business units that may occurred during the development of service business. Finally, the informants verified that our notes and graphs represented a valid interpretation of the subsidiary's history. To counter disadvantages inherited from

partially retrospective data collection, we concentrated on concrete events, structural characteristics and decision-making examples to mitigate retrospective and cognitive bias (Miller et al., 1997; Miller and Salkind, 2001). Another facet of our research design was helpful in countering retrospective bias: subsidiaries were operating at different stages of their service journey when we interviewed them, and while some subsidiaries had already introduced advanced service offerings prior to our interview phase, others were at the development stage throughout the course of our data collection. We replicated the logic employed by Zimmermann, Raisch, & Birkinshaw (2015) to benefit from retrospective data and combine them with current data to mitigate retrospective bias (Miller et al., 1997).

Sample selection						Data collection	
Sub-sidiary	Market develop-ment	Service coverage ²	Service portfolio advancement	Service efficiency (%)	Overall performance	Senior manager	General Manager
AUA	Higher	0.55 (7)	0.022 (5)	13.85 (2)	14	1	1
ADE	Higher	0.40 (2)	0.128 (8)	33.09 (9)	19	1	1
BGA	Higher	0.66 (9)	0.172 (9)	12.44 (1)	19	1	1
BRP	Lower	0.34 (1)	0.068 (7)	21.35 (5)	13	1	1
ESA	Higher	0.62 (8)	0.009 (4)	20.19 (4)	16	1	1
GBA	Higher	0.54 (6)	0.236 (10)	30.06 (8)	24	1	1
HOL	Higher	0.41 (3)	0.027 (6)	25.99 (6)	15	1	1
RUA	Lower	0.46 (4)	0.001 (1)	14.94 (3)	8	1	1
SHT	Lower	0.48 (5)	0.003 (2)	36.16 (10)	17	1	1
THD	Lower	0.72 (10)	0.003 (2)	27.44 (7)	19	1	1
						1 interview with the President and CEO 1 interview with the VP for Services	

Table 3. Subsidiary selection and data collection for Study 2

² Values in brackets represent the ranking of the subsidiary relative to the other subsidiaries. 1 is lowest and 10 is highest

In parallel with the interviews, the study of internal company documents was conducted, including company presentations, organizational charts, organograms and annual reports. Archival data were used to understand formal and structural aspects of the subsidiary as well as to track the evolutionary aspects of the managerial practices deployed in the subsidiary. Table 3 provides an overview of data collection and data analysis efforts.

In study 3, I was not personally involved in the data collection phase, but executed the data analysis. In the data-collection phase, data from semi-structured interviews was combined with archival data, such as company reports, financial data and historical records. My co-authors conducted 25 interviews, targeting mainly top management, project managers and informants who had a comprehensive picture of the entire business model orchestrated toward meeting the requirements of the outcome-based contracts. All 25 interviews were tape-recorded and transcribed. In particular, interviews focused on the value drivers that firms encountered and employed as they shifted to an outcome business model. In addition, probes were asked in order to gain further insights where appropriate.

	Type	Organizational level*	Period	Representatives from participating companies			
				Caterpillar	Hitachi	Rolls Royce	Bombardier
1	F2F interview, site visit	General Manager	Dec-10		x		
2	F2F interview, site visit	Business Analysis Director	Dec-10			x	
3	Phone interview	Business Development Director	Dec-10	x			
4	F2F interview, site visit	Service Manager	Jan-11	x			
5	F2F interview	Maintenance Manager	Apr-11		x		
6	F2F interview, site visit	Data Analytics Manager	Jun-11				x
7	F2F interview, site visit	Maintenance Manager	Jun-11				x

8	F2F interview, site visit	Data Analyst	Jun-11				x
9	F2F interview, site visit	Service Manager	Jun-11				x
10	F2F interview	Managing Director	Sep-11		x		
11	F2F interview, site visit	Division Manager	Sep-11	x			
12	F2F interview	Director	Sep-11	x			
13	F2F Interview	Strategy Manager	Sep-11	x			
14	F2F Interview	Vice President	Dec-11	x			
15	F2F interview	Service Business Operations	Sep-12			x	
16	F2F interview	Product Support Operations	Jan-14	x			
17	F2F interview	Digital & Technology Director	Jan-14	x			x
18	F2F interview	Service Manager	Mar-14	x			
19	F2F Interview	Global Service Solutions and Customer Experience	May-14			x	
20	F2F Interview	Dealer Service and Support	Oct-14			x	
21	F2F Interview	Business Development Director	Nov-14			x	
22	F2F Interview	Operations Executive	Nov-14			x	
23	F2F Interview	Services Executive	Nov-14			x	
24	F2F interview	Global Head of Customer and Product Training	Nov-14		x		
25	F2F interview	Director of Customer Experience	Mar-15	x			

Table 4. Data collection for Study 3

In study 4, I was not personally involved in the data collection phase, but executed the data analysis. In the data-collection phase, data from semi-structured interviews was combined with archival data, such as company reports, financial data and historical records. My co-authors conducted over 42 interviews with each of the 12 selected firms.

The interviewees included business leads, service design engineers, head of capability development, head of systems engineering, head of strategy and planning, head of service units, head of business analysis, president of services business, head of services research and development etc. In particular, interviews focused on the process of how the value proposition changed from selling product to services to outcomes and how the business model change to accommodate such transition (see Table 5).

Study	Case company	Research theme	Data collection	Data analysis
Study 1	Alpha Sweden Alpha HQ	Two servitization initiatives at the Swedish subsidiary – cross-comparison	19 face-to-face interviews On-site observation Employee-level access	Ethnography-inspired Insider-outsider Case history Cross-comparison
Study 2	10 Alpha subsidiaries – US, China, Australia, Belgium, Spain, Germany, Thailand, UK, Russia, Brazil	Juxtaposing ten subsidiary capability based Subsidiary selection based on maximum variation Performance indicators: service coverage index, service portfolio index, service margin index	22 telephone interviews 10 Subsidiary General Managers 10 Subsidiary SBLMs 1 CEO Alpha 1 President of Service Division	Case histories Process maps First order, second order and aggregate categories
Study 3	Rolls-Royce, Caterpillar, Hitachi and Bombardier	Exemplary cases of advanced	25 face-to-face interviews	Coding, Cross-case analysis, First order,

		outcome-based contracts		second order and aggregate categories
Study 4	12 firms from various sectors. Aerospace and defense providers, train manufacturers, construction equipment, IT hardware and software providers, utility equipment, consulting services	Firms that evolved their market strategy from selling products to selling services to selling outcomes.	Over 42 interviews with each of the 12 firms	Coding Cross-case analysis First order, second order and aggregate categories

Table 5. Overall data collection and data analysis for all four studies

3.5. Data analysis

For Studies 1, 2, 3 and 4 the grounded theory approach of initial coding, writing memos, advanced coding and theoretical integration was followed (Birks and Mills, 2011; Corbin and Strauss, 1990). Specifically, data analysis started off with the writing the case histories that followed with the initial coding and categorization of data (first-order codes) and then progressed to writing and revising memos for each subsidiary transformation pathway and performing comparative analyses. Research units varies across studies: two divisions in the case of Study 1, ten subsidiaries in the case of Study 2, 4 outcome-based providers in the case of Study 3 and 13 outcome-based providers in the case of Study 4. For each research unit, case histories were created to map out the most important events related to changes in the service business (e.g., product characteristics, hiring people, changing roles, introducing new processes and organizational structures), and we created an evolutionary map of the changes that occurred in each subsidiary. For Study 1, we used case histories to derive a cross-comparison table with different contextual characteristics for two product lines, compressors and construction equipment (see Figure 6).

For other studies, case histories were used to create a list of first-order codes. The second step included the identification of second-order categories. In other words, we linked our first-order codes back to previous theoretical constructs from the literature (Gioia et al., 2013; Suddaby, 2006). More specifically, we compared the list of the first-order codes with the theoretical constructs from the literature and found corresponding second-order categories.

Characteristic	Compressors	Construction Equipment
<i>Product Function</i>		
Role of product in customer's business	Critical ancillary input to customers' value creation processes	Core element of customers' value creation processes
Total cost of ownership vs. Initial Investment	Significant	Not significant
Financial risk in case of breakdown	Very high	Low
<i>Product Operation</i>		
Operating environment	Stationary, indoors	Movable, outdoors, often at remote locations
Level of automation	High. Self-contained product technology	Low to medium. Customer operates products and fixes minor breakdowns
Variance in operations	Low	High
Product performance	Direct relation between performance and customer cost savings	Operators affect performance significantly
Connectedness	Yes. Measurements of equipment performance	No
<i>Product Provisioning</i>		
Primary customers	Industrial companies of any size or type	Major building contractors, equipment rental companies
Sales channels	Direct	Indirect to contractors via distributors or rental companies
Service provision	Direct	Major contractors operate in-house services. Local workshops at distributors and rental companies

Figure 6. Data analysis for Study 1

Thus, we classified first-order codes into the second-order categories. For example, in Study 2, leveraging the existing product sales force to sell services was the initial way of fostering service coverage. First order codes like “incentivizing to sell services” and “leveraging product sales” were linked to “hybrid offering sales capabilities” (Ulaga and Reinartz, 2011). Thus, second-order categories were drawn from the available literature. Finally, we grouped second order categories into aggregate dimensions (e.g. presence, progress and process) to delineate different stages and to better explain the sequence.

Figure 7. Data analysis for Study 2

In Study 3, existing value drivers drawn from the business model literature were an aggregate dimension (Amit and Zott, 2001), so first-order and second-order categories were grouped around value drivers as an aggregate category. Value drivers identified by Amit and Zott (2001) were complementarity, lock-in, efficiency, novelty. Additionally, during the second coding, we create a new value driver category that emerged from the data and we labeled 'accountability' (See Figure 8).

In Study 4, interviews were recorded and then transcribed, while background data were collected from secondary sources in parallel (Yin, 1994). Transcripts were first coded with respect to their fit with the broad categories defined in the literature (market strategy and business model/activity system design) (Corbin and Strauss, 1990).

Figure 8. Data analysis for Study 3

During the second coding, new subcategories were allowed to emerge with particular emphasis on the change (Corbin and Strauss, 1990; Birks and Mills, 2011). For market strategy change, important changes in **scope**, **time** and **outcome** were recognized. Similarly, for business model change, three subcategories of activities that were the most affected by the shift to an outcome business model were distilled: these were labelled **internal**, **supplier**, and **partner**. After analyzing the business models of each individual firm independently, two researchers instituted an independent cross-firm analysis.

MARKET STRATEGY CHANGE	BUSINESS MODEL CHANGE
<p>1: <u>Scope</u>- From spare parts delivery to spares inventory management. <u>Time</u>- From ad-hoc supply of spares to a multi-year contract (up to 5 years). <u>Outcome</u>- Now guaranteeing spares availability for target cost (price/km of vehicle use).</p>	<p><u>Internal</u>- New activities to manage the inventory, investments in inventory IT systems. <u>Suppliers</u>- Increase in complexity of the supply chain- number of suppliers. <u>Partners</u>- Started partnering for delivery of spares for partner's vehicles.</p>
<p>2: <u>Scope</u>- From train sales to through-life train asset management service portfolio. <u>Time</u>- From ad-hoc maintenance service provision to multi- year contracts. <u>Outcome</u>- Now penalty clauses and revenue share incentives (e.g. energy efficiency).</p>	<p><u>Internal</u>-New data diagnostics experts and systems service business model adoption. <u>Suppliers</u>-New technical support and spares supply contracts w/ suppliers. <u>Partners</u>-Started partnering for provision of technical support and spare supplies.</p>
<p>3: <u>Scope</u>- From warehousing to 24 supply chain (SC) related services. <u>Time</u>- From commodity services of 1-2 years, to customized 5-year contracts. <u>Outcome</u>- Contracts w/ guaranteed availability of inventory including maintenance, repair and operations (MRO) processes.</p>	<p><u>Internal</u>-Developed internal knowledge on inventory management. <u>Suppliers</u>-Subcontracting the transportation services. <u>Partners</u>-Partnering w/ consulting and software firm to develop SC software</p>
<p>4: <u>Scope</u>- From trains to train solutions (refurbishment, full rebuild and cleaning). <u>Time</u>- From ad hoc to 7-9 years and finally 27 (7+20) years. <u>Outcome</u>- Charging for usage guaranteeing availability, reliability and cleanliness.</p>	<p><u>Internal</u>-Hired with well-trained and experienced service staff that do a range of jobs. <u>Suppliers</u>-Extended contracts with their suppliers into spares supply. <u>Partners</u>-Partnering with depot developers to finance train ownership.</p>
<p>5: <u>Scope</u>- From hardware to services and integrated solutions. <u>Time</u>- Post-merger integration IT projects last between 36 and 60 months. <u>Outcome</u>- A structured process to assess the possibility and the level of guarantee.</p>	<p><u>Internal</u>-Came up with structured engineering process to assess guarantee offerings. <u>Suppliers</u>-Collaborate to fill their skills gaps (e.g. for specialized software). <u>Partners</u>-Global research network (3500 pure researchers)</p>
<p>6: <u>Scope</u>- From blue-collar services (road repair) to all city support services. <u>Time</u>- From one-off projects to 5- year contracts and above. <u>Outcome</u>- Revenue-sharing agreements based on cost targets</p>	<p><u>Internal</u>-Substantial expansion through acquisition of support-service providers. <u>Suppliers</u>-MAG relies on the supply network of small local service providers. <u>Partners</u>-Partnering with IT provider to generate data for all city support services</p>
<p>7: <u>Scope</u>- From connecting clients to research community to helping in problem definition. <u>Time</u>- Developing into long-term relationships where NIS works closely with clients. <u>Outcome</u>- Vouching with reputation that found solution does not exist elsewhere.</p>	<p><u>Internal</u>-NIS hired PhDs in diverse fields to translate and generalize problems. <u>Partners</u>-NIS nurtures network of 2 million researchers</p>

<p>8: Scope- From selling engines to selling engine capacity. Time- From ad-hoc supply of spares to long-term contracting for capability. Outcome- Guaranteeing engine performance, in terms of availability and reliability.</p>	<p>Internal-Monitoring room to track engines in real-time on civil aircraft. Suppliers- Extensive product and technology supply chain. Partners-Integrated solution delivery in partnership w/ other service firms</p>
<p>9: Scope- From clean water to all-water and ‘door-to-door’ solutions. Time- Working under 20-year rolling contracts. Outcome- Delivery of service is measured by 20 KPIs. (e.g. leakages, quality).</p>	<p>Internal-Investing in data analytics using social media for customer support. Suppliers-Outsourcing to third parties (e.g. private drains and sewage leakage). Partners-Partners with engineering firms for designing and building water wells.</p>
<p>10: Scope- From energy data reading to smart meter installations and data analytics. Time- Starts with pilots (install one or two smart meters), to get long-term renewal contracts (3 years and more). Outcome- Paid for quality data only; not all data collected</p>	<p>Internal-Invested in data analytics competencies. Suppliers-Relies on workforce solution providers for management of field workers. Partners- Partnering with offshore wind farms solution providers.</p>
<p>11: Scope- A set of 8 interrelated IT support services to citizens. Time- The partnership, which is set to run for an initial period of 10 years, began in 2007. Outcome- Provider makes 100% of the profits and covers 100% of the losses.</p>	<p>Internal-Created entirely new organization with novel organization- a JV with clients. Suppliers-Each of the partners brought its own suppliers Partners-Services partly provided by the three JV partners- city councils.</p>
<p>12: Scope- From ad-hoc construction services to facility management solutions. Time- From ad-hoc services to 3-5 years contracts to 25-40 years contracts. Outcome- Contracts for facility service availability with response time penalties.</p>	<p>Internal-Consolidated scattered service outlets in a consolidated service chain. Suppliers-New service data IT system for a nationwide network. Partners-Partnering with an IT company to ensure full integration with the client’s system.</p>

Table 5. Data analysis for study 4

Study	Research question of the specific studies	Unit of analysis	Methodology	Domain theory
1	How do product preconditions affect the service business models?	Two business units	Qualitative	Operations management Servitization
2	How do product firms build service capabilities for service business models?	Ten country subsidiaries of multinational corporation (MNC)	Mixed Qualitative and performance data	Capability literature Service capabilities Process perspective
3	How do product firms create value with the service business models?	4 exemplary cases of outcome-based contract providers	Qualitative	Business Model Literature Value creation literature
4	How the interplay between service market strategy and service business models jointly create value for the firm?	12 firms with an outcome-based contracts	Qualitative	Business Model Literature Open Innovation literature Value creation literature

Table 6. Overview of research questions, unit of analysis, methods and domain theories

4. Results and discussions

The companies included in this dissertation revealed a common pattern with respect to how they approached servitization, which services they started to develop and deploy, and how they created a viable servitized business model. Putting the findings together, the thesis indicates a pattern of three archetypes of business models for servitization in manufacturing firms: (1) the product business model; (2) the service business model; and (3) the outcome business model. In the following sections these archetypes and the interplay between the business model elements are presented.

4.1. Product Business Model

The main case company in this dissertation, Alpha, is a traditional industrial firm that has been selling high quality, premium, capital equipment products to industrial customers (B2B) for more than 140 years. The point of departure for Alpha was the spare parts model, since it historically complemented the product offering. Alpha's product portfolio offered great service potential in terms of increasing the scope of the market offering that included spare parts, ad-hoc repairs and consumables – basic services. Alpha had strong manufacturing competences that enabled them to deliver such product-centric services.

In particular, Study 1 showed that the business model for basic services did not significantly differ from the traditional product business model, in which Alpha sold products directly or via a retail sales model. As basic services were standardized with a large variability in components, Alpha tended to economize on retail distribution, which allowed them to reach a larger customer base and gain territorial coverage. Findings from the second study, which covered 10 of Alpha's national subsidiaries, confirmed that the basic services promoted the indirect sales through distributors or rental companies. Indirect sales allowed the firm to leverage on the distributor's local presence, but also knowledge of the local market. In particular, Study 2 showed that distributors also bring agility, local practices, relationships with customers, access to the right resources and the right location in the territory that they cover. That way, Alpha's subsidiaries leveraged on the resources and capabilities that are outside Alpha's core.

In Study 4, specific cases showed that the combination of company-owned and independent (authorized) distributors might also make a successful case for basic service provision (but more advanced services as well). In particular, some cases from Study 4 show that firms need to actively manage their distributor's network. For instance, firms may decide to specialize with some distributors on low-volume and high-margin products, while focusing with others on high-volume and low-margin products (e.g. Caterpillar). On the other hand, for specific product and service components, firms may be heavily reliant on the distributors. In that respect, the distributor's close proximity to customers may create new types of dependencies between the firms and the distributors.

From the in-house capability development perspective, the findings indicate that the key capabilities for basic services are related to the effectiveness and efficiency of the service delivery. Study 1 and Study 2 revealed that key service capabilities rely on basic service execution (e.g. skilled technicians). In particular, Study 2 suggested that firms could differentiate their offerings by recruiting and training service generalists/technicians with the skills to deliver high quality basic services. In addition, basic services were a useful way to build a large and loyal customer base. For industrial firms with a superior brand, like Alpha, the local presence achieved by service generalists can constitute a fruitful base for gaining customer insights for up-selling and cross-selling of other types of services. Study 2 also suggested that Alpha's subsidiaries were successfully penetrating basic services by incentivizing the existing product sales personnel to sell services.

Finally, Study 1 showed that basic services are typically priced on the component level in a traditional cost-plus fashion or competitive/market-based pricing. As previously argued, such pricing activities are consistent with the use of distributors for delivery since they help product providers gain greater access to the largest number of potential customers and, most importantly, scale up the sales of basic services.

4.2. Service Business Model

Intermediate services differ from the basic services in two ways: (1) they bundle product sales with maintenance, support, and other services around the service contract; (2) they extend the time-frame of the service contract. Study 1 showed that Alpha was gradually trying to tailor and customize services to meet specific customer demands. Similarly, Study 1 showed that as value proposition was becoming more sophisticated, the service

delivery required narrowing down the scope of the product base and favoring self-contained products with fewer context-related interferences that are difficult to model and predict.

In order to support the advancement of the service offer, Study 2 found that Alpha needed to develop specialized service capabilities. In regard to this, Study 2 highlighted the critical event of separating the service business unit from the traditional product business. This organizational design solution gave more independence to the service sales function, which was previously subordinate to the product sales function. Thus, in order to promote the service contracts, a specialized service sales force capable of demonstrating service values was set up. Furthermore, rolling out the service sales was an initial trigger, followed by a need to further develop specialized back-end service capabilities such as service marketing and service R&D capabilities. Consequently, the service marketing competences included offering customization, customer segmentation and assessing the customer's lifetime value. On the other hand, service R&D capabilities relate to the in-house consultancy that supported all "front-end" service activities. Service R&D capability brought granularity and a breakdown of the service costs as well as assisting the service personnel during the repair process and resolving the customer's inquiries.

Finally, Study 4 demonstrated that while intermediate services help generate higher service revenues, they are also associated with high resource and capability investments. While basic services showed a relatively quick return on investment (new service technicians versus basic service revenues), service contracts require significant investments in service capabilities as well as experimentation in order to generate and test different capability configurations. Consequently, service contracts impose higher risks of creating a non-viable business model.

Study 2 found that the structural separation helped grow the service business by keeping the nascent service business away from the dominating product business culture. However, Study 2 also showed that structural separation contributed to conflict escalation and created boundaries (functional "silos") as business units attempted to maximize business unit performance rather than the overarching goals of the firm.

In addition, Study 2 and Study 3 showed that distributors also fueled conflicts, since product business units and service business units experienced contradictory benefits with

the distributors. Service sales personnel objected to any indirect channel strategy since distributors also competed for the customer's service potential. Consequently, any indirect sales via distributors would potentially impede the follow-up service sales.

Study 2, Study 3 and Study 4 showed that the intermediate services require value-based selling and value capture mechanisms that price product-service bundles. In particular, Study 1 and Study 4 discussed that the bundling effects create additional value for customers in terms of one-stop shopping, reduced search costs, increased efficiency and interoperability and complementarity gains. All of these aspects allowed firms to charge for the premium.

4.3. Outcome Business Model

The advanced services encompass service contracts that include accountability in terms of performance or outcome guarantees. Study 3 explicitly addressed outcome-based services by investigating the cases of Rolls Royce, Caterpillar, Hitachi and Bombardier, in addition to Alpha, which has also developed such services for its industrial compressors division. The findings demarcated two stages in the development of advanced services. In the first stage, the value proposition is defined in terms of specific outcomes the provider commits to. In the second stage, the provider orchestrates the activities that ensure the outcomes are met. Study 4 showed that while provider completely removes the market uncertainty with a signed long-term service contract in the first stage, the provider faces the service delivery uncertainty in the second stage.

Study 2 showed that in-house developing capabilities for advanced services requires a considerable upfront investment. Nevertheless, cases from Study 4 showed that firms needed to engage wider networks of partners and suppliers to develop and deploy advanced services. In Study 4, advanced service providers prefer to keep the core competences and outsource the activities outside the provider's core to suppliers and partners. This enabled firms to deliver the advanced services in a cost-efficient way.

Information and communication technologies (ICT) represent a critical enabler for the advanced services. Study 4 revealed that firms used ICT in order to achieve operational efficiencies and responsiveness to customer demands, reduce costs, minimize equipment downtime, provide insights for predictive maintenance services and increase value for

the customer. ICT also helped in the management of business processes across organizational boundaries.

To a large extent, advanced services essentially internalize specific customer's activities. However, findings suggest that there are two different approaches: (1) advanced services can be oriented toward the installed base operations; and (2) advanced services can be oriented toward the customer's process (in order to improve, optimize or fully outsource the customer's processes).

Results from Study 1 suggested that not all products (installed bases) were suitable for advanced services. First, findings indicated that the role of the product in the customers' processes may determine the likelihood of success for the advanced services. Alpha's customers were more prone to accept the advanced services in cases in which the installed base was associated with a high total cost of ownership, high risk, and high cost in the event of failure. Second, Alpha's customers were likely to accept the advanced services if the products were self-contained and could be assessed in the context of the "product-in-use".

On the other hand, advanced services oriented toward the customer process allow customers to focus on their core business model. For instance, Study 4 showed that machinery providers may target to internalize following customer's processes: inventory management, purchasing, service loss analysis, availability checks and warehouse optimization.

All case studies suggested risk-high and high-reward in the case of advanced services. Moreover, providers are effectively "importing risks and uncertainties" with the advanced services, both foreseen and unforeseen. Thus, the findings from Study 4 revealed that these unforeseen risks and uncertainties might represent a significant source of value loss. Moreover, the findings of Study 1 also suggest that the success of advanced services depends on the ability to manage risk related to increased dependency on the partners and suppliers as well as increased accountability to customers.

The findings from Study 1 and Study 2 suggested that both intermediate and advanced services favor direct access to the customers. Downstream intermediaries in the distribution channel, such as distributors and specialized multivendor service providers, tend to compete for the service potential with the provider. On the other hand, findings

from Study 4 suggest that a network of authorized distributors may also be a successful scenario for advanced services.

Finally, value capture activities for advanced services are directly linked to specified outcomes at the contract design stage. Consequently, value capture activities are associated with the service contract design; that is, what kinds of measures, timeframe, and outcomes should be included in a contract.

4.4. Factors Driving Business Model Archetypes in Servitization

The findings pinpointed several factors driving the business model archetypes in servitization of manufacturing firms. The factors were grouped around key business model elements: the value proposition, the value creation and the value capture.

The value proposition represents the firm's product-service offering. Findings distilled several factors affected by the service offering type. Clearly, offering customization was gradually increasing from basic to more advanced services while the target customer base was decreasing. The extension in the scope, time frame and accountability was also associated with the shift from basic to more advanced service offerings. Installed base characteristics ranged from high variability in the case of basic services while more advanced services concerned the possibility to monitor and predict how the product is delivering. Basic services did not internalize customer's process, while more advanced services were designed to internalize the product-related services or fully internalize the customer's entire process.

When it comes to the value creation business model element, capabilities clearly varied from the internally-developed manufacturing capabilities and basic ad-hoc service capabilities, to more sophisticated and specialized service capabilities. At the most advanced levels, findings point to the need to orchestrate the service delivery system composed of internal and specialized external (partner and supplier) capabilities. From the organizational design perspective, firms make minor changes in order to accommodate basic services. On the other hand, intermediate services require a structural separation and creation of a stand-alone service business unit. Advanced services require inter-organizational integration and a system of activities that spans the focal firm's boundaries. The sales process also ranged from the transactional to relationship, while at

the advanced service level it required firms to engage in defining and designing the service contract as part of the sales process. Finally, the delivery focus varied from the classical retail model to building cost-effectiveness within or beyond the focal firm's boundaries.

The pricing strategy ranged from a traditional manufacturing cost-plus model to a competitive- and value-based pricing model. The basic services are usually sold on the component level, while more advanced services include product-service bundles and solutions addressing specific customer needs. Finally, the revenue model for basic services is frequently "payment per unit," while more sophisticated services include some form of flat rate service contract.

Finally, Table 7. systematically presents fine-grained factors belonging to key business model elements for each of the three business model archetypes: the product business model, the service business model, and the outcome business model.

BM element	Key factors	Product BM	Service BM	Outcome BM
Value proposition	<i>Service type</i>	Basic services	Intermediate service	Advanced services
	<i>Offering customization</i>	Standardized	Semi-customized	Fully customized
	<i>Offering base</i>	Scope (product and services)	Time-frame (service contracts)	Accountability (availability and outcome)
	<i>Target customer base</i>	Large	Small	One-on-one
	<i>Variability of the installed base</i>	High variability	Low-variability	Self-contained base

	<i>Internalizing customer's processes</i>	Not internalized (warranty and support services)	Internalizing product-related services	Fully internalizing customer's processes
Value creation	<i>Capabilities</i>	Manufacturing Product sales Basic service	Service sales Service marketing Service operations Service R&D	Orchestration Digitalization Contract design capabilities
	<i>Organizational design</i>	Adding service technicians	Structural separation Service BU P&L responsibility	Inter-organizational integration Network of suppliers and partners
	<i>Sales process</i>	Transactional Separate product and add-on service sales	Relationship Equal importance given to both product and service sales	Relationship Defining and designing the outcome-based contract
	<i>Delivery focus</i>	Retail model Distributors Rentals	Internal delivery with external support Improving internal cost-effectiveness	Collaborative internal and external delivery Improving cost-effectiveness of the service system
	<i>Pricing strategy</i>	Cost-plus or Competitive-based	Value-based or Competitive-based	Value-based

Value capture	<i>Product-service bundling</i>	Separate Component	Product-service bundles	Solutions
	<i>Revenue model</i>	Payment per item	Payment per item and flat rate service contract	Outcome based Flat rate service contracts Pay-Per-Use

Table 7. Factors corresponding to three business model archetypes

5. Conclusions and contributions

This dissertation has some obvious limitations. It relies on the in-depth case studies of five leading capital equipment manufacturers. Thus, the findings should be considered applicable primarily to contexts characterized by similar conditions. Furthermore, the dissertation mainly addresses servitization in the business-to-business context (B2B). In addition, the presented case studies focused primarily on the providers that started servitization with internal capability development and gradually began to leverage on the external capabilities only at the most advanced stages of servitization. For instance, approaches to acquiring service capabilities via merger and acquisition (M&A) may require a different business model. Moreover, all manufacturers operated in the mature stage of the industry life cycle so exploring servitization in the emerging industries might provide a different picture. However, assuming that the present findings are generally valid, there are several issues that call for further inquiry.

5.1. Initiating the servitization transformation

The literature suggests that the success of the servitization strategy hinges on the ability to formulate and plan a deliberate strategy (Gebauer and Fleisch, 2007; Mintzberg and Waters, 1985). On the other hand, scholars have also found that the servitization strategy is emergent and unfolds in an incremental way (Kowalkowski et al., 2012; Sirén et al., 2012). As servitization implies a strategic change that affects all elements of the business model (Kindström and Kowalkowski, 2015), different business model configurations emerge. It has been argued that the business model represent firm's realized strategy or how strategy unfolded in practice (Casadesus-Masanell and Ricart, 2010). Yet, there is little discussion about the relationship between business model elements during this change. Based on the findings from the studies of industrial product firms that embark on a servitization strategy, the dissertation explores the dynamics between different business model elements.

Findings in this dissertation suggest that firms usually have a planned, top-down management directive that focuses on the value proposition; that is, to move from basic to more advanced service offerings. However, the value creation activities to

accommodate such extensions are usually emergent (Sirén et al., 2012). The value proposition in the product business model includes extensions in the scope of the offering (product plus services) (Visnjic et al., 2018). Dissertation findings support the claims in the early literature that industrial firms should start off with delivering (basic) services they are particularly good at (Chase and Garvin, 1989). Similarly, in line with the previous literature, my findings have also shown that building trust and customer relationship are important success factors at this stage of servitization (Brax and Jonsson, 2009; Gebauer and Fleisch, 2007).

My findings highlight that industrial firms may extract multiple benefits from basic service delivery. Basic services have the ability to quickly maximize the expected benefits of investing in the required resources and capabilities. In the context of product firms, and especially those firms with a trusted brand, basic services entail low costs for service delivery and customer acquisition (Shankar et al., 2009). Thus, basic services establish the customer relationship and generate revenues with relatively low effort. Basic service delivery also establishes the infrastructure around the entire geographic area, thereby laying the foundation for economies of scale and territory coverage for the service organization. This may be supported by using distributors and wholesalers in the sales channel (Jovanovic et al., 2016). Thus, a provider may initiate the relationship with the larger customer base that could be leveraged for introducing more sophisticated services later on. This is in line with the research of Visnjic Kastalli and Van Looy (2013), who found that profits come easier during the initial steps of servicing. Basic service provision gives the provider a sense of offering-market dynamics and key cost drivers of the service business. These factors may facilitate the servitization process and reduce risk associated with the negative returns on service investments (Gebauer et al., 2005; Visnjic Kastalli and Van Looy, 2013).

Consequently, this experience-based knowledge with basic services gives managers unique productive opportunities to create greater value for customers later on (Penrose, 1959). The basic service delivery gives managers resource slack (Daniel et al., 2004) and the bundle of managerial experiences to further develop service business (Kor, 2003).

Moreover, the findings are in line with the research of Kowalkowski et al. (2012), who argued that future managerial choices build incrementally on the previous choices.

Since the research draws on the in-house organic growth of the service capabilities (Gebauer and Fleisch, 2007), the findings may inform servitization in small and medium enterprises (SME) literature since such firms often lack the necessary resources (e.g. staff, competences, finances) to develop and deploy services (Clegg et al., 2017; Confente et al., 2015; Kowalkowski et al., 2013). Similarly, the findings may link servitization to the corporate entrepreneurship literature since service development may “require changes in the pattern of resource deployment and the creation of new capabilities to add new possibilities for positioning in markets” (Stopford and Baden-Fuller, 1994: 4).

The findings identified two groups of service capabilities for the product business model. First, the basic service capabilities refer to the activities through which an organization acquires, trains and coordinates service technicians responsible for frequent customer visits, ad hoc repairs and initial lead generation in terms of cross-selling product-oriented services. Second, the hybrid sales capabilities, in line with the research of Ulaga and Reinartz (2011), encompasses activities associated with incentivizing product sales to sell services, and the coordination of the growing numbers of service technicians, as well as customer interactions. Yet, my findings also change the hybrid sales capabilities from the person-centric view of the capability to a more organization-wide construct (see Dosi et al., 2008).

5.2. Advancing the servitization transformation

The value proposition in the service business model encompasses more sophisticated service contracts that imply an extension of the offering’s time frame (Visnjic et al., 2018). In order to extend the service offer, most studies argue that the separate service organization is necessary (Gebauer et al., 2005). My findings expand this argument by showing the importance of the act of splitting out the service sales function, as it represents an initial trigger for the structural separation at the organization level. Consequently, the act of splitting out the service sales from the product/equipment sales function is considered to be a pivotal point.

Moreover, my findings suggest that the adjustment of product salesperson incentive systems are insufficient to promote advanced service offerings. Consequently, findings support the claims that specialized service sales force capable of demonstrating service-specific value is required (Kindström and Kowalkowski, 2014; Shah et al., 2006; Ulaga and Loveland, 2014).

Apart from the specialized service salesforce, the service marketing function needs to be expanded in the areas of service offering customization, customer segmentation and assessing customer lifetime value (Terho et al., 2012). On the other hand, service R&D capabilities are related to an in-house “back-end” consultancy that supports both “front-end” service salesforce and service marketing. Service R&D capability brings granularity and break down the service costs, as well as synchronize and facilitate the sales process, repair process, and any customer inquiry. While these capabilities have been already identified in the literature, my findings bring fine-grained attributes that underpin these capabilities.

In addition, my findings point to the importance of the triadic relationship between, service salesforce, service marketing and service R&D capabilities. While others have explored such capabilities independently, this dissertation shows an important interplay among service salesforce, service marketing, and service R&D achieved through knowledge sharing and cross-functional collaborations (c.f. Biggemann et al., 2013). Thus, while separate servitization studies point to each of these capabilities independently (Reinartz and Ulaga, 2008; Ulaga and Loveland, 2014), my findings elaborate on their interaction and support the argument that they are best developed jointly (c.f. Rönnerberg Sjödin et al., 2016). However, the dynamics between the different service capabilities could be potentially very difficult to manage, and require trial-and-error learning (Sosna et al., 2010) in order to reach the optimal configuration of service capabilities (Raddats et al., 2015; Rönnerberg Sjödin et al., 2016; Wales et al., 2013). In that way, my findings contribute to the literature on service capability configurations in servitization.

Unlike in the case of the product business model, which requires modest investment and substantially mobilizes the existing resources of the product organization, the service business model is more resource-intensive. In particular, highly customized service

contracts are usually the main cost driver. However, the case studies suggest that, without committing this investment, organizations fail to develop more sophisticated services. On the other hand, service business model brings customer retention and financial stability due to time-frame extension of the service offering. Thus, the critical factor for service business models relies on the ability to achieve satisfactory returns on the relatively high investment.

5.3. Towards the outcome-based business model

The value proposition that includes the outcome-based contracts concurrently defines the value capture. Consequently, value capture and value proposition are merged at the service design stage (Kreye et al., 2015). On the other hand, service delivery requires a collaborative network of partners and suppliers (Spring and Araujo, 2013; Story et al., 2017). Value creation relies on the orchestration of the resources and capabilities necessary to deliver the specified outcomes, both within and outside the organizational boundaries (Chesbrough, 2011; Sumo et al., 2016). Providers increasingly rely on partners and suppliers to provide activities that are outside their competence base (non-appended paper, Visnjic et al, 2018).

However, dissertation findings suggest that reliance on partner's and supplier's capabilities increases risks due to third-party dependency and a loss of control over the activity system – what is labeled as accountability construct (appended paper, Visnjic et al., 2017). Dissertation findings suggest that such foreseen and unforeseen dependencies represent a source of value loss (appended paper, Visnjic et al., 2017). Consequently, the dissertation findings provide a link between servitization and broader value creation literature, as well as introduces the concept of value loss (see Figure 9).

Previous studies have shown that investment in information and communication technology (ICT) plays an important role in making service processes more efficient (Agnihotri et al., 2002; Belvedere et al., 2013). Literature suggest that the use of ICT, especially in large-scale service operations, helps to achieve certain efficiency gains through better capacity utilization of the front-line personnel, as well as automation of administrative tasks (c.f. Coreynen et al., 2017; Penttinen and Palmer, 2007).

My findings extend these efforts by highlighting the specific capabilities that organization need in order to adopt these ICT systems and make use of them. First, dissertation findings point to the need for end-to-end integration in order to provide transparency for tasks and activities in the workflow. Second, my findings specify the service performance measures that encompass KPIs for the utilization of resources for service provision, but also evaluate the success of the entire service organization. Third, service offering standardization helps to temper the costs associated with the high customization of the advanced service offerings, and helps achieve a balance in the flexibility-efficiency trade-off.

Figure 9 Interplay of servitization strategy and business model change

Consequently, findings go in line with the research of Kowalkowski et al. (2015) and the notion of “industrialization” as these standardization efforts could potentially make the advanced services more affordable for a larger customer base. Similarly, findings may also relate to the literature on “deservitization” and the antecedents of servitization failure (Valtakoski, 2017).

5.4. Multiple Business Models and Product-Service Conflicts

In the product business model, tensions between product and service business rarely happen, since the product business occupies a dominant position, while services play a peripheral and supporting role. Consequently, basic services are often used to facilitate the product sales process (or even given away for free) (Witell and Löfgren, 2013).

As already mentioned, in order to create a competitive service or outcome business model, servitization research emphasizes the importance of creating a structurally separate stand-alone service business unit in order to enable service-specific capabilities, goals, and processes to emerge (Davies et al., 2006; Gebauer et al., 2005; Oliva et al., 2012). It is claimed that a structurally separate service business is a necessity in order to “protect [an] emerging service culture from the dominating manufacturing culture” (Oliva, Gebauer, & Brann, 2012: 4).

The case study of Alpha showed that while a structural separation of service business units from the product business units is an important pivotal point, there are several complications that should be considered.

First, the structural separation creates knowledge boundaries—since knowledge is localized, embedded and invested in the practice of the business units (Carlile, 2002)—and impedes cross-functional information and knowledge sharing between business units (Antioco et al., 2008; Tsai, 2001). Consequently, the business unit is “siloe” due to its different pricing process (Kindström, et. al., 2013; Rapaccini, 2015), sales process (Kowalkowski and Ulaga, 2017; Ulaga and Loveland, 2014), installed base factors (Jovanovic et al., 2016) and performance-management metrics (Auguste et al., 2006). Although servitization literature explored these factors in depth, the findings in this

dissertation position them as the alienation devices at the business unit level and give fine-grained attributes to their diverging nature.

Second, the tension between the structurally separated units is often created as a spillover effect of their relationship with the external actors (Lacoste, 2012; Vendrell-Herrero et al., 2017). Distributors are very often powerful intermediaries in servitization (Kowalkowski and Ulaga, 2017). Thus, they could also be sources of conflicts as they relate positively to the product business but negatively to the service business. Moreover, findings suggest that distributors increase the likelihood of conflicts, disagreements, and opportunistic behavior between the business units.

On the other hand, in order to gain the full benefits of bundling products and services, a tight cross-functional collaborative approach across the business units is required. First, my findings suggest that senior leaders need to implement a business unit strategy aligned with the corporate strategy, and set the overarching performance metrics that will dictate the priorities and resolve situations in which business units may act in an opportunistic way. Second, senior leaders must position the customers' long-term benefit as a key driver for the firm, and transparently present the product and service options to the customer. In such cases, knowledge flow between the business units is enhanced. Thus, my findings relate to the literature on cross-functional integration as well as knowledge boundaries in the context of product-service business units (Ford and Randolph, 1992).

Servitization has been recognized as one of the strategic priorities in the service research (Ostrom et al., 2015). This dissertation answers the call from Kowalkowski et al. (2015) to break out of the product-service continuum discourse by applying the business model perspective to servitization. Servitization is conceptualized as a service expansion that triggers changes in the incumbent business model and the underpinning business model elements. While previous research has explored the characteristics of the business model components (Adrodegari et al., 2017), the business model is often seen in the literature as a static combination of business model elements (Demil and Lecocq, 2010). The major managerial question, however, is how to change the business model, which requires a transformational and dynamic perspective on the business model configuration (Alexy et al., 2017; Hacklin et al., 2017). This is where this dissertation fits in.

This dissertation sheds light on the interdependence and co-evolution of value proposition and the underpinning value creation and value capture elements. In doing so, it adds to the understanding of the servitization process as a business model reconfiguration (Forkmann, Henneberg, et al., 2017a).

Additionally, dissertation may connect servitization and the open innovation literature and, in particular, the open business model literature, as it shows that advanced services tend to favor opening up the business model to external partners and specialized service providers, since critical resources for the service delivery system are outside the organization (Appleyard and Chesbrough, 2017; Chesbrough, 2006; Kortmann and Piller, 2016). While it seems more flexible and economic to deliver advanced services with partners, at the same time, it increases the provider's accountability spread (non-appended, Visnjic et al., 2018).

First, this dissertation may assist managers by unpacking the content of the critical business model elements required to make the shift to services and innovate their business models. Second, this dissertation highlights the differences between three identified business model archetypes and may assist managers in choosing the business model according to their needs. In particular, this dissertation provides the fine-grained group of factors that may be used to determine the preferred (service) business model archetype. Moreover, highlighted factors may provide managers with additional help in choosing the right product type (installed base) to servitize.

Furthermore, the dissertation identifies a preferred sequence of service capability base development that supports the shift to advanced service provision. The understanding of such sequences may assist managers in prioritizing activities and gradually investing in service business. As investing in multiple service capabilities entails trade-offs, the proposed process view of capability development may help managers in that respect.

The dissertation also pinpoints the sources of the conflicts and tensions that often exist between product and service business units. On the other hand, cross-functional integration mechanisms were proposed in order to mitigate such potential conflicts, allowing managers to focus on these areas during the servitization process.

Finally, manufacturers that aspire to move toward the outcome business model can cross-check the list of value drivers and value loss. This allows managers to craft an outcome-based contract that amplifies value drivers and attenuates the sources of value loss.

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