

**UNIVERSITY OF VAASA**  
**FACULTY OF BUSINESS STUDIES**  
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**Servitization: Synthesis and Direction Forward**

Master's Thesis in  
Strategic Management

**VAASA 2016**



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**Year of Completing the Thesis:** 2016 **Pages:** 116

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**ABSTRACT**

This literature review makes an attempt to synthesize existing research on servitization and integrated solutions. Using an exhaustive and systematic methodology, a total of 152 articles are identified as relevant and of high impact in the field. An integrative framework of servitization is developed and the antecedents, processual elements, outcomes, and the linkages between them are identified and discussed. The results show that servitization is complex and that it is contingent on a multitude of different elements. These range from industry-related and customer-related factors, to organizational configuration, product elements, service culture, employee characteristics and several others. The article finds however, that the literature on servitization is often shallow in nature and that research needs to take steps in the right direction in order to deepen our understanding of the process by focusing on more specific research questions and by applying different methodologies and theories. Both general research considerations as well as specific suggestions for research are proposed here. The thesis concludes by offering some theoretical and managerial implications.

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**KEYWORDS:** Servitization, Integrated Solutions, Product-Service Systems, Service Infusion, Product-Service Integration, Literature Review



## 1. INTRODUCTION

For manufacturing firms there are various reasons to start offering services or to expand their service portfolio. Growth (Sawhney et al. 2004), more stable streams of revenue (Wise & Baumgartner 1999), a less imitable competitive position (Oliva & Kallenberg 2003), less influence of price-based competition (Malleret 2006), creating customer loyalty or dependency (Vandermerwe & Rada 1988), and gaining more inside information on customer operations in order to develop new offerings in the future (e.g. Opresnik & Taisch 2015), are just a few of the reasons why firms alter their offerings. Manufacturers can also choose to add more services to their portfolio due to external pressures such as demands or requests from customers (Biggemann et al. 2013; Penttinen & Palmer 2007) or changing industry conditions (Turunen & Finne 2014). But simply adding services to a product portfolio is difficult, the results might be unexpected, and it is negatively related to the financial results of the company (Reim et al. 2014). This can be due to a multitude of factors, but simply put, a more comprehensive organizational change is necessary. Firms should not just develop new services, but also change their product-centric culture or organizational identity (e.g. Gebauer et al. 2010) their organizational and value chain structure (e.g. Miller et al. 2002; Davies et al. 2006), and remove the cognitive barriers that might be hindering them to achieve success (Gebauer & Fleisch 2007; Gebauer 2009). However, the literature on servitization is diverse and diffused, and for both scholars and practitioners it can be difficult to form a picture of the boundaries and content of servitization (cf. Lightfoot et al. 2013; Velamuri et al. 2011; Rabetino et al. 2015).

The study presented in this thesis was conducted as a systematic and critical literature review. Its goals were to synthesize current research on servitization and to identify and map patterns discernible in extant studies. This was done by identifying, selecting, reading, and summarizing 152 articles published in high-impact journals. Following this, an integrative framework of servitization was developed which showcases how antecedent factors influence servitization, how the servitization process itself is organized, and how the process conclusion affects the outcomes for the organization

(in both financial and non-financial terms). Thus, this thesis, and the study presented in it, contributes to the development of the servitization literature by synthesizing existing research, by identifying interlinkages between studies, and by providing a framework that visualizes the servitization process for both scholars and practitioners.

The thesis is organized in perhaps an unconventional manner. First, a short introduction on servitization will be given in which the context of the current study will be explained. Secondly, and predominantly, the research is presented in an article-based format. This article constitutes the majority of the research for this thesis and is subdivided into an introduction, the methodology, development of an integrative framework, discussion of the literature, future research directions, limitations, and managerial and theoretical implications.

### **1.1 STUDY IN CONTEXT**

In essence, servitization entails that manufacturers start offering “bundles” that consist of goods and services and that fulfill the customer needs to a larger extent (Vandermerwe & Rada 1988). Although the offering of services by manufacturers is nothing new (Schmenner 2009), over the last decades the demand for products has declined and manufacturers are seeking, and finding, new sources of profit and revenue downstream, that is, by selling services close to the end consumer (Wise & Baumgartner 1999). The type of service a manufacturer offers can be placed on a spectrum where, on the one hand, services support the product and, on the other hand, the product supports the services. Tukker (2004) provides perhaps the most well-known and used distinction and defines three types of services: product-oriented services (e.g. maintenance and repair), use-oriented services (e.g. leasing, renting & sharing), and result-oriented services (e.g. customer pays for the functional result). Thus, manufacturers have different options and degrees in which they can offer services. Developing services for the installed base, such as maintenance and repair, is relatively easy to organize and do (naturally, the firm knows its products best). Offering more advanced types of services, such as use-oriented or result-oriented, can be more

difficult for firms to develop because it requires a different mindset, a different approach, and a different organizational structure (e.g. Gebauer et al. 2005). Nevertheless, extant literature has been almost unanimous in the support of servitization and in the support of manufacturers adding services to their portfolios (Oliva & Kallenberg 2003).

The phenomenon of manufacturers adding services to their portfolios has also attracted increasing numbers of researchers and institutions that study this. Several literature reviews have chronicled this rise in publications on servitization, which has increased exponentially over the years (Baines et al. 2007; Lightfoot et al. 2013; Velamuri et al. 2011). However, the literature that has been published on servitization has a few deficiencies. Most notably, there are different concepts and constructs that describe the exact same, or similar, thing. Instead of servitization, authors might talk about the service transition (Fang et al. 2008), service infusion (Brax 2005; Kowalkowski et al. 2012), or value migration (Davies 2004). Likewise, operational services (Oliva & Kallenberg 2003), functional products (Kumar & Kumar 2004), and functional sales (Lindahl & Ölundh 2001) all describe the situation in which the customer buys the utility of the product, but not the product itself. Bundles of products and services are sometimes called integrated solutions (Wise & Baumgartner 1999), other times solutions (Shepherd & Ahmed 2000), and yet others call them product-service systems (Mont 2002). Although the latter usually denotes a more environmental focus in which the impact of the product on the environment is lower than in traditional offerings. This lack of common terminology and conceptualizations increases the opaqueness of the field and makes it difficult to grasp the entirety of studies. Adding to this, it is not solely business scholars that write on servitization, but there has been an increasing influx of scholars from different backgrounds (e.g. Boehm & Thomas 2013; Cavalieri & Pezzotta 2012; Wang et al. 2011). Such an influx is to be welcomed, but it does make the research field more complex and difficult to comprehend.

As noted earlier, the move towards more services for manufacturers is not an easy path. Several studies have identified non-linear relationships between adding services and sales, revenue or profit growth (e.g. Fang et al. 2008; Visnjic Kastalli & Van Looy 2013; Kohtamäki et al. 2013). This indicates that firms can benefit from adding simple, basic services to their portfolios, such as maintenance and repair, but that gaining a significant part of the revenue from services requires more drastic changes. This has also been called the service paradox, where more investments in the service business do not result in equally good returns (Gebauer et al. 2005; Brax 2005). Neely (2008), for instance, identifies several challenges related to shifting mindsets (e.g. from transactional to relational marketing), changing timescales (e.g. long-term relationships and projects), and business model and customer offering changes (e.g. development of a service culture). Likewise, firms will have to weigh the decision to develop the services in-house, to set-up a separate service business or to outsource the service business of the firm (e.g. Paiola et al. 2013). Another commonly identified challenge that needs to be surpassed is the cognitive barriers of the managers of the firm. When servitization is desired, managers need to realize and understand the service potential for their business and to “believe” in the service addition (Gebauer et al. 2005; Gebauer 2009). But this list is by no means complete. Alghisi and Sacconi (2015), for example, identify a multitude of factors, others than the ones presented here, that can be seen as challenges for servitization. Thus, in practice, it can be difficult for firms to successfully make a transition towards a service-oriented business, or towards significant services sales. Many different organizational elements (both tangible and intangible) will need to be altered in order to achieve success. The integrative framework developed in this thesis maps the most commonly identified factors that firms need to alter.

Combining the opaqueness of the servitization field and the multitude of identified factors that organizations will need to change in order to achieve servitization success, results in a situation where it can be both difficult for scholars to continue research efforts and for practitioners to servitize in practice. To fully grasp the complexity of

extant research, this review (i.e.: thesis) aims to synthesize current research on servitization and to provide a common framework for both scholars and practitioners. The identification and synthesis of the servitization phenomenon constitutes what Pettigrew (1997, p.347) has described as processual research: *“to catch reality in flight, to explore the dynamic qualities of human conduct and organisational life and to embed such dynamics over time in the various layers of context in which streams of activities occur.”* In doing so, the aim of the thesis is to guide future work on servitization by providing, summarizing and mapping current knowledge in the field and by showcasing what has been underexplored. Moreover, by developing an integrative framework of servitization it will hopefully become easier for practitioners to guide servitization efforts in practice.

## REFERENCES

- Alghisi, A. & Saccani, N., 2015. Internal and external alignment in the servitization journey – overcoming the challenges. *Production Planning & Control*, 26(14-15), pp.1219–1232.
- Baines, T.S. et al., 2007. State-of-the-art in product-service systems. *Proceedings of the Institution of Mechanical Engineers, Part B: Journal of Engineering Manufacture*, 221(10), pp.1543–1552.
- Biggemann, S. et al., 2013. Development and implementation of customer solutions: A study of process dynamics and market shaping. *Industrial Marketing Management*, 42(7), pp.1083–1092.
- Boehm, M. & Thomas, O., 2013. Looking beyond the rim of one’s teacup: a multidisciplinary literature review of Product-Service Systems in Information Systems, Business Management, and Engineering & Design. *Journal of Cleaner Production*, 51, pp.245–260.
- Brax, S., 2005. A manufacturer becoming service provider – challenges and a paradox. *Managing Service Quality: An International Journal*, 15(2), pp.142–155.
- Cavalieri, S. & Pezzotta, G., 2012. Product–Service Systems Engineering: State of the art and research challenges. *Computers in Industry*, 63(4), pp.278–288.
- Davies, A., 2004. Moving base into high-value integrated solutions: a value stream approach. *Industrial and Corporate Change*, 13(5), pp.727–756.
- Davies, A., Brady, T. & Hobday, M., 2006. Charting a path toward integrated solutions. *MIT Sloan Management Review*, 47(3), pp.39–48.
- Fang, E. (Er), Palmatier, R.W. & Steenkamp, J.-B.E., 2008. Effect of Service Transition Strategies on Firm Value. *Journal of Marketing*, 72(5), pp.1–14.
- Gebauer, H., 2009. An attention-based view on service orientation in the business strategy of manufacturing companies. *Journal of Managerial Psychology*, 24(1), pp.79–98.
- Gebauer, H., Edvardsson, B. & Bjurklo, M., 2010. The impact of service orientation in corporate culture on business performance in manufacturing companies. *Journal of Service Management*, 21(2), pp.237–259.

- Gebauer, H. & Fleisch, E., 2007. An investigation of the relationship between behavioral processes, motivation, investments in the service business and service revenue. *Industrial Marketing Management*, 36(3), pp.337–348.
- Gebauer, H., Fleisch, E. & Friedli, T., 2005. Overcoming the Service Paradox in Manufacturing Companies. *European Management Journal*, 23(1), pp.14–26.
- Kohtamäki, M. et al., 2013. Non-linear relationship between industrial service offering and sales growth: The moderating role of network capabilities. *Industrial Marketing Management*, 42(8), pp.1374–1385.
- Kowalkowski, C. et al., 2012. Service infusion as agile incrementalism in action. *Journal of Business Research*, 65(6), pp.765–772.
- Kumar, R. & Kumar, U., 2004. A conceptual framework for the development of a service delivery strategy for industrial systems and products. *Journal of Business & Industrial Marketing*, 19(5), pp.310–319.
- Lightfoot, H., Baines, T.S. & Smart, P., 2013. The servitization of manufacturing: A systematic literature review of interdependent trends. *International Journal of Operations & Production Management*, 33(11/12), pp.1408–1434.
- Lindahl, M. & Ölundh, G., 2001. The meaning of functional sales. In *8th CIRP International Seminar on Life Cycle Engineering—Life Cycle Engineering: Challenges and Opportunities*. pp. 211–220.
- Malleret, V., 2006. Value Creation through Service Offers. *European Management Journal*, 24(1), pp.106–116.
- Miller, D. et al., 2002. The problem of solutions: Balancing clients and capabilities. *Business Horizons*, 45(2), pp.3–12.
- Mont, O., 2002. Clarifying the concept of product–service system. *Journal of Cleaner Production*, 10(3), pp.237–245.
- Neely, A., 2008. Exploring the financial consequences of the servitization of manufacturing. *Operations Management Research*, 1(2), pp.103–118.
- Oliva, R. & Kallenberg, R., 2003. Managing the transition from products to services. *International Journal of Service Industry Management*, 14(2), pp.160–172.
- Opresnik, D. & Taisch, M., 2015. The value of big data in servitization. *International Journal of Production Economics*, 165, pp.174–184.

- Paiola, M. et al., 2013. Moving from products to solutions: Strategic approaches for developing capabilities. *European Management Journal*, 31(4), pp.390–409.
- Penttinen, E. & Palmer, J., 2007. Improving firm positioning through enhanced offerings and buyer–seller relationships. *Industrial Marketing Management*, 36(5), pp.552–564.
- Pettigrew, A.M., 1997. What is processual analysis? *Scandinavian Journal of Management*, 13(4), pp.337–348.
- Rabetino, R., Harmsen, W. & Kohtamäki, M., 2015. Bridging Research Communities in Servitization. In *4th International Conference on Business Servitization, 19-20 November, 2015, Madrid, Spain*.
- Reim, W., Parida, V. & Örtqvist, D., 2014. Product–Service Systems (PSS) business models and tactics – a systematic literature review. *Journal of Cleaner Production*, 97, pp.61–75.
- Sawhney, M., Balasubramanian, S. & Krishnan, V. V., 2004. Creating growth with services. *MIT Sloan Management Review*, 45(2), pp.34–43.
- Schmenner, R.W., 2009. Manufacturing, service, and their integration: some history and theory. *International Journal of Operations & Production Management*, 29(5), pp.431–443.
- Shepherd, C. & Ahmed, P.K., 2000. From product innovation to solutions innovation: a new paradigm for competitive advantage. *European Journal of Innovation Management*, 3(2), pp.100–106.
- Tukker, A., 2004. Eight types of product–service system: eight ways to sustainability? Experiences from SusProNet. *Business Strategy and the Environment*, 13(4), pp.246–260.
- Turunen, T.T. & Finne, M., 2014. The organisational environment’s impact on the servitization of manufacturers. *European Management Journal*, 32(4), pp.603–615.
- Vandermerwe, S. & Rada, J., 1988. Servitization of business: Adding value by adding services. *European Management Journal*, 6(4), pp.314–324.
- Wang, P. et al., 2011. Status review and research strategies on product-service systems. *International Journal of Production Research*, 49(22), pp.6863–6883.

## **2. SERVITIZATION: SYNTHESIS AND DIRECTION FORWARD (ARTICLE)**

### **ABSTRACT**

This literature review makes an attempt to synthesize existing research on servitization and integrated solutions. Using an exhaustive and systematic methodology, a total of 152 articles are identified as relevant and of high impact in the field. An integrative framework of servitization is developed and the antecedents, processual elements, outcomes, and the linkages between them are identified and discussed. The results show that servitization is complex and that it is contingent on a multitude of different elements. These range from industry-related and customer-related factors, to organizational configuration, product elements, service culture, employee characteristics and several others. The article finds however, that the literature on servitization is often shallow in nature and that research needs to take steps in the right direction in order to deepen our understanding of the process by focusing on more specific research questions and by applying different methodologies and theories. Both general research considerations as well as specific suggestions for research are proposed here. The article concludes by offering some theoretical and managerial implications.

**KEYWORDS:** Servitization, Integrated Solutions, Product-Service Systems, Service Infusion, Product-Service Integration, Literature Review

### **2.1 INTRODUCTION**

The move towards servitization has been defined as the process in which companies are increasingly offering bundles of goods, services, and other factors that are integrated into a single package (Vandermerwe & Rada 1988). However, this process is not something recent: manufacturers have been moving forward (and backward) in their value chain to offer something besides products since the late 1800s, as discussed by Schmenner (2009). There are different reasons why a manufacturer might make this move to servitize. Some do it due to external reasons such as commoditization of the industry (Matthyssens & Vandenbempt 2008), others might be attracted by a more stable source of revenue (Wise & Baumgartner 1999) or higher growth (Sawhney et al. 2004), and others yet might start to offer services to get a less imitable competitive position (Oliva & Kallenberg 2003). Several studies have reported however, that companies struggle to servitize in practice, or to reap the full benefits of servitization, something that has been called the servitization paradox: increasing the service offerings does not increase the total return for the manufacturer (Gebauer et

al. 2005; Brax 2005). Likewise, even though the product-service transition is often conceptualized as a continuum where firms start from selling products, to basic services, to more integrated solutions, recent research has placed doubts about this (Kowalkowski et al. 2015). Thus, one thing is clear: even though the proposed benefits of servitization are bountiful, in practice it is not as easy as it looks to servitize the offerings of a manufacturing firm.

Although the roots of this field of research have been traced back to the earlier B2B marketing literature on systems selling (Davies et al. 2007), in recent decades many different streams of studies can be identified within the product-service integration literature (Lightfoot et al. 2013; Velamuri et al. 2011; Cavalieri & Pezzotta 2012; Boehm & Thomas 2013). Scholars from business, engineering, IT, and environmental backgrounds all seek to describe the advantages and usage of product-service bundles, albeit with different terminology and conceptualizations (Rabetino, Harmsen, et al. 2015; Tukker 2015; Pawar et al. 2009). Not only have the different research communities increased in number, the amount of researched published on the subject of product-service integration has blossomed over the last decades as well (Velamuri et al. 2011; Lightfoot et al. 2013; Tukker 2015; Boehm & Thomas 2013). All this has made it increasingly complex for both scholars as well as practitioners to keep up to date with the research efforts, and to see the forest through the trees. This is not just because of the amount of work that has been written on the subject; the complexity, depth and specific applications of recent research efforts also introduces additional confusion. Moreover, because servitization requires a different way of thinking about and of organizing a business, it can be difficult for managers to successfully apply concepts in practice.

This article examines and discerns the servitization process as a whole. By exploring the different linkages that exist between influencing factors identified by previous research, the article aims at developing an integrative framework that sheds light on how the servitization process actually operates. In doing this, a page is taken from

Rajagopalan et al's (1993) article on strategic decision processes and Hutzschenreuter and Kleindienst's (2006) article on strategy-process research, by following a similar methodology and development of the framework. This is done because, as Ginsberg and Venkatraman (1985, p.422) observed, an analytical review scheme is necessary when trying to identify patterns and when trying to identify the contributions of a body of literature. Since the former two articles clearly show a systematic review scheme and development of the framework, a similar approach will be taken in this article. Thus, the article aims to clarify the servitization process as a whole, while identifying the antecedents, processes and outcomes. In particular, the following questions are addressed: which factors influence what? What are the success factors for servitization in practice? And what are the antecedents and outcomes of servitization? By reviewing the established research on servitization as a whole, the key interlinkages between factors will be explored. In essence, this constitutes what Pettigrew (1997) has described as processual research.

The organization of this review is as follows. First, the methodology of the search is presented which shows how the relevant literature was identified. Next, the development of the integrative framework is explained, and the linkage exploration and an overview of all the identified literature are given. Following this, the integrative framework is used to describe previous literature and attempts are made to synthesize extant research. Not only does this help to explore existing findings, it also provides a good starting point for focusing future research efforts, which is the topic of the next chapter. Finally, the article concludes by offering both theoretical and managerial implications.

## **2.2 METHODOLOGY**

Following David and Han (2004) and Newbert (2007) this review takes on a systematic, objective and critical methodology to identify the relevant literature. There are a few common deficiencies in the literature reviews on servitization that have been published so far: some of them lack a systemic literature identification procedure (e.g.

Pawar et al. 2009; Wang et al. 2011; Park et al. 2012), other reviews are either holistic and broad (e.g. Baines et al. 2007; Lightfoot et al. 2013; Velamuri et al. 2011), or focused on a specific subset or a particular topic (e.g. Eloranta & Turunen 2015b; Gaiardelli et al. 2014; Rabetino, Kohtamäki, et al. 2015). In contrast, this study will consider the research field of servitization as a whole (i.e. no topics are excluded a priori), but the sample will be subject to a set of objective criteria for exclusion/inclusion. However, previous reviews have identified several communities of researchers writing on product-service integration from different perspectives and from different backgrounds (e.g. Baines, Lightfoot, Peppard, et al. 2009; Lightfoot et al. 2013). Examples of this include scholars studying product-service systems, which are usually more environmentally focused, and services science, which are usually more focused on IT and technological aspects (Baines, Lightfoot, Peppard, et al. 2009). Studies from these perspectives were not deliberately excluded, but because the current review takes on a management or organizational perspective, the research design and keywords were focused to a larger extent on this. Thus, the final sample contains few articles from these perspectives.

As a first step, only peer-reviewed journals with publications in English published before 2016 were considered. Second, two different databases, Scopus and Web of Science, were utilized. This was done in order to avoid missing years, journals, and editions, which might have been the case when using a single database. The initial search was conducted in Scopus, and after reviewing the results in that database, the sample was supplemented with articles from Web of Science. Third, two different sets of keywords were created based on previous research and previous literature reviews / bibliometric analyses (Baines, Lightfoot, Benedettini, et al. 2009; Boehm & Thomas 2013; Lightfoot et al. 2013; Velamuri et al. 2011; Baines et al. 2007; Nordin & Kowalkowski 2010; Rabetino, Harmsen, et al. 2015). This was done in order to 'tier' the search into two different layers. The first layer required that the article used one of 8 keywords in the text; the second layer required that articles also contained one of 77 keywords in the title, abstract, or author-supplied keywords. This was done in order to

eliminate irrelevant research and to improve the accuracy of the search. The search keywords used can be found in Table 1.

**Table 1: Overview of Search Keywords**

	<b>Keywords</b>
First layer (ALL)	"service transition" OR "service infusion" OR "servitization" OR "solution business model" OR "service-driven manufacturing" OR "solution business" OR "integrated solutions" OR "industrial services"
Second layer (TITLE, ABSTRACT, OR KEYWORDS)	"service supporting products" OR "service supporting processes" OR "services supporting clients" OR "tertiarization" OR "tertiarisation" OR "service-driven manufacturing" OR "servicization" OR "service orientation" OR "high-value manufacturing" OR "service strategy" OR "service dominant logic" OR "value in use" OR "downstream integration" OR "product-oriented services" OR "IPS2" OR "manufacturing-oriented services" OR "value-added solutions" OR "industrial service offering" OR "industrial service business" OR "customized solutions" OR "customised solutions" OR "solution business" OR "solution selling" OR "servicising" OR "servicizing" OR "servicisation" OR "servicification" OR "service addition" OR "value migration" OR "integrated solution" OR "business solution" OR "full service" OR "service package" OR "product service bundling" OR "total solution" OR "product-related services" OR "installed base service" OR "operational services" OR "integrated product and service offering" OR "customer support service" OR "post-sales service" OR "after-sales service" OR "complex product system" OR "performance-based contract" OR "capability contract" OR "outcome-based contract" OR "hybrid offering" OR "advanced services" OR "product-service system" OR "product service system" OR "product service system" OR "functional sales" OR "functional product" OR "total care product" OR "service engineering" OR "dematerialization" OR "use-oriented services" OR "result-oriented services" OR "product life-cycle services" OR "experiential services" OR "complex service systems" OR "extended products" OR "product-based service" OR "productization" OR "customer-centric" OR "customer care service" OR "service agreement" OR "process related services" OR "performance services" OR "outsourcing services" OR "hybrid products" OR "hybrid solutions" OR "customer solutions" OR "service management" OR "service modularization" OR "industrial services" OR "product/service offering"

The reasoning behind including a rather large list of keywords in the second tier is that, as previous research has identified, the field of servitization is dispersed and fragmented, and the vocabulary often differs from author to author (see discussion in Rabetino, Harmsen, et al. 2015). As a result, the search results most probably yielded non-relevant items, but this was considered preferable to excluding relevant items by limiting the keywords for the search.

As a fourth step, after conducting the search in the databases, the articles that were returned were checked for basic relevance to the theme of this review and to the theme of servitization in general by looking at the journal, the title, and the subject area. Next, as step number five, the abstracts of the remaining articles were read in order to see if the articles were related to the servitization process or context, or to the outcomes of servitization. After consolidation of the articles, that is, combining the search results from both search engines and removing duplicates (which was done after conducting step 5 in one database, and step 4 in the other), a final step was conducted. This last step required the articles to be published in journals with an impact factor of 1.00 or higher (as measured by Thomson Reuters Journal Citation Reports [JCR]). This was done in order to limit the articles to just the highest-rated research in the field and to exclude papers that would only add incremental additions at best, or noise at worst. Thus, it was ensured that only research with the highest impact in the field of servitization was included. In total, 74 articles were published in journals with an impact factor of lower than 1.00, and these were thus deleted. In the end, the final samples consisted of 146 articles from Scopus and 6 articles from Web of Science, for a total of 152 articles. The sample details and numbers can be found in the Table 2.

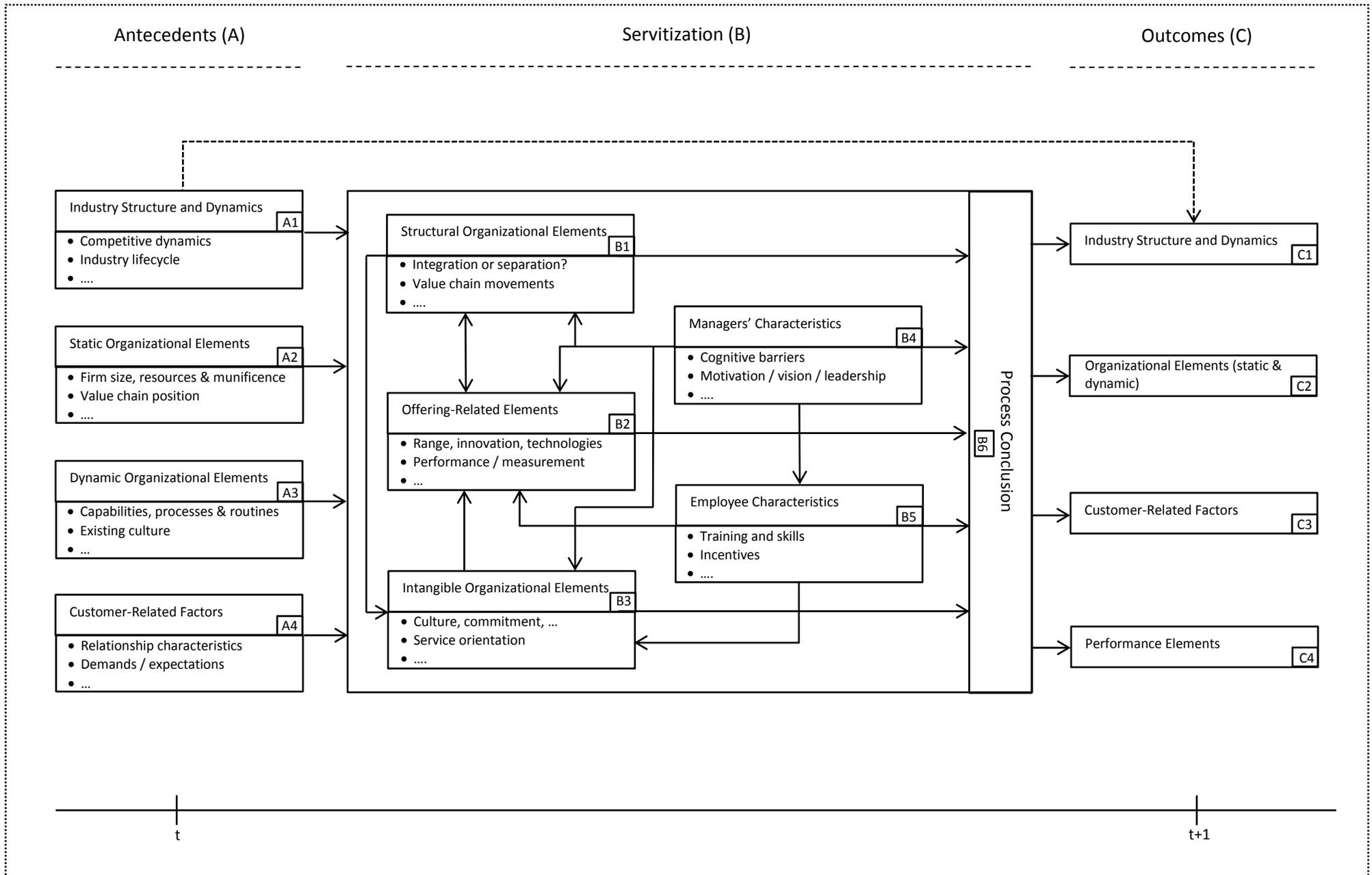
**Table 2: Search Results from the Databases**

<b>Database</b>	<b>Steps</b>	<b># left</b>
Scopus	Initial search	1968
	Check for relevance (titles and subject area)	509
	Keep relevant after reading abstract	220
	Remove journals with impact factor of <1.00	146
	<b>Total Scopus</b>	<b>146</b>
Web of Science	Initial search	153
	After removing duplicates (found in Scopus)	13
	Check for relevance (titles and subject area)	11
	Keep relevant after reading abstract	6
	Remove journals with impact factor of <1.00	6
	<b>Total Web of Science</b>	<b>6</b>
	<b>Total from both databases</b>	<b>152</b>

### **2.3 DEVELOPMENT OF THE FRAMEWORK**

After establishment of the relevant studies, all the included articles were read and information on the type of research, sample size, sample characteristics, and key findings were extracted. In doing so, special attention was paid to how the studies connected to each other which was an essential step in the model development. After careful reading and examination of the results, a similar categorization as Hutzschenreuter and Kleindienst's (2006) strategy-process research was identified and used: servitization seems to be comprised of antecedents to the process (A), the servitization process itself (B), and the outcomes of the process (C). This chapter will briefly outline the different the different aspects of servitization that have been identified and will show the integrative framework (see Figure 1) and relevant studies that have been used. The next chapter will explore these results more in depth.

**Figure 1: Integrative Framework of Servitization**



### 2.3.1 Antecedents

The servitization of a firm's offerings is contingent on several antecedent factors, which can be divided into four different categories. First, the entire servitization process will be shaped by the environment in which it is done. The type of industry, the specific lifecycle, its dynamism, competitive dynamics, the amount of players and servitized competitors, et cetera, all help to shape the servitization process and can be considered as contingent factors (e.g. Cusumano et al. 2015; Fang et al. 2008; Turunen & Finne 2014). A second category of antecedent factors to the servitization process contain static organizational elements: firm size (e.g. Kowalkowski et al. 2013), its resources (e.g. Ulaga & Reinartz 2011; Löfberg et al. 2010), the value chain position (e.g. Gebauer, Paiola, et al. 2010; Bustinza et al. 2015), and characteristics of the current offerings (e.g. Opresnik & Taisch 2015), are initial factors that help determine the specific context of the servitization process. Third, the servitization process is also contingent on specific dynamic organizational elements. Examples include operational capabilities (e.g. Gebauer et al. 2013; MacBryde et al. 2013), network capabilities (e.g. Kohtamäki, Partanen, Parida, et al. 2013), organizational capabilities (e.g. Davies & Brady 2000), specific competences (e.g. Neu & Brown 2005; Reim et al. 2014), or existing microfoundations that aid in the servitization process (e.g. Kindström et al. 2013). The final category that has been identified in the literature is that of customer-related factors. Customer interest, motivation and willingness for servitized offerings (e.g. Biggemann et al. 2013; Tuli et al. 2007), the amount of customer interaction (e.g. Santamaría et al. 2012; Hakanen & Jaakkola 2012) customer demands (e.g. Penttinen & Palmer 2007), needs (e.g. Gebauer et al. 2011), or specific expectations (e.g. Matthyssens & Vandenbempt 2010) are examples of factors that influence the servitization process. One can expect the servitization process to differ depending on the specific set of antecedent factors the firm has or is exposed to. Unfortunately, the exact consequences and degrees of antecedent factors on the servitization process are difficult to identify due to the opaqueness and the multitude of factors involved. Nevertheless, these antecedents show that a wide range of factors can influence the servitization of firms, and that this process is by no means simple and easily chartable.

In Figure 2 and Table 3 some of the antecedents identified have direct influence on specific parts of the servitization process, but the majority of the literature does not explicitly state which part of the servitization process is affected. Thus, in the latter case, a '\*' sign denotes that it influences the process in general, or that the exact link is unknown.

### **2.3.2 The servitization process**

The servitization process itself consists of different elements that have been divided into five main categories: 1) structural organizational elements, 2) offering-related elements, 3) intangible organizational elements, 4) managers' characteristics, and 5) employee characteristics. First, structural organizational elements refer to, for example, the integration or separation of the service business from the product business (e.g. Miller et al. 2002; Kowalkowski et al. 2011; Gebauer, Edvardsson, Gustafsson, et al. 2010; Davies et al. 2006), value chain integration or movements – whether its forward, backwards, or horizontal – (e.g. Penttinen & Palmer 2007; Finne & Holmström 2013; Eloranta & Turunen 2015a), cross-functional operations or information sharing (e.g. Gebauer et al. 2008; Li 2011; Baines, Lightfoot, Peppard, et al. 2009), and co-location of facilities with customers or other delivery practices (e.g. Baines & Lightfoot 2013; Kindström 2010). Second, the offering-related elements category contains factors such as service technologies (e.g. Antioco et al. 2008; Bastl et al. 2012), performance measurements and contracts (e.g. Ng & Nudurupati 2010; Rapaccini 2015), service innovation or (modular) development (e.g. Kindström & Kowalkowski 2009; de Brentani 1995; Gremyr et al. 2010; Eggert et al. 2011), product characteristics (e.g. Saccani et al. 2007; Kowalkowski et al. 2011) or specific methods or tools (e.g. Raddats et al. 2015; Wuest et al. 2015) for integrated product-service offerings development. Third, intangible organizational elements contain factors such as the customer centricity of the organization (e.g. Gebauer et al. 2011; Miller et al. 2002), cultural change for servitization (e.g. Ulaga & Reinartz 2011; Salonen 2011; Ng & Nudurupati 2010) or a so-called service culture (e.g. Gebauer et al. 2005), business or service orientation of the firm (e.g. Antioco et al. 2008; Gebauer, Edvardsson &

Bjurklo 2010), and also some miscellaneous factors such as pro-activeness and flexibility (e.g. Datta & Roy 2011). The fourth category consists of elements related to the top management / middle-managers and the role they play in the servitization process. It contains factors such cognitive barriers of managers to the servitization process (e.g. Gebauer 2009; Gebauer & Fleisch 2007), support to the service business or vision on the service business (e.g. Raddats et al. 2015; Gebauer et al. 2008), the commitment and leadership of the TMT (e.g. Antioco et al. 2008; Ulaga & Reinartz 2011), the activeness and visibility of managers making changes in the organization (e.g. Neu & Brown 2005), and HRM practices of hiring new service (sales) employees (e.g. Ulaga & Loveland 2014). The final category that exerts influence in the servitization process is related to the employees themselves. This category contains characteristics such as training (e.g. Antioco et al. 2008; Gebauer et al. 2008; Ulaga & Reinartz 2011), working hours / employment type (Homburg et al. 2002), relationship skills (e.g. Baines, Lightfoot, Peppard, et al. 2009; Neu & Brown 2005), sales skills (e.g. Ulaga & Loveland 2014), involvement of frontline employees (e.g. Gebauer et al. 2008), employee behavior / service orientation (e.g. Gebauer, Edvardsson & Bjurklo 2010; Bjurklo et al. 2009; Raddats & Easingwood 2010), and incentives for employees (e.g. Tuli et al. 2007; Kindström et al. 2015).

### **2.3.3 Outcomes**

After an iteration of the servitization process (“process conclusion”) where the firm changes and aligns (some of) the aforementioned elements, specific links to the outcomes of the process can be identified. These outcomes can be separated into four different categories. The first deals with the servitization result on the industry structure and dynamics, and includes factors such as: market-shaping effects (Biggemann et al. 2013), creation of new markets (Cusumano et al. 2015), de-commoditization (Matthyssens & Vandenbempt 2008), creation of legitimacy effects that encourage other firms to servitize (Turunen & Finne 2014), disruption (Cusumano et al. 2015), or the taking of a dominant position (Turunen & Finne 2014). The second category focusses on the outcomes related to both the static and dynamic

organizational elements (thus, it combines the two categories identified in the antecedent factors into a single outcome). Although not much research has addressed this in depth and explicitly, it is clear from the structural organizational elements category in the servitization process that value chain positions can shift (e.g. Penttinen & Palmer 2007; Finne & Holmström 2013). Likewise, it is also clear that developing more servitized offerings will change the product offering of the firm. It does remain unclear, however, if the servitization process affects static organizational elements such as those described in the antecedent factors. Some dynamic elements have been researched by the literature, although they are scarce too. Effects such as resilience (Baines & Shi 2015), increased skills in capabilities over time (Kindström et al. 2013), and service learning effects over time (Visnjic Kastalli & Van Looy 2013) have been identified. The servitization outcomes on customer-related factors, category three, are clearer than the previous one. In general, the relationship between buyers and suppliers change due to servitization. A more long-term relationship (Pan & Nguyen 2015), with a more open exchange of information and increased operational linkages (Bastl et al. 2012; Saccani et al. 2014), and increased interdependency (Windahl & Lakemond 2010; Brax & Jonsson 2009) are in order. The perceived value of the offerings for the customer will change (Prior 2013; Jaakkola & Hakanen 2013), and the interest and motivation to co-develop solution will change over time (Biggemann et al. 2013; Windahl & Lakemond 2010). Finally, the servitization process affects the performance elements of the firm. Examples include increased growth (Baines & Shi 2015), better financial results (Cusumano et al. 2015; Parida et al. 2014) or increased revenues and profitability (Eggert et al. 2011; Eggert et al. 2014; Gebauer & Fleisch 2007; Malleret 2006; Visnjic Kastalli & Van Looy 2013), increased firm value (Fang et al. 2008), sales growth (Kohtamäki, Partanen, Parida, et al. 2013), increased market share (Cusumano et al. 2015; Turunen & Finne 2014; Homburg et al. 2002), better environmental impact (Lindahl et al. 2014), and increased customer satisfaction and loyalty (Homburg et al. 2002; Bustinza et al. 2015) are some of the factors mentioned in this section of literature. It should be noted, however, that several authors have identified non-linear effects between increased service offerings and sales, revenue, or

profit growth (e.g. Fang et al. 2008; Kohtamäki, Partanen, Parida, et al. 2013; Visnjic Kastalli & Van Looy 2013). Thus, the outcomes described above are not guaranteed to firms making the transition and might not be the same in every situation.

In sum, the research can be summarized by stating that there are a total of three “groups” of articles within the developed framework. First, group number one contains studies that deal with the antecedent factors that exert influence on the servitization process. Second, in group number two, there are articles that show how the servitization process happens and how different factors are interrelated. Third, the final group deals with the outcomes of servitization process. Figure 2 provides an overview of all the identified linkages between the different studies and shows the three groups in which the literature on servitization can be divided. Table 3 contains an overview of all the studies that were included in the sample. The table shows the linkages of the article, the type of paper (qualitative, quantitative, conceptual, et cetera), the sample characteristics and the key findings. It should be noted that some articles in the sample contain no links (predominantly literature reviews), or only implicit ones. The next chapter will explore these results in more detail.

*(text continues on page 53)*

Figure 2: Linkage-Exploration Matrix

	B*	B1	B2	B3	B4	B5	B6	C1	C2	C3	C4
<b>A1</b>	007, 009, 012, 023, 037, 038, 039, 045, 051, 061, 066, 092, 094, 095, 098, 104, 105, 109, 111, 112, 134, 138, 147, 148, 152	075, 101	023, 024, 120								
<b>A2</b>	041, 051, 062, 077, 083, 090, 092, 098, 103, 105, 109, 118, 121, 134, 138, 139, 146, 152	005, 021, 075, 126	030, 065	061							
<b>A3</b>	054, 073, 092, 097, 098, 121, 139	075, 126	023, 030, 070	023, 027							
<b>A4</b>	015, 034, 038, 067, 072, 073, 084, 092, 095, 109, 111, 114, 129, 130, 133, 137	037, 057, 079, 104, 111, 133	030, 052, 056, 057, 068, 074, 093, 099, 127, 133	052							
<b>B1</b>			036, 038, 046, 060, 077, 081, 086, 099, 105, 110, 127, 129, 130, 132, 148	048			001, 002, 003, 006, 008, 011, 018, 019, 020, 021, 023, 026, 029, 034, 036, 038, 039, 040, 041, 043, 044, 049, 050, 056, 057, 062, 066, 068, 069, 073, 075, 076, 085, 090, 091, 094, 095, 096, 097, 098, 101, 105, 107, 108, 109, 110, 111, 114, 116, 117, 121, 123, 125, 126, 131, 132, 133, 134, 137, 139, 147				
<b>B2</b>		011, 060, 075, 079, 101, 105, 110, 117, 123, 124, 126, 132, 133, 147					001, 006, 007, 008, 010, 011, 015, 019, 025, 028, 030, 032, 033, 034, 039, 044, 052, 055, 056, 058, 063, 064, 065, 066, 068, 069, 070, 072, 074, 076, 078, 083, 086, 090, 093, 095, 096, 098, 099, 103, 106, 107, 109, 110, 111, 116, 118, 119, 120, 121, 122, 124, 125, 130, 131, 133, 134, 137, 139, 141, 143, 148, 149, 150, 151				
<b>B3</b>			061, 081, 086, 099				001, 003, 008, 018, 019, 020, 025, 043, 048, 049, 050, 052, 076, 095, 098, 125, 133, 139, 145				
<b>B4</b>		044, 137	046, 118, 130	001, 044, 048, 070		016, 043, 070, 098, 110, 140, 145	016, 028, 043, 044, 047, 078, 095, 098, 118, 137, 139, 147				
<b>B5</b>			046, 070, 071, 086, 099, 127, 130	016, 048, 061			001, 006, 009, 016, 018, 032, 037, 038, 049, 050, 066, 071, 078, 095, 098, 110, 115, 116, 118, 122, 125, 133, 137, 139, 140, 145				
<b>B6</b>								012, 015, 024, 091, 094, 110, 138	007, 070, 094, 144	003, 010, 015, 018, 020, 056, 062, 066, 067, 069, 093, 106, 111, 114, 115, 116, 119, 124, 138, 141, 147, 148, 149	007, 015, 021, 024, 033, 034, 039, 044, 061, 073, 083, 089, 093, 107, 112, 119, 138, 144, 149

A1: Industry Structure and Dynamics  
 A2: Static Organizational Elements  
 A3: Dynamic Organizational Elements  
 A4: Customer-Related Factors

B\*: (denotes servitization process as a whole)  
 B1: Structural Organizational Elements  
 B2: Offering-Related Elements  
 B3: Intangible Organizational Elements

B4: Managers' Characteristics  
 B5: Employee Characteristics  
 B6: (Servitization) Process Conclusion  
 C1: Industry Structure and Dynamics

C2: Organizational Elements (static & dynamic)  
 C3: Customer-Related Factors  
 C4: Performance Elements

**Table 3: Studies, Key Findings and Linkages**

No.	Article	Type	Sample size	Sample Characteristics	Linkages	Key findings
001	Antioco et al. (2008)	Quantitative	137 firms	-Seven industry segments -Companies from Belgium, The Netherlands & Denmark	B1 – B6 B2 – B6 B3 – B6 B4 – B3 B5 – B6	-TMT <sup>1</sup> commitment, visionary leadership and service rewards are pure antecedents to business orientation (BO) -SSP <sup>2</sup> BO increases service volume, SSC <sup>3</sup> BO does not -Cross-functional communication aids product sales in SSC -Employee service training is of importance for volume -Service technologies create higher volume with SSP
002	Araujo & Spring (2006)	Conceptual	-	-	B1 – B6	-Increasing importance of services for manufacturing firms -Product / service differences are dependent on producer-users interactions, and structure of production
003	Artto et al. (2015)	Qualitative	1 firm	-Global supplier of industry systems -32 interviews and archival data	B1 – B6 B3 – B6 B6 – C3	-Identification of eight integration mechanisms that help to combine project activities and service activities in a solution delivery
004	Badinelli et al. (2012)	Conceptual	-	-	(none)	-Systems thinking models can prove to be helpful in understanding service systems
005	Baines et al. (2005)	Qualitative	2 firms	-Three full day workshops	A2 – B1	-Development of a five-stage decision process for manufacturing firms that helps with strategic positioning, and decisions on internal/external production allocation
006	Baines, Lightfoot, Peppard, et al. (2009)	Literature review + Qualitative	1 firm	-UK based OEM -15 interviews across organization	B1 – B6 B2 – B6 B5 – B6	-Set of characteristics for servitized operations principles: blend of transaction activities with customer management function; test and repair centers located near customers; heavy reliance on supply chains; cross functional internal structure; emphasis on product availability; employees combine product knowledge with relationship management skills; product ranges limited with similar products combined with support services.
007	Baines & Shi (2015)	Qualitative	33 experts from 28 firms	-Delphi study with senior managers -Three rounds	A1 – B* B2 – B6 B6 – C2 B6 – C4	-Adoption of servitization can both be defensive and offensive -Evidence of positive impact on resilience, efficiencies and growth, but potential loss of traditional revenue streams -For OEMs <sup>4</sup> servitization can be difficult due to (e.g.) culture changes, skills needed, technologies, organization structure and processes.

<sup>1</sup> Top Management Team (TMT)

<sup>2</sup> Services in Support of the Product (SSP)

<sup>3</sup> Services in Support of the Client's actions (SSC)

<sup>4</sup> Original Equipment Manufacturer (OEM)

008	Baines & Lightfoot (2013)	Qualitative	4 firms	-20-30 interviews per case -Manual clustering of data -Workshop (cross-validation)	B1 – B6 B2 – B6 B3 – B6	-For successful delivery of advanced services firms should: co-locate facilities in customers' operations, integrate both forwards and backwards, develop ICTs for remote monitoring, have customer-specific performance measures, develop front-office employees with specific skills, and deploy business process integration with customers.
009	Barquet et al. (2013)	Qualitative	1 firm	-Brazilian tool manufacturer -Two workshops	A1 – B* B5 – B6	-Framework for the adoption of a PSS <sup>1</sup> business model
010	Bastl et al. (2012)	Qualitative	3 firms	-1 manufacturer & 2 suppliers -16 respondents across firms	B2 – B6 B6 – C3	-Servitization adoption changes buyer-supplier relationships (more open exchange of information, strengthening of operational linkages, structural arrangement changes, relational norms besides legal contracts & supplier adaption to IS from buyer)
011	Belvedere et al. (2013)	Quantitative	109 respondents	-26% IT managers, 74% functional managers	B1 – B6 B2 – B1 B2 – B6	-Impact of ICTs on value creation in PSS due to responsiveness and sound improvements of offerings -Process standardization enables value creation (especially for after-sales services)
012	Benedettini et al. (2015)	Mixed methods	75 servitized firms & 54 non-servitized firms	-Study of bankruptcies through secondary data -These were coded, followed by a statistical analysis	A1 – B* B6 – C1	-Service business increases bankruptcy risks (due to internal risks related to servitization challenges) -Demand chain services create greater increase in environmental risks of bankruptcy (i.e. changes in business landscape), product support services create significantly less environmental risks
013	Beuren et al. (2013)	Systematic literature review	149 articles	-Published between 2006-2010	(none)	-PSS creates benefits for stakeholders, society, and the environment -Lack of common terminology
014	Biege et al. (2012)	Qualitative	1 firm	-Manufacturer of high precision machines -Interview & meeting with head of service department, workshop with several managers	(none)	-New process-modelling method for servitized manufacturing processes
015	Biggemann et al. (2013)	Qualitative	5 firms	-5 mining industry suppliers -Sweden, Australia & Chili -28 interviews	A4 – B* B2 – B6 B6 – C1 B6 – C3 B6 – C4	-Interest and motivation to co-develop solutions between suppliers and customers changes over time -New solutions can have market-shaping effects, and can trigger reactions from parties wanting to enhance their market position

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<sup>1</sup> Product-Service System (PSS)

016	Bjurklo et al. (2009)	Qualitative	1 firm	-Tool manufacturer in Sweden -Longitudinal (6 years) -Participation in workshops and interviews (60+ employees)	B4 – B5 B4 – B6 B5 – B3 B5 – B6	-Transition from products to service necessitates understanding of customer requirements and SDL <sup>1</sup> for employees. Service socialization (sharing experiences and mental models), and service narratives can help in this process
017	Boehm & Thomas (2013)	Systematic literature review	256 articles	-Includes articles in German	(none)	-Identification of three streams of literature: Information Systems, Business Management, Engineering & Design. Each stream views PSS through a different lens
018	Brady et al. (2005)	Qualitative	6 firms	-Project of three years -92 interviews -UK, Sweden & France	B1 – B6 B3 – B6 B5 – B6 B6 – C3	-The shift towards IS <sup>2</sup> has major consequences for the firm: business strategy, value chain positions, capability, organizational structure, culture, and mindsets have to change -Firms will have to learn and adapt their internal structure continually
019	Brax (2005)	Qualitative	1 firm	-35 interviews	B1 – B6 B2 – B6 B3 – B6	-Service paradox: clear benefits of adding services, but becoming service-oriented is difficult due to conflict with product-orientation -Five specific challenges: marketing, production, product-design, communication, and relationship factors
020	Brax & Jonsson (2009)	Qualitative	2 firms	-Condition-based maintenance solutions -57 interviews	B1 – B6 B3 – B6 B6 – C3	-To build IS, firms must manage the interdependence between the company and the offering, and between the company and the customer (different from product business)
021	Bustinza et al. (2015)	Quantitative	112 firms	-Survey of service executives -Heavy industry B2B (n=52), medical industry (n=50), selling to end customers ->1 billion in revenue	A2 – B1 B1 – B6 B6 – C4	-Strategies for servitization must be adapted to the unique situation in the value chain to generate competitive advantage and performance -If a firm seeks competitive advantage through customer satisfaction, services should be developed directly by business functions -Firms operating upstream can achieve higher performance through a servitization strategy providing both differentiation and customer satisfaction; firms operating downstream can only achieve this through customer satisfaction
022	Cavalieri & Pezzotta (2012)	Systematic literature review	79 articles	-Articles from preceding 10 years	(none)	-The service engineering field is still in its infancy; models, methods, and tools often adapted from other research fields
023	Ceci & Masini (2011)	Mixed methods	102 firms	-IS providers in IT industry -10 firms studied by interviews (Italy) -Survey to four countries (102 firms)	A1 – B* A1 – B2 A3 – B2 A3 – B3 B1 – B6	-Identification of different configurations between firm capabilities and environment; different strategies are used for different objectives -Firms that have specialized capabilities tend to customize more and generate more value when operating in a homogeneous environment -A priori advantages of bundle providers over generic IT firms (increases when aligning capabilities to environment)

<sup>1</sup> Service Dominant Logic (SDL)

<sup>2</sup> Integrated Solution (IS)

024	Cusumano et al. (2015)	Conceptual	-	-	A1 – B2 B6 – C1 B6 – C4	-Services are not just compliments to products: they can spark new markets, increase industry shakeout, establish dominant designs, improve financial performance (in mature industries), or create market disruption -Different phases of the industry lifecycle and the specific competitive dynamics require different usage of services
025	Datta & Roy (2011)	Qualitative	2 firms	-2 performance-based contracts -15 interviews with firm and customer	B2 – B6 B3 – B6	-Success contribution in cases: service provider should be proactive and flexible, and be ready to make extra investments (for better performance). Contractor has to adhere with joint operations strategy (between supplier and customer). All parties should be willing to make some sacrifices, and there should be clear contract incentives and performance indicators
026	Davies (2004)	Qualitative	5 firms	-Study during 2001-2003 -Up to 10 interviews with senior managers in each firm	B1 – B6	-Firms moving to provide IS are developing capabilities in systems integration -Four capabilities for the provision of IS: systems integration, operational services, business consultancy & financing
027	Davies & Brady (2000)	Qualitative	2 firms	-Study during 1996-1999 -Interviews	A3 – B3	-Suppliers of CoPS <sup>1</sup> expand their capabilities into new areas. These capabilities are built at different levels (strategic, project & functional), and the organizational learning process is dynamic and path dependent -Firms can increase their competitive position by taking lessons from earlier projects and building organizational capabilities around them to make more similar projects in the future. In this way, firms can exploit “economies of repetition”
028	Davies et al. (2006)	Practitioners journal	5 firms	-Study during 2001-2003 -Up to 10 interviews with senior managers in each firm	B2 – B6 B4 – B6	-To become an IS provider, a firm must transition through three levels of organizational capabilities: 1) build a new customer facing “front”, 2) build and strengthen back-end capabilities (“modular offerings”), and 3) develop a strong strategic center in order to develop repeatable IS.
029	Davies et al. (2007)	Qualitative	5 firms	-Study during 2001-2003 -Up to 10 interviews with senior managers in each firm	B1 – B6	-The literature identifies two types of IS firms: the vertically-integrated systems seller, and the systems integrator (coordination and integration of external components). In practice, neither form dominates nor is there a simple transition: firms combine elements from both models.

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<sup>1</sup> Complex Product System (CoPS)

030	de Brentani (1995)	Qualitative	115 firms / 276 projects	-Phase 1: telephone interviews with 184 managers -Phase 2: questionnaire (148 managers in 115 firms: 276 projects – 150 successes, 126 failures)	A2 – B2 A3 – B2 A4 – B2 B2 – B6	-New industrial service development success scenarios: 1) customized experts service (leveraging firm capabilities and resources), 2) planned “pioneering” venture in attractive market (first to market, good fit, excellent execution, suits with company capabilities), and 3) improved service experience (understanding customer needs and developing new service) -New industrial service development failure scenarios: 1) peripheral, low market potential service (few benefits, low market potential and not part of core business), and 2) poorly planned, “industrialized” clone (“me-too” services, lack of innovativeness, not fit with firm capabilities).
031	Dimache & Roche (2013)	Qualitative	1 firm	-Global manufacturer -Action research: meetings, kaizen events, consultation, debriefing and reviewing company documents	(none)	-Development of a new framework for the development of PSS business models (TraPSS). Visualizes the business model aspects and aids with decision making
032	Durugbo (2013)	Qualitative	4 firms	-Microsystems technologies companies -55 interviews	B2 – B6 B5 – B6	-Work systems perspective on PSS. The importance of trustworthy systems and the need to build long-term relationship with customers, suppliers and markets
033	Eggert et al. (2011)	Quantitative	414 cases	-Longitudinal: 5 years -German manufacturing industry	B2 – B6 B6 – C4	-Industrial services can increase profitability, but it depends on the firm’s fit between service offerings and product innovation activity. For firms with low product innovation activities both SSPs and SSCs support profitability, when product innovation is high (differentiation strategy) SSPs boost profitability, but SSCs require significant investments (which could be prove difficult in a highly innovative product firm)
034	Eggert et al. (2014)	Quantitative	513 cases	-Longitudinal: 3 years -German manufacturing industry	A4 – B* B1 – B6 B2 – B6 B6 – C4	-Revenues and profits from service strategies do not necessarily move in the same direction. Firms with broader service portfolios have lower profitability levels in the beginning than narrower portfolios (changes later, after learning effects). -Firms should focus on their SSPs first: it helps to build insight, competences, and acts as a foundation for more complex SSCs. After that, financial benefits can be gained by offering broad portfolio of SSCs (linked to higher profitability and revenue growth). -Decentralization of decision making to lower levels necessary for reaping financial benefits -Loyal customer base increases service business profitability. Firms can start the SSCs roll-out with core customers, instead of entire customer base

035	Eloranta & Turunen (2015b)	Systematic literature review	58 articles	-	(none)	-Most literature on dyadic relationships, but competitive advantage is often based on a firm's network -Literature overemphasizes technology; relational approach can provide insight as well. -Lack of research on fleeting competitive advantages (e.g. hypercompetition)
036	Eloranta & Turunen (2015a)	Qualitative	4 firms	-42 interviews	B1 – B2 B1 – B6	-Platform usage in servitization in order to have flexible externalization or resources and capabilities, and a structure for network orchestration -Three “logics”: connecting actors (for further collaboration), sharing resources (sharing can benefit individual players), and integrating systems (most traditional in servitization)
037	Erkoyuncu et al. (2010)	Systematic literature review	121 articles		A1 – B* A4 – B1 B5 – B6	-Identification of sources of uncertainty in the delivery of services
038	Erkoyuncu et al. (2013)	Qualitative	22 informants	-3 year period -Interviews and workshops	A1 – B* A4 – B* B1 – B2 B1 – B6 B5 – B6	-Development of an extensive list of uncertainties for the design stage (and during bidding stage)
039	Fang et al. (2008)	Quantitative	477 firms	-Longitudinal (1990-2005) -US manufacturing firms	A1 – B* B1 – B6 B2 – B6 B6 – C4	-The impact of service transition on a firm's value starts to become positive after a critical mass in service sales (20-30%). This negative start can be linked to “implementation issues” -It is also contingent on the firm: the transition is more effective when it concerns services linked to the core business (/products) -Likewise, it is also contingent on the industry: slow-growth and turbulent are more effective than high-growth and stable industries
040	Ferreira et al. (2013)	Qualitative	2 firms	-1 manufacturer & 1 customer in Aerospace industry -Desk research & interviews	B1 – B6	-Business models in solution business are dynamic and change during the relationship lifecycle (with all parties involved) -Business model focus should be relationships, not products or services
041	Finne & Holmström (2013)	Qualitative	1 firm	-Longitudinal (18 months) -24 interviews (+meetings, workshops, observations, and internal documents)	A2 – B* B1 – B6	-Capabilities and resources for service provision can be spread in the service supply chain (integrators bring them together) -The relationships between the supplier, integrator and customer can create a triadic operation model (supplier's capabilities & integrators end users base)
042	Gaiardelli et al. (2014)	Literature review / qualitative	20 experts 5 firms 1 firm	-model development -interviews (15 in total) -case study (heavy trucking company, Italy)	(none)	-Development of a model that identifies the different elements of a PSS offering

043	Gebauer et al. (2005)	Qualitative	>30 firms	-German and Swiss manufacturing companies	B1 – B6 B3 – B6 B4 – B5 B4 – B6	-The service paradox can be caused by limited managerial motivation to develop service business. Understanding the potential economic potential of services, increasing service awareness, and accept the risks involved can counter this -Organizational structure needs to be altered for extension of service business (clear NSD <sup>1</sup> process, value proposition based on customer, start relationship marketing, have a clear service strategy, set-up a separate service organization & establish a service culture)
044	Gebauer & Fleisch (2007)	Mixed methods	32 firms, 10 case studies, 187 firms in survey	-Five focus groups with 32 firms -10 case studies (interviews -Survey of 187 manufacturers in Switzerland and Germany	B1 – B6 B2 – B6 B4 – B1 B4 – B3 B4 – B6 B6 – C4	-To increase service revenue, managers need to get rid of the behavioral processes of the old business. This entails understanding the potential of service sales, getting a comprehensive understanding of the service market, formulating and implementing a service strategy, be aware of potential resistance (which can be solved by setting up a separate service organization), integrating customer into the process, and investing effort into (interactive) marketing to manage customer expectations -High service revenues cannot be expected early. Avoiding overambitious goals, setting up a separate service organization, having different cost monitoring systems, having a service development process, and using relationship-based marketing can aid in this process
045	Gebauer (2008)	Mixed methods	195 SBUs	-Mixed survey with qualitative and quantitative aspects	A1 – B*	-Identification of four service strategies: after-sales providers, customer support providers, outsourcing partners, and development partners
046	Gebauer et al. (2008)	Qualitative	16 projects	-16 product-related innovation projects -80 interviews (5 per project)	B1 – B2 B4 – B2 B5 – B2	-For both integrated and separated service innovation there is a positive impact from involvement of frontline employees, information sharing, multifunctional teams, funnel tools, IT, internal organization, and training and education. Strategic focus, external contacts, availability of resources, and management support are more positive for separate than for integrated innovations. Presence of a service champion, autonomy of employees, market testing and market research has positive influence on separated innovations, but negative on integrated service innovations
047	Gebauer (2009)	Quantitative	302 SBUs	-Manufacturing companies -German speaking countries -6 interviews before survey	B4 – B6	-To successfully undertake the move from products to services, managers need to overcome cognitive limitations (such as disbelieving the potential of services, the margins of services, risk aversion, and overemphasis on tangible and obvious features of the environment)

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<sup>1</sup> New Service Development (NSD)

048	Gebauer, Edvardsson & Bjurklo (2010)	Quantitative	302 SBUs	-Manufacturing companies -German speaking countries	B1 – B3 B3 – B6 B4 – B3 B5 – B3	-Identification of the interactions of service elements in the corporate culture (service orientation of management values, employee values, management behavior & employee behavior) -The service orientation of a firm has positive impact on the business performance -Organizational structure moderates interactions of service orientation (separate service business boosts service orientation in the firm's culture)
049	Gebauer, Edvardsson, Gustafsson, et al. (2010)	Quantitative	195 firms	-European manufacturing firms -SBUs (89) and company (106) level	B1 – B6 B3 – B6 B5 – B6	-Separating or integrating the service business depends on the type of service strategy (customer support & outsourcing services are better separated, with development services parts should be integrated) -The degree of service orientation of the corporate culture and employee behavior also depends on the service strategy of the firm
050	Gebauer, Fischer, et al. (2010)	Mixed methods	97 firms / 15 case studies	-Longitudinal (1997, 2001, 2004) -After surveys, 5 most successful companies were interviewed (66 informants in total)	B1 – B6 B3 – B6 B5 – B6	-Changing (or transitioning) from one service strategy to another requires the alignment of organizational elements and structure -Four service strategy transitions are identified: from customer service to after-sales, from after-sales to customer-support, from customer-support to development, and from customer-support to outsourcing
051	Gebauer, Paiola, et al. (2010)	Qualitative	8 + 8 firms	-8 Longitudinal "action" cases (observations) -8 "normal" cases	A1 – B* A2 – B*	-In SMEs <sup>1</sup> service strategy development and implementation depends on the value chain position and the business environment -Four general situations: suppliers selling to a few customers / selling to distributors, and OEMs selling to a few customers / selling to distributors
052	Gebauer et al. (2011)	Quantitative	332 SBUs	-European manufacturing companies	A4 – B2 A4 – B3 B2 – B6 B3 – B6	-The higher the customers needs' complexity, the higher the customer centricity and innovativeness, which means better business performance -Service differentiation makes firms less sensitive to the complex needs of customers, strengthens the link between customer centricity and performance, and improves employees understanding of customer needs -Innovativeness has higher impact on performance if the firm focuses on either product or service innovations
053	Gebauer et al. (2012)	"Research direction"	-	-	(none)	-Directions for future research are provided

<sup>1</sup> Small and Medium-Sized Enterprises (SME)

054	Gebauer et al. (2013)	Qualitative	17 firms / 4 case studies	-Pilot study (17 firms) with 4 in depth case studies -27 interviews -France, Germany, Italy, Sweden, Switzerland & UK	A3 – B*	-Identification of four different service networks: vertical after-sales, horizontal outsourcing, vertical life-cycle, and horizontal integration -Vertical dimension of the network is influenced by after-sales and life-cycle services -Horizontal dimension of the network is influenced by outsourcing and integration services -Firms need specific capabilities (both dynamic and operational) to initiate and use the network
055	Gremyr et al. (2010)	Qualitative	3 firms	-Archival records & interviews (16 in total)	B2 – B6	-Studied service innovations are all recombinative innovations, which implies bundling and unbundling of products/services and that parts can be broken down into subsets
056	Hakanen & Jaakkola (2012)	Qualitative	2 networks	-13 companies in networks: 8 suppliers, 5 customers -Interviews & workshops	A4 – B2 B1 – B6 B2 – B6 B6 – C3	-In effective co-creation in a business network context, the supplier should not only know the customer's needs, but also understand what role the firm should play in the process (e.g. interaction)
057	Hakanen (2014)	Qualitative	12 companies	-9 suppliers, 3 customers -30 interviews -2009-2013, EU firms	B1 – B6 A4 – B1 A4 – B2	-KAM (key account management) in business networks helps to integrate and apply resources in value co-creation ("orchestration" of network actors)
058	Hellström (2014)	Qualitative	2 projects	-Design structure methodology -1 project in bio-fueled boiler plants, and 1 project in shipbuilding	B2 – B6	-Paper identifies integrated solutions business models that are focused on modularity (in delivering complex capital goods), where the coordination and integration of parts becomes central for the firm
059	Hobday (2005)	Conceptual	-	-	(none)	-Systems integration as a capability depends on the product. With high-volume products firms tend to exploit upstream suppliers, with low-volume firms tend to exploit downstream opportunities
060	Holmström et al. (2010)	Conceptual	-	-	B1 – B2 B2 – B1	-Development of a constellation scheme for visibility-based services. This scheme emphasizes that moving downstream in the supply chain, means moving upstream for the customers demand chain and that effective services/offerings require information about this demand chain (i.e. operations of customers)

061	Homburg et al. (2002)	Quantitative	411 firms	-217 clothing stores, 194 furniture stores (divided in USA and Germany)	A1 – B* A2 – B3 B3 – B2 B5 – B3 B6 – C4	-Development of a service-oriented business construct: number of services, the breadth of the services, and the emphasis placed on the services -Service-oriented business increases customer satisfaction, loyalty, retention and market share. Also a positive link between service-oriented business and financial performance -Positive relation between customer orientation and service-oriented business -Larger stores are more service-oriented than smaller ones -Full-time employees positively influence service-oriented business, part-time employees negatively -Store characteristics provide stronger relationship to service-oriented business than external characteristics -On the other hand, local retail innovativeness is related to service-oriented business, but competitive intensity is not
062	Jaakkola & Hakanen (2013)	Qualitative	2 networks (14 firms)	-9 suppliers, 5 customers -Interviews (39) and observations of workshops / meetings -Firms in EU, 2009-2012	A2 – B* B1 – B6 B6 – C3	-Customers gain value of a solution through more efficient activity patterns (increasing benefits, lower sacrifices), or through better resource configurations. Perceived value is influenced by resource integration and interaction among suppliers -Network position determines benefits and sacrifices of actors, and firms should experiment with network positions
063	Jacob et al. (2014)	Mixed methods	Survey: 106 responses	-Qualitative study used to define categories (20 respondents) -Quantitative: survey of German IT sector	B2 – B6	-High importance of consulting satisfaction in B2B solution processes. Developing these capabilities positively impacts the marketing performance
064	Johansson & Olhager (2004)	Conceptual	-	-	B2 – B6	-Development of industrial service profiling and the benefits its offers to position and fit service offerings
065	Johansson & Olhager (2006)	Conceptual	-	-	A2 – B2 B2 – B6	-Development of a product-process matrix which can be used for integrated manufacturing offerings
066	Johnstone et al. (2009)	Qualitative	1 firm	-Civil aerospace and defense industry -18 interviews	A1 – B* B1 – B6 B2 – B6 B5 – B6 B6 – C3	-P-S strategies and transitions in practice are more complex than the literature suggest (e.g. they often fail to take into account industry context and dynamics) -Combining product and service qualities / focuses, the dissemination and effective use of knowledge, and appropriate HR strategies were identified as challenges in the study

067	Kapletia & Probert (2010)	Qualitative	11 projects	-Projects for the UK defense ministry	A4 – B*	-Identifications of four solution models: product system support, life cycle product system support, functional system support, and enterprise system support -Winning customer support can be achieved through: integration expertise, assurance of total delivery, system integration skills, co-development, and solution neutrality
068	Kindström & Kowalkowski (2009)	Qualitative	10 firms	-Swedish firms -Study conducted between 2004-2008 (focus groups & interviews)	A4 – B2 B1 – B6 B2 – B6	-Previous research emphasizes earlier stages of NSD, while the latter are equally important. -An integrative NPD and NSD process is highlighted: the longer the life-cycle, the more important service interactions and customer co-innovation
069	Kindström (2010)	Qualitative	7 firms	-46 interviews (+5 in customer firms), and 14 focus group sessions	B1 – B6 B2 – B6 B6 – C3	-Firms need to focus on all elements of the business model, not on specific subsets -Firms should develop the ability to promote new value propositions; develop relationships skills; be aware of customer processes; establish dynamic portfolio; establish service delivery infrastructure; develop new revenue models.
070	Kindström et al. (2013)	Qualitative	8 firms	-Interviews, focus group sessions, and secondary data	A3 – B2 B5 – B2 B4 – B3 B4 – B5 B6 – C2	-Identification of microfoundations that aid in service innovation -These microfoundations are not sequential (no one way to become service oriented), thus suggesting path dependency
071	Kindström et al. (2015)	Qualitative	3 firms	-Industrial equipment (2) and industrial gas (1) firms -15 interviews (+additional focus group sessions and secondary data)	B5 – B2 B5 – B6	-Service infusion in firms entails that the sales function needs to change. A problem-solving approach, bringing new innovative ideas, focusing on more than the technical, and new skills are necessary. Likewise, incentive systems and the service delivery/sales leads generation need to be adjusted (delivery becomes a key part of sales process).
072	Kohtamäki, Partanen & Möller (2013)	Quantitative	91 firms	-Manufacturers in Finland (20+ employees)	A4 – B* B2 – B6	-Relational capital (a form of social capital in a single relationship) improves the profit impact of R&D services for supplier (without relational capital the link is less supportive) -Relational capital aids in creating a competitive advantage in complex service offerings
073	Kohtamäki, Partanen, Parida, et al. (2013)	Quantitative	91 firms	-Manufacturers in Finland (20+ employees) -On objective sales growth 2008-2011	A3 – B* A4 – B* B1 – B6 B6 – C4	-The link between industrial services offerings and firm sales growth is non-linear -Network capabilities positively moderate the link between service offerings and service sales growth
074	Kowalkowski (2011)	Conceptual	-	-	A4 – B2 B2 – B6	-The ability to communicate the firm's value proposition enhances the company's ability to compete on services. A difference is made between "value-in-use" and "value-in-exchange"

075	Kowalkowski et al. (2011)	Qualitative	7 firms	-70 interviews in total	A1 – B1 A2 – B1 A3 – B1 B1 – B6 B2 – B1	-Firms wanting to organize a service business do not just choose between integration or separation: a hybrid form is also possible. The latter was most common in practice -No best way to organize, but contingent on many factors (firm, offering and market specific ones)
076	Kowalkowski et al. (2012)	Qualitative	1 firm	-Originally 2 firms, but they merged -21 interviews -2004-2008	B1 – B6 B3 – B6 B2 – B6	-Service infusion in practice is not part of a rational plan, but is often based on incremental changes and adjustments as required -Challenges in service infusion come from organizational design, cultural & social factors, and perceived cognitive biases -When firms start the service infusion process they often use an emergent strategy; later on it turns more systematic as value increases
077	Kowalkowski et al. (2013)	Qualitative	13 firms	-SMEs in Sweden (<250 employees) -25 interviews + company visits	A2 – B* B1 – B2	-SMEs often do not have the resources to build organizational elements or resources. Instead, differentiation is achieved through business networks
078	Kowalkowski et al. (2015)	Qualitative	13 firms	-Synthesis of different research projects between 2001-2012 -All firms are manufacturers -Total of 170 interviews & 90 workshops	B2 – B6 B4 – B6 B5 – B6	-Three trajectories are identified, becoming: 1) an availability provider, 2) a performance provider, and 3) an 'industrializer' (standardizing) -Service expansion and standardization of solutions needs to be balanced -Firms need to manage the different supplier roles / trajectories and decide where to proceed (most value created/profitable)
079	Kujala et al. (2011)	Qualitative	1 firm	-5 solutions developed in firm -15 interviews + additional data	A4 – B1 B2 – B1	-Choice of business model for project firm depends on the specific solution project -Majority of influencing factors (partly or fully) related to the customer
080	Laine et al. (2012)	Qualitative	1 firm	-Longitudinal (2003-2008) -"Interventionist case study" -14 events with 140 participants	(none)	-In the early stages of servitization, a business game can help with information gathering, reaching consensus among stakeholders, best organizational structure (integration vs. separation, changes in power, revenue, and costs for Bus)
081	Laperche & Picard (2013)	Qualitative	10 firms	-Manufacturers from CAC40 (France)	B1 – B2 B3 – B2	-Identification of links between eco-innovation strategy and PSS development -In case companies, business model changes are incremental and marginal (firms did not make radical changes) -Development of PSS depends on learning capabilities and value chain position
082	Lay et al. (2009)	Qualitative	17 firms	-Firms from 4 European countries	(none)	-Development of a typology for service-based business
083	Lay et al. (2010)	Quantitative	3376 firms	-European Manufacturing Survey (Austria, Switzerland, Germany, France, Croatia, The Netherlands, Slovenia & Spain) during 2006-2007	A2 – B* B2 – B6 B6 – C4	-Majority of manufacturers offer services, but revenue is low -Services prices are often bundled with products (after-sales services) -Breadth and depth of service offering determines service sales -Value chain position does not affect servitization differences
084	Lee et al. (2015)	Conceptual	-	-	A4 – B*	-Evaluation method of PSS from customer's perspective
085	Li (2011)	Quantitative	403 respondents	-Contract manufacturers / OEMs in China	B1 – B6	-Service-based added value in integrated solutions based on cross-functional dissemination of information and joint development

086	Lightfoot & Gebauer (2011)	Qualitative	12 firms / 24 projects	-Western European manufacturers -5 persons per project were involved (interviews, workshops & internal documents)	B1 – B2 B2 – B6 B3 – B2 B5 – B2	-Specific service strategies have different alignments with determinants of service innovation (complex relationship) -The more advanced the services, the more important the determinants become for service innovation
087	Lightfoot et al. (2013)	Systematic literature review	148 articles	-	(none)	-Identification of five distinct research communities with little cross-citation -Common interest: product-service differentiation, competitive strategy, customer value, customer relationships, product-service configurations
088	Lim et al. (2012)	Conceptual	-	(-181 PSS cases were analyzed during development of framework)	(none)	-Development of a PSS matrix that aids in visualization of the PSS process and shows relationships of underlying components
089	Lindahl et al. (2014)	Qualitative	3 firms	-IPSO providers	B6 – C4	-IPSO <sup>1</sup> offerings are better both economically as well as environmentally compared to “normal” offerings -Engineering activities such as remanufacturing, reuse, maintenance, recycling support these advantages -High flexibility and close relationships with other actors were enablers
090	Löfberg et al. (2010)	Qualitative	11 firms	-3 OEMs plus set of suppliers -19 interviews	A2 – B* B1 – B6 B2 – B6	-A firm’s position in the supply chain influences the choice of service strategy (different customers, different demand; and services are closely related to the product) -Firm size, or resources available, influences service strategy as well -Common challenge: making a profitable service business model
091	Löfberg et al. (2015)	Qualitative	13 firms	-3 OEMs, 8 suppliers & 2 consultancies -15 interviews	B1 – B6 B6 – C1	-To overcome challenges in the service network, firms use resource integration and developing new value constellations as new manoeuvres
092	MacBryde et al. (2013)	Mixed methods	435 firms / 50 firms	-Survey / in-depth analysis -Scottish manufacturing SMEs	A1 – B* A2 – B* A3 – B* A4 – B*	-Before offering advanced services, manufacturers must be operationally excellent. After this, firms can become resource integrators and offer life cycle solutions -This transition path differs per firm depending on its customers/the market
093	Malleret (2006)	Qualitative	6 firms	-SMEs in France (B2B services)	A4 – B2 B2 – B6 B6 – C3 B6 – C4	-Designing a service offering should be done in close relationship with the user (/customer) -Services should be delivered at competitive quality and cost; quality procedures and HRM are required for this -Value creation needs to be marketed to customer (performance based contracts can help make this clear) -“Threshold effect”: profitability is not immediate -Services are not automatically profitable (well thought-out policy necessary)

<sup>1</sup> Integrated Product Service Offering (IPSO)

094	Matthyssens & Vandenbempt (2008)	Qualitative	?	-Longitudinal (1997-2006) -Electro-technical industry in The Netherlands	A1 – B* B1 – B6 B6 – C1 B6 – C2	-To add value successfully firms need to create ground-breaking, proactive, and customer-focused logics -Firms seeking more advanced services need to integrate more with the value chain -Situation specific: internal and external barriers to mobility exist
095	Matthyssens & Vandenbempt (2010)	Qualitative	5 firms	-Belgian and European machine building companies -12 interviews	A1 – B* A4 – B* B1 – B6 B2 – B6 B3 – B6 B4 – B6 B5 – B6	-Identification of 4 types of service addition, and two common trajectories in sample: standardized services to tailored ones, and product-focused customization to process optimization -Identification of challenges: internal ones such as (e.g.) no customer insight, lack of technical competences, scale issues, lack of network capabilities, and resistance from internal organization. And external ones: (e.g.) customer distance, customers want services for free or don't want to share information.
096	Meier et al. (2010)	Conceptual	-	-	B1 – B6 B2 – B6	-Conceptualization of product and services into IPS2 (industrial product-service systems) and potential business models
097	Miller et al. (2002)	Practitioners journal	30 firms	-Two year study -Data from newspaper, magazines, annual reports, et cetera + interviews	A3 – B* B1 – B6	-Three capabilities for success: 1) exploit internal capabilities to provide services to clients unattainable for them, 2) sustain that advantage by client centricity and capability management, and 3) create the correct organization: front, back, with a strong central infrastructure -To manage the transition managers should start with small experiments, observe the commonalities, and constantly improve and adapt
098	Neu & Brown (2005)	Qualitative	3 / 4 firms	-Exploratory: 16 interviews in 3 firms -Main: 3 successful and 1 unsuccessful firm (75 interviews with 25 managers)	A1 – B* A2 – B* A3 – B* B1 – B6 B2 – B6 B3 – B6 B4 – B5 B4 – B6 B5 – B6	-Major challenge for firms lies in aligning the market condition with the strategy and organization of the firm -Market orientation of the firm, leveraging existing organizational resources, and the availability of competences in-house to deliver the solution are factors for success. -Human resources play an important part: developing (learning) relations with customers, being trusted advisors, delivering complex services, etc. Individuals need technical and relational competences -Several structural factors might need to be changed: from autonomous business units to intrafirm collaboration, and (financial) incentive systems -TMT should be active and visible in changing the organization, but should also decentralize (part of) decision making to lower levels (since lower levels understand the customers' needs better) -Managers should adopt a high degree of information processing in the strategy formulation, but the implementation should be more improvisational (to help with unanticipated factors, learning or changing market conditions)

099	Ng & Nudurupati (2010)	Mixed methods	2 contracts	-2 outcome based contracts (service firms and UK government) -32 interviews / 84 responses from survey	A4 – B2 B1 – B2 B2 – B6 B3 – B2 B5 – B2	-Making outcome-based contracts requires different activities and processes than with traditional contracting. Challenges include complexity of costs, unpredictability, reliance on customer and cultural change issues -11 factors are identified to counter these challenges
100	Ng et al. (2012)	Mixed methods	1 case / 1 contract	-1 contract for service/support -Interviews, text analysis & survey	(none)	-Development of a visualization technique using the SDL to show the firm's value propositions
101	Nordin (2008)	Qualitative	4 firms	-25 interviews and workshops	A1 – B1 B1 – B6 B2 – B1	-Development of different propositions in order to determine "make or buy" decisions for services, and how to organize this -Competitive advantage is achieved if firms simultaneously keep down costs (e.g. scale advantages), differentiate and increase value of offerings, and by developing bonds with customers (innovation & responsiveness)
102	Olhager & Johansson (2012)	Qualitative	1 firm	-One of the researchers worked at the company for two years	(none)	-Development of a framework for the management of long-term capacity management for service operations
103	Opresnik & Taisch (2015)	Conceptual	-	-	A2 – B* B2- B6	-Development of different big data strategies for servitized firms -The more servitized the offerings and the more users, the more data is available, so the more valuable big data strategies will become
104	Osegowitsch & Madhok (2003)	Practitioners journal	-	-	A1 – B* A4 – B1	-Reasons for vertical integration have shifted over the years: from strategic and efficiency reasons to pursuing value migration, differentiation, customer demands for integrated solutions, synergies, or learning motivations. -Not just in mature industries, but also in emerging ones due to credibility and system compatibility (standards)
105	Paiola et al. (2013)	Qualitative	20 / 4 firms	-Exploratory (20 firms) and in depth case study (4 firms) -Switzerland, Germany & Italy (2006-2010) -Main study: 3-9 executives per firm were interviewed (23 in total)	A1 – B* A2 – B* B1 – B2 B1 – B6 B2 – B1	-Identification of different "make-or-buy" decisions for capability development: internal, external & hybrid method. In early stages, basis services and internal development is more common. Later on, when services move away from the core business, external development is more common -Identification of four different approaches for aligning service components and capabilities -Moving towards more advanced services does not imply that all customers want this; basic services still should be offered -Servitization in SMEs seems more complex than just lack of resources and size
106	Pan & Nguyen (2015)	Quantitative	6 experts / 30 respondents	-Respondents from 30 manufacturing firms -Study in Taiwan, Vietnam & Thailand	B2 – B6 B6 – C3	-Manufacturers should focus on customer satisfaction and loyalty by integrating product / services, by having value-added offerings and by nurturing long-term relationships -Development of an overview of different planning zones based on importance and improvability

107	Parida et al. (2014)	Mixed methods	115 firms / 11 case studies	-Survey: 115 manufacturers in Finland -Case study: 11 firms in Sweden and Finland (30 interviews)	B1 – B6 B2 – B6 B6 – C4	-Simply adding services to a product offering has a negative effect on financial performance, a comprehensive transformation of the organization is required -4 basic types of services. Add-on services negatively related to financial performance, product support services, R&D services and functional services are positively related. -While moving in the service continuum, firms do not abandon “lower level” services, instead new services are added to the offering -Key challenges and learning activities: business model design, network management, integrated development and service delivery network management.
108	Park (2012)	Qualitative	1 CoPS case	-Telecommunications sector in Korea -Background papers (27), interviews (twice 4 persons)	B1 – B6	-Capabilities that are needed for success in CoPS: network capabilities, acquiring skills and knowledge, leveraging policy and institutions -The way to acquire capabilities changed over time, and standardization became more important
109	Pawar et al. (2009)	Mixed methods	33 articles / 2 firms	-Three stages: road mapping, literature review & case studies -2 large firms: interviews, documents & presentations	A1 – B* A2 – B* A4 – B* B1 – B6 B2 – B6	-Most effective delivery is through networks of different firms -Designing product, service and organization has three stages: defining value (customer needs), designing value (organizational requirements), and delivering value (network of partners) -Configuration of PSO (product-service-organization) should be done based on customer needs, not on internal resources and capabilities
110	Peillon et al. (2015)	Qualitative	1 firm	-French manufacturer (capital goods) -Interviews with general manager & R&D manager	B1 – B2 B1 – B6 B2 – B1 B2 – B6 B4 – B5 B5 – B6 B6 – C1	-In the capital goods sector, servitization might constitute more of a non-reversible path of integrating product and services, than a continuous transition -In servitization, there are continued (increasing) interactions between product and service oriented systems -Risk exists of a split of employees between service operations and traditional manufacturing camps
111	Penttinen & Palmer (2007)	Qualitative	4 firms	-Product manufacturers in different countries (2 small & 2 large) -Different methodologies per case	A1 – B* A4 – B* A4 – B1 B1 – B6 B2 – B6 B6 – C3	-Development of a framework based on completeness of offering and transactional/relational relationships, and the identification of two paths -Requests by customers, demands by customers, or search for steadier revenue streams push manufacturers to reposition -Firms gain new capabilities by networking or implementing innovative IT technology -IT enables more complex service offerings

112	Phillips et al. (1999)	Conceptual / Qualitative	41 respondents	-Managers and engineers	A1 – B* B6 – C4	-“Death” of the product due to: commodization, shifted basis of competitive advantage, focusing on customer needs is more successful than focusing on internal matters, mass customization, and shorter market life cycles -Adapting to customer needs and offering a package of goods, services and information is more successful than a traditional product offering
113	Phumbua & Tjahjono (2012)	Systematic literature review	22 papers	-	(none)	-Review of PSS modeling and simulation techniques
114	Piccoli et al. (2009)	Qualitative	6 firms	-30 interviews -Firms are located in North-America	A4 – B* B1 – B6 B6 – C3	-Use of process completeness (from the customer’s perspective) for the development of four distinct service systems: transaction, process, alliance & agility. -Identification of three “gaps” that need to be bridged that need to be mitigated if firms move towards advanced offerings
115	Prior (2013)	Netnography / webnography	316 comments	-Based on discussion boards on LinkedIn -Comments made over 3 years (2007-2010) -Interviews with 17 respondents	B5 – B6 B6 – C3	-Activities of supplier personnel shape the way in which customers perceive value in complex industrial solutions delivery -Four categories: communication, planning, risk management, and coordination (perceived value is separated into functional, social and emotional forms)
116	Raddats & Easingwood (2010)	Qualitative	25 firms	-40 managers in 25 firms (interviews) -Director level	B1 – B6 B2 – B6 B5 – B6 B6 – C3	-Development of service typology with strategies and growth options (through operations orientation or through multi-party products) -Focusing on operational activities increases, risks since it requires organizational changes and a successful transition -For successful service delivery a services centric mindset (processes, tools, employees) is necessary
117	Raddats & Burton (2011)	Qualitative	25 firms	-40 managers in 25 firms (interviews)	B1 – B6 B2 – B1	-Organizational configuration for service delivery depends on the specific service strategy -Strategy/structure can also depend on specific product characteristics -For product differentiation, a combined service/product business makes sense. For service growth a separate organization is most appropriate (though it can hinder the product business). However, a virtual organization might work better if service growth is linked to the firm’s own products -Virtual service business is not always a solution though: it can lead to lack of focus

118	Raddats et al. (2015)	Quantitative	155 firms / SBUs	-Manufacturers in the UK	A2 – B* B2 – B6 B4 – B2 B4 – B6 B5 – B6	-Service orientation of the firm's managers and employees (creating a vision and implementing it) contributes to services success -Service methods and tools also contributes to services success -Industry standing does contribute to service success, but the resources needed for this are problematic to identify and idiosyncratic -Collaborative approach and solution approach do not contribute to service success (the former is not necessary for every type of solution, and the latter is a form of advanced services, so not every firm sells this or made the necessary – far-reaching – organizational changes)
119	Rapaccini & Visintin (2015)	Qualitative	?	-Framework development by meetings with and feedback from companies -4 short, confirmatory cases	B2 – B6 B6 – C3 B6 – C4	-Development of a framework for hybrid solutions based on potential value of the product and the associated risks -If the value of product is low, basic services are in order. If the value is higher, more product / advanced services can be offered -Depending on the type of risk, it is wiser to offer availability, use, or process-oriented solutions
120	Rapaccini (2015)	Qualitative	5 firms	-Large, Italian manufacturers -Interviews (13), secondary data & workshop	A1 – B2 B2 – B6	-Pricing strategies of firms depend on the amount of servitization: basic services mostly use cost-based pricing, extended offerings use innovative price strategies -Less servitized firms prefer to sell standardized bundles, later on bundling is used to offer unique offerings to the customers' needs -Competition and environmental factors do not have direct influence on the adoption of value-based pricing, but it does influence differentiated offerings -New pricing strategies require new capabilities (calculation, accounting, etc.)
121	Reim et al. (2014)	Systematic literature review	67 articles	-Sample includes articles discussing business models or tactics	A2 – B* A3 – B* B1 – B6 B2 – B6	-Article finds support for the division into product, use and result-oriented business models -Five main tactics identified: contracts, marketing, network, P&S design, and sustainability -Tactic usage depends on internal and external conditions: 1) product or service nature of the supplier, 2) firm's size, resources, flexibility and competences, and 3) B2C or B2B orientation
122	Roehrich & Caldwell (2012)	Qualitative	2 PPPs	-Private public partnerships (health care, spanning 14 years) -Interviews (38) & secondary data	B2 – B6 B5 – B6	-In order to be competitive, the provider of the solution 'unbundles' the integrated solution into different parts in order to handle specific phases (meta-level solution capability to tender and contract public services)
123	Saccani et al. (2007)	Qualitative	7 firms	-Industrial firms supplying the consumer market -Interviews, questionnaire, observations & secondary sources	B1 – B6 B2 – B1	-Configuration of after-sales service supply chain differs and no best way exists -Influenced by multiple factors: product characteristics (complexity, life cycle) strategy (differentiation, quality or cost), and the distribution chain. -In-house provision used if the service is complex or of strategic importance. -Multiple supply chain configurations can exist in one company if there are different requests with different contextual factors

124	Saccani et al. (2014)	Qualitative	7 buyer-supplier relationships	-7 suppliers & 4 buyers -Data collection from both sides (interviews, secondary data)	B2 – B1 B2 – B6 B6 – C3	-There is not a single best way to manage buyer-supplier relationships in servitized environments, instead it depends on the service type -Moving to more advanced services, more technical and customer information (i.e. business processes) are necessary. This increases the information exchange as well as cooperation in the relationships, and adds more operational linkages between the firms -Basic services are mostly run on transactional agreements (legal & formal), more advanced services have less formal contractual elements
125	Salonen (2011)	Qualitative	2 firms	-Capital goods manufacturers in Finland -33 interviews	B1 – B6 B2 – B6 B3 – B6 B5 – B6	-Firms in sample set up a separate service division that deals with product-related services (for installed base) as well as integrated solutions (to increase competitiveness). Product-based business remains crucial however, and changes are made gradually. -This service transition requires change in culture, a more open relationship with customers, new capabilities are necessary for the sales force, and solutions should be as standardized as possible -Firms still represent more systems selling than systems integration -Highly customized solutions are made through project teams, but more standardized ones are conducted under normal operations
126	Salonen & Jaakkola (2015)	Qualitative	2 firms	-Capital goods manufacturers in Finland -34 interviews (2006-2013)	A2 – B1 A3 – B1 B1 – B6 B2 – B1	-External or internal resource integration is analyzed through four views -Identity view: internal when firms wants to grow past current business, external when it wants to enhance current business -Competence view: internal when fields of knowledge are similar, external when they differ / are distant -Efficiency view: internal when system is not modular, external when system can be modularized -Power view: internal when firm cannot show itself as an attractive channel for external companies, external when it can
127	Santamaría et al. (2012)	Quantitative	12.334 firms	-Service innovation in Spanish manufacturing firms -2004-2007	A4 – B2 B1 – B2 B5 – B2	-Training activities are positively related to service and process innovation, but not to product innovation -Usage of advanced machinery and IT is positively related to all types of innovation, but more so for service innovation -Collaboration with customers in positively related to service innovation -Research shows correlation between service and product innovations, and R&D also positively impacts service innovation
128	Schrödl & Turowski (2014)	Conceptual	-	-	(none)	-Development of a risk management model for a supplier seeking low-risk supply chains

129	Shelton (2009)	Conceptual	-	-	A4 – B* B1 – B2	-For successful innovation management, firms should expand their offerings beyond the existing products, they should make organizational change that help foster innovation, and they should develop partners to support this
130	Smith et al. (2014)	Qualitative	1 firm	-UK manufacturer -28 interviews, archival data	A4 – B* B1 – B2 B2 – B6 B4 – B2 B5 – B2	-Identification of four value proposition for service offerings -The importance of contextual factors increases as firms move towards more advanced value propositions (customer integration, HR, design of the processes)
131	Spring & Araujo (2009)	Conceptual	-	-	B1 – B6 B2 – B6	-Article sheds light on new elements of operations strategy , and identifies areas such as network structure, the nature of transactions (how are they made), new revenue models, and how capabilities are developed
132	Spring & Araujo (2013)	Qualitative	1 firm	-Manufacturing firm -Interviews & meetings with management	B1 – B2 B1 – B6 B2 – B1	-There are multiple routes and logics through which firms can servitize -The shift to services is emergent and an ongoing process (firm and network partners) -Understanding other firms' capabilities (in the network) and orchestrating the service network provides the opportunity for valuable service offerings
133	Storbacka (2011)	Qualitative	10 firms	-Interviews & workshops -Firms sell solutions	A4 – B* A4 – B1 A4 – B2 B1 – B6 B2 – B1 B2 – B6 B3 – B6 B5 – B6	-Development of a framework for successful solution business. A process point of view is taken (develop solutions, create demand, sell solution, deliver solution) with cross-functionality elements (commercialization, which is related to the customer interface, industrialization, which is related to the development, and solution platforms, which is related management of the solution -The article identifies 64 capabilities and management practices for successful solution business, which is separated into 12 different categories
134	Storbacka et al. (2013)	Qualitative	52 firms	-Data from eight research projects (presented in other papers) -216 interviews & 15 workshops	A1 – B* A2 – B* B1 – B6 B2 – B6	-Identification of four continua for firms moving towards solution business: customer embeddedness, offering integratedness, operational adaptiveness and organizational networkedness. However, the specific nature of these continua (and their importance) differ per industry -In an installed-base context, the transition is natural but gradual. As a result, the firms do not address the interdependencies explicitly and mismatches between the continua form -In an input-to-process context, explicit choices are made and the continua have to be developed together
135	Sun et al. (2012)	Conceptual	-	-	(none)	-Development of a model for the evaluation of product-service performance
136	Tukker (2015)	Systematic literature review	278 papers	-	(none)	-The number of articles on PSS is increasing rapidly, and researchers now come from a variety of countries and backgrounds

137	Tuli et al. (2007)	Qualitative	54 firms	<p>-Interviews with 49 managers from 25 purchasing firms, and 55 managers from 29 supplying firms</p> <p>-Focus groups with 21 managers with 19 supplying firms</p>	<p>A4 – B*</p> <p>B1 – B6</p> <p>B2 – B6</p> <p>B4 – B1</p> <p>B4 – B6</p> <p>B5 – B6</p>	<p>-Identification of four relational processes in customer solutions: requirements definition, customization and integration, deployment, post-deployment support</p> <p>-Delivering solutions requires organizational changes, so mechanism should be developed for the coordination of each relational process</p> <p>-Most firms take into account customization and integration of solutions, but not the other factors. This can potentially explain poor profits of solutions</p> <p>-Solution effectiveness depends on supplier and customer behavior. Customers need to be willing to adapt to the products, and understand the suppliers internal processes &amp; politics</p> <p>-Adopting new processes and organizational elements for solutions might be met with resistance by managers with vested interest. Contingent hierarchy, communicating success stories can help solve this</p> <p>-Value systems and incentives for employees need to be implemented in order to establish proper documentation of activities</p>
138	Turunen & Finne (2014)	Conceptual	-	-	<p>A1 – B*</p> <p>A2 – B*</p> <p>B6 – C1</p> <p>B6 – C3</p> <p>B6 – C4</p>	<p>-Different environmental factors can have influence on the servitization of a given population</p> <p>-Competition in product sales and density of firms providing services encourages adoption, supported by the legitimacy effect. Later on, competition becomes fiercer and firms exit the servitized arena</p> <p>-Legitimacy drives adoption of servitization, this is supported by available service resources and relevant institutions</p> <p>-Technological innovation can change competitive positions in servitized environments. Early adoption can lead a firm to dominate a market</p> <p>-Political forces also shape the servitization adoption in markets through policies and regulations</p>

139	Ulaga & Reinartz (2011)	Qualitative	22 firms	-22 interviews with managers	A2 – B* A3 – B* B1 – B6 B2 – B6 B3 – B6 B4 – B6 B5 – B6	-Development of a service typology -Identification of four resources (installed base product usage and process data, product development and manufacturing assets, product sales force and distribution network, and field service organization) and five capabilities (service-related data processing and interpretation capability, execution risk assessment and mitigation capability, design-to-service capability, hybrid offering sales capability, and hybrid offering deployment capability) that firms should nurture and develop -Firms fail to recognize the potential of IB <sup>1</sup> data, fail to invest in smart technologies, or fail to leverage the potential of this data -Firms should also develop a service culture, train staff, include service in innovation specifications, leverage existing sales contacts, and management must lead and commit to service development
140	Ulaga & Loveland (2014)	Qualitative	17 firms	-Pilot: 18 interviews -Main: 20 interviews / 17 firms -C-level managers	B4 – B5 B5 – B6	-Significant role for the sales organization in the transition, but many issues related to resistance and churn -Sales process for hybrid offerings is different: more focus on co-creation, more cooperation, larger network of stakeholders & increasing customer share instead of focusing on new customers -Sales proficiencies based on: deep understand of customer('s business), proactively manage customer expectations, more complex network of actors and practicing value selling -Traits that can be good for good-based sales might be detrimental for service-based sales, so different personality types can be better at different type of sales (thus managers should reconsider their hiring, assessment and training of sales employees, just setting incentives and quotas does not work)
141	Valtakoski (2015)	Qualitative	4 firms	-Software industry (Finland) -24 interviews	B2 – B6 B6 – C3	-The higher the degree of intangibility of the offer, the lower the chance that the buyer will purchase it / start a relationship with the supplier -This can be countered by increasing the level of trust through mitigation strategies (standardization, wide adoption of solutions, enhancing cognitive trust, and affective trust)
142	Vasantha et al. (2012)	Conceptual / review	-	-	(none)	-Review of current PSS design methodologies. Current methods only highlight a few areas (design processes, terminology & planning life cycle phases)
143	Visintin (2012)	Qualitative	1 firm	-Interviews with and comments from four managers	B2 – B6	-Firms do not move from just providing products to offering solutions; a firm needs to have the capability to do both and to deliver standardized goods, while also providing customized solutions (depending on the customer)

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<sup>1</sup> Installed Base (IB)

144	Visnjic Kastalli & Van Looy (2013)	Mixed methods	44 subsidiaries / 1 firm	-44 subsidiaries of 1 firm -Longitudinal (7-year period)	B6 – C2 B6 – C4	-Non-linear relationship between service sales and profitability (low-hanging fruit increases profits, but on a larger scale this decreases, and only turns positive again when talking about high levels of service activity) -Product sales and service sales are complementary (higher = higher), but only if services are related to the business model. Customer proximity also adds to the positive effect -If firms add services over time, they will gain from service learning effects -These learning effects, and economy of scales, will aid in long-term profits
145	Visnjic Kastalli et al. (2013)	Qualitative	10 subsidiaries / 1 firm	-10 subsidiaries of 1 firm -> 100 interviews	B3 – B6 B4 – B5 B5 – B6	-Development of a performance management system with product / service perspectives. Service adoption (breadth) and service coverage (depth) are used as dimensions. The complementarity index is used to assess the interdependency of product and service sales (to minimize cannibalization) -Customer orientation, raising organizational awareness for the PMS, transparency, and accurate measurements are needed for effective implementation
146	Wikström et al. (2009)	Qualitative	6 firms	-17 interviews with executives	(none)	-Identification of four different business logics for project-based businesses wanting to supply services (based on complexity of project delivery, and degree of maturity in delivering services). Drivers for both factors are also identified
147	Windahl & Lakemond (2006)	Qualitative	2 projects / 1 firm	-Two initiatives within one firm -1: 11 interviews -2: 4 interviews	A2 – B* B1 – B6 B2 – B1 B4 – B6 B6 – C3	-When delivering integrated solutions, challenges derive not just from the internal organization, but also from the firm's network -Identification of six influencing factors: strength of the relationships of different actors involved, firm's position in the network, the network horizon, the impact of the solution on the internal activities, the impact of the solution on the core processes of the client, and external determinants -Strong inter-firm relations important for innovation and value creation -Intra-firm relations also of importance: activities need to be addressed integrally, commitment and involvement of TMT, development of credibility, possible development of a separate division / organization for solutions.

148	Windahl & Lakemond (2010)	Qualitative	3 cases / 2 firms	-Research during 2001-2007 -Case 1: 6 interviews, case 2: 4 interviews, case 3: 2 interviews -Workshop / reference group meetings	A1 – B* B1 – B2 B2 – B6 B6 – C3	-Development of a typology for integrated solutions (based on literature) -Firms do not just move from product-based to service-based, but need to balance elements from both. Especially established departments such as R&D can contribute to integrated solutions even though they are goods-focused -More advanced integrated solutions increase the interdependencies between supplier and clients (thus, it might be more applicable to non-core processes for customer) -Incentives and driving forces for integrated solutions change over time (related to business cycle) -For customers it can be difficult to see the value of the offering, so price calculations and offerings need to be clearly communicated
149	Witell & Löfgren (2013)	Qualitative	6 firms	-Manufacturing companies -12 interviews in total	B2 – B6 B6 – C3 B6 – C4	-Identification of eight transition strategies from “free to fee” services -Changing the business model from one day to the next (same services, now with fees) results in big response from customers and a loss of service sales. Incrementally changing the business model (current services stay the same) has no effect on current services, but new services will begin to grow slowly. Radically changing the business model entails changing the value proposition and involving other actors, but still this is not certain to succeed
150	Wuest et al. (2015)	Conceptual	-	(-Some interviews with customers were done for evaluation – B2C)	B2 – B6	-The concept of a product avatar is used as a platform for servitization. This can be used to access PL information and connecting stakeholders (e.g. useful when selling upgrades, or connecting companies in a network)
151	Zhang et al. (2014)	Conceptual	-	-	B2 – B6	-Development of a pricing strategy for selling services with products based on information asymmetry (e.g. service quality) and customer expectations
152	Zhen (2012)	Conceptual	-	-	A1 – B* A2 – B*	-Analytical study on service-oriented manufacturing (SOM). Status in the market, costs structure, and configurations for providing services have impact if SOM should be chosen and depend on the scope of SOM

## **2.4 REVIEW OF THE LITERATURE**

This section will explore the integrative framework of servitization and the different linkages in the model in more depth. A distinction is made between the three groups of literature, identified in the previous chapter, and each will be discussed separately. Not every study in the sample will be discussed because of space considerations, but the major themes in each group will be elaborated upon. Following this, a short overall evaluation of extant research will be presented. It should be noted however, that in Figure 1 and Figure 2 are built solely on the sample that was identified earlier. Hence, some linkages are described only to a lesser extent or only implicitly. An example is the connection between intangible organizational elements and structural organization elements or employee characteristics; one could expect that the influence of cultural change or the degree of customer centricity of the organization exerts influence on both. As it stands however, these linkages are not explored within the sample. Thus, either they have been underexplored, are not present within the research, or are not a major concern to servitization. The next chapter will look at possible avenues for future research and take into account these underexplored research areas.

### **2.4.1 Studies on the linkage between antecedent factors and servitization**

#### *2.4.1.1 Industry Structure and Dynamics (A1)*

Previous research has identified various industry factors that have the potential to influence servitization in general, or specific subsets of the servitization process. A deficiency of the current literature is that it is often not clear or explicit what environmental factors affect which specific parts of servitization; most of the literature is general and remains vague about the details. Nevertheless, this group of research provides some good insight into what drives servitization and what obstructs it.

There are various external pressures that have been identified in the literature that urge or pressure manufacturers to start the service transition process. Phillips et al. (1999), for example, state that commoditization, changing basis of competitive advantage, and shorter market cycles are external reasons why firms move to offer

services. Similarly, Matthyssens and Vandenbempt (2008) found that commoditization drives servitization. Baines and Shi (2015) concluded that early adopters of servitization in an industry are often motivated by defensive reasons such as financial improvements or commercial viability, and less so by offensive reasons such as gaining a competitive advantage on the direct competitors. Another reason is identified by Homburg et al. (2002), who found that it is not so much the competitive intensity that drives firms to servitize, but more about local service innovativeness of firms (i.e. if the competitor offers it, so should we). It should be noted however that their study was based in a business-to-consumer context, so it is unclear if the same principle applies to an industrial business-to-business context. Turunen and Finne (2014) provided perhaps the most extensive discussion on industry factors that influence servitization. They posit that the density of service-providing firms is a main determinant for servitization in an industry. At first, there are just a few companies who are servitized, but as this number slowly keeps increasing a legitimacy effect takes place. This encourages more firms to servitize, and thus the number of direct competitors increases. But, as the number of competitors in the service business increases, the intensity of the competition increases as well, which forces firms to exit the servitized environment again. Turunen and Finne (2014) also stated that political forces can be of influence to servitization. Especially in tightly-regulated environments, deregulation can increase servitization. Overall, it should be noted that not every industry is conducive to servitization. Finally, Fang et al. (2008) identified that service addition is more effective in slow-growth and turbulent environments, but less so in high-growth or low-turbulence environments.

A few industry and environmental inhibitors to the servitization process have been identified as well. Market fragmentation (Matthyssens & Vandenbempt 2010) is one factor, and in their case study, Barquet et al. (2013) state that the case company also had concerns about regulations on the financing of machinery and the specific taxation rules that were involved. Servitization also does not need to be successful at every point in time. Windahl and Lakemond (2010) found, for example, that the driving

forces for service addition and solution integration change with the business cycle. Gebauer, Paiola, et al. (2010) developed a framework with four business models for SMEs wanting to servitize and also took into account the environment of the firms. They found that the business environment of the firm is shaped by the amount of customers available, how complex their needs are, and how competitive differentiation can be achieved.

Although much of the research in the industry structure and dynamics category has been general in nature, there are some studies that identified direct linkages between the industry structure and dynamics, and the structure of the business and the offering-related elements that are present in it. Kowalkowski et al. (2011) provided the most in depth discussion on this by taking into account how market factors shape the internalization or externalization of the service business. They identified several factors: the smaller the current installed base of the company, the more likely it is that the firm will internalize the service business; if firms operate in an emerging market it favors externalization; consolidation in the supplier base favors internalization. One final factor they included is industry turbulence, which is defined as changing customer needs, market channel consolidation and low-cost competitors. The higher the turbulence in the industry, the more likely that the firm will internalize the service business. Nordin (2008) seems to offer a similar line of reasoning by stating that the greater the speed of change is, the better it is to internalize the service business. Likewise, he states that complex or unstandardized products favor internalization due to the necessity of having close and positive relationships with the customers.

The industry structure and dynamics also seems to have an effect on specific offering-related elements. Cusumano et al. (2015), for example, concluded that industry maturity shapes the service offering of firms. In the “ferment” phase, firms offer services that tend to be customized for the client and aimed at adapting the servitized product to the specific customer situation (firms can also offer substitution services, which are basically functional products where customer buys the usage, not the

product itself). When the industry starts maturing, firms offer more standardized services aimed at “smoothing” the product sale, such as financing, maintenance, training or technical support. Later on, in mature industries, “smoothing” services still play a dominant role, but substitution services can return as well. Finally, Ceci and Masini (2011) find that firms that have the capabilities will customize their offerings more and generate more value if they operate in a homogeneous environment.

#### *2.4.1.2 Static Organizational Elements (A2)*

Although there are other avenues for research, most of the studies in this area have focused on value chain positions (at the start of the servitization process) or on firm resources and size. Different value chain positions of firms yield different opportunities, but opportunities for servitization exist throughout the value chain. Lay et al. (2010) stated that the value chain position does not matter for servitization; opportunities exist for suppliers up- and downstream as long as they have the right methods in order to co-create value with the customer. Likewise, Finne and Holmström (2013) and Gebauer, Paiola, et al. (2010) confirmed this, and showed that even though servitization opportunities might differ depending on the value chain position, different positions in the value chain still provide opportunities to servitize. It should be noted however that research has shown that the value chain position does affect the benefits and sacrifices for a firm. Jaakkola and Hakanen (2013) found that there are distinct differences depending on where in the network the firm finds itself. Integrators will develop a deeper bond with the (end) customers, while suppliers upstream might lose this contact, or might not have a chance to initiate it. Moreover, Löfberg et al. (2010) stated that service strategies will differ depending on the value chain position due to the different sets of customers and their idiosyncratic demands. Their study also found that profitability is most likely to be found closer to the end-customer.

Research on how the availability of resources and the firm size affect servitization have also provided some good insight into the process as a whole. Several studies have

found that leveraging existing resources can provide a higher chance at servitization success. Neu and Brown (2005), for example, noted that leveraging existing organizational resources is essential for success in the new, servitized position. Likewise, Ulaga and Reinartz (2011) identified a short list of unique resources that firms can leverage for servitization success. This includes data from the current installed base, current manufacturing assets, current sales force and distribution network, but also the current field service the organization has. Another resource that might be leveraged is technological innovation. Turunen and Finne (2014) concluded that higher levels of technological innovation can aid servitization through faster growth and the potential of market dominance.

In terms of size, most extant research seems to have focused on larger industrial firms, while there are only a few studies that specifically look at SMEs (e.g. Malleret 2006; Paiola et al. 2013). In general, Reim et al. (2014) suggested that firm size denotes the specific resources it has, but also the competences that are available, and thus it influences the specific servitization tactics a firm can utilize. More specifically, there seems to be a lack of clarity whether or not small firms have more difficulty to servitize. Löfberg et al. (2010) concluded, for example, that smaller firms might face more difficulty, and thus fail to servitize, because they do not have enough resources to manage the idiosyncratic demands made by customers or OEMs. One solution to this would be acknowledge that SMEs have less resources, but that they can still explore the same opportunities but through collaboration with a network of firms, as suggested by Kowalkowski et al. (2013). In contrast to this, Paiola et al. (2013) posited that resource availability for SMEs might not provide the entire picture. In their sample, they found SMEs that also built internal capabilities and succeeded. Thus, the link between size, resources, and servitization success seem to be more complex than it appears. More research in this area could help clarify the specific influencing factors and process conclusions.

In addition, more specific linkages have also been identified. Kowalkowski et al. (2011) suggested that current service orientation influences the internalization / externalization debate: the higher the current service orientation, the more likely that firms will internalize their service business. They also stated that limited financial or human resources decrease the possibility of internalization. If firms favor flexibility or if they are risk averse in nature, externalization seems more common. The current static organizational elements also affect the product/service combinations that might be developed during servitization. De Brentani (1995) found that successful services are those that are close to the current offerings and competences of the firm, and that specific types of services (such as expert-based services) require the leveraging of internal resources. Opresnik and Taisch (2015) concluded something similar by stating that the current offerings of the firms will shape what options are available for future services. An example of this is when a firm sells products that collect data (e.g. from the installed base), since more data availability means more information, and more information means better insight and more advanced big data strategies the firm can use. Finally, and although it was focused on a business-to-consumer context, Homburg et al. (2002) suggested that firm size can influence the service-orientation of the firm, where larger size equals higher service-orientation.

#### *2.4.1.3 Dynamic Organizational Elements (A3)*

Research on how dynamic organizational elements (e.g. capabilities, routines, current culture, et cetera) can affect the servitization process is not as wide-spread as the other antecedent factors. Multiple articles seem to group static elements, such as resources, and dynamic elements, such as capabilities or competences, together without further specification. For example, Neu and Brown (2005) also stated that firms should leverage current capabilities for success; Miller et al. (2002) found that internal capabilities should be used to provide services that are otherwise unattainable for customers and that the goal is to achieve a comparative and a competitive advantage; Reim et al. (2014) asserted that tactics for servitization not just depend on resources, but also on competences; finally, Ulaga and Reinartz (2011) identified

specific capabilities that could be used to leverage the earlier mentioned resources (such as data processing and interpretation, design-to-service, or hybrid offering sales capabilities, amongst others). Other studies described the capabilities needed for servitization success a bit more in detail. Gebauer et al. (2013) discussed operational capabilities (i.e. how to run the organization) and specific dynamic capabilities such as sensing and seizing opportunities, reconfiguring the organization, and orchestration of the network. Kohtamäki, Partanen, Parida, et al. (2013) examined network capabilities in the context of positive moderation on service sales growth. They define this capability as managing, integrating and learning from network relationships. Although few and far between, there are some specific elements that have been identified in the context of dynamic organizational elements as well. Salonen and Jaakkola (2015) studied internal / external resource integration based of firm boundary theory (Santos & Eisenhardt 2005), and found that it is influenced by competences as well. Internalization makes more sense when the field of knowledge (and the firms' competences) is similar, externalization when it is not. De Brentani (1995) concluded, adding to the information presented in static organizational elements, that successful services should be close to the capabilities of the firm, and that services that fail are often those that do not fit with a firm's capabilities. In terms of specific services innovation, Kindström et al. (2013) identified microfoundations of several dynamic capabilities (such as sensing, seizing and reconfiguring) that aid in this. Some examples that they identified include sensing capabilities can be customer-linked (meaning deep relationships or information) or technology-linked (scanning and exploration of environment), seizing capabilities can be based on specific interactions with customers (co-creation), and reconfiguring is supported by orchestration and creating a service logic. Finally, some links have been identified between dynamic organizational elements and intangible organizational elements in the servitization process. Ceci and Masini (2011) found evidence for sticky capabilities, which results in the fact that strategic intents by the company in the process might be limited by the capabilities they originally possessed (before servitizing). A different influence has been identified by Davies and Brady (2000) who stated that learning capabilities are dynamic in nature

and path dependent. This means that current capabilities shape the future learning and absorptive capacity of the firm when servitizing.

#### *2.4.1.4 Customer-Related Factors (A4)*

The final antecedent category that has been identified in the literature contains factors related to the customers. It is no surprise that much research has been conducted on customer interactions in servitization, since the traditional boundaries of the businesses change. Instead of just selling the product, in more servitized business environments the relationship between the buyer and supplier becomes more intense and closer. Hence, this is also an area where many difficulties can be found for the firm willing to servitize. Matthyssens and Vandenbempt (2010) described two common problems: first, customers often have the expectation that services should be free, and second, the larger the distance between the customer and the supplier, the more difficult it is to successfully provide servitized products. Many different uncertainties exist as well, and Erkoyuncu et al. (2013) provided a comprehensive list of them, which includes factors such as perceived service quality and the ability of the customer to spend on integrated solutions. One of the main problems of firms wanting to servitize is the fact that it can be difficult to chart the customers' expectations. This has been identified by Smith et al. (2014), who stated that the more advanced an offering is, the more requirements are unknown, and thus the more essential that they are identified. Likewise, Piccoli et al. (2009) found that a strategy that moves towards more advanced offerings should be based on the expectation of the customer, which can be found, for example, by analyzing past interactions with them, and looking at the inquiries they have made. Another study that confirmed this is the one Tuli et al. (2007). Besides the customer expectations, they also argued that success depends on the willingness of customers to adapt to the new situation / products and on close interactions between the supplier and buyer. Other factors seem to help with successful servitization transitions too. Eggert et al. (2014) stated that a loyal customer base can be essential in the initial development and roll-out of solutions; Kohtamäki, Partanen and Möller (2013) found that relational capital (social capital in a single relationship) aids in the

potential competitive advantage of the service offering; finally, Kowalkowski (2011) posited that close relationships enable success, and also stated that the closer the relationship the more likely that the firm will offer or develop value-in-use services (which can be seen as a form of functional products, where the customer buys the utility). It is interesting to note that solution development is not solely initiated by suppliers; customers can also initiate it by demands or requests as observed by Osegowitsch and Madhok (2003), Penttinen and Palmer (2007), and Biggemann et al. (2013). The latter does note that interest in solutions or solution development can change over time.

Kujala et al. (2011) stated that customers can affect specific factors related to the business model choice for complex (solution) projects. Customers also affect static organizational elements (B1) through the potential usage of key account management (KAM) in networked solutions. Hakanen (2014) described this phenomenon where different providers to the same solution set up KAM in order to ensure that customers have a one-stop shop, and that the interaction proceeds smoothly. Customer-related factors can likewise influence specific offering-related factors (B2), and several authors name success factors for service development in their research. Malleret (2006) and Storbacka (2011) described how the design of a service should be done in close relationship with the customer or user of the product; de Brentani (1995) expands on the development of new services by stating that an element of a successful service is that it is based on specific customer needs; Hakanen and Jaakkola (2012) acknowledge this, but go a step further by stating that successful service provision does not just depend on the customers' needs, but also on how customers want the supplier to interact in the process. Customer-related factors can also drive the specific service innovation of a firm, Gebauer et al. (2011) and Kindström and Kowalkowski (2009) for instance found that innovativeness of the product is driven by the (complexity of) customer needs. In their quantitative study of the manufacturing industry in Spain, Santamaría et al. (2012) observed that collaboration with customers is also closely and positively related to service innovation.

## **2.4.2 Studies on the servitization process itself**

### *2.4.2.1 Tangible Organizational Elements (B1)*

If one looks at the literature that describes tangible organizational elements, several themes within this category emerge. A first major theme concerns the debate on integration or separation of the service business of the firm: if a firm starts to servitize, should it integrate the service business in the traditional structure, set up a separate division/organization, or even outsource the entire service business? Research seems to be divided. Some studies advocate setting up a separate organization or division for the service business because it is different from the traditional business of selling products, and thus it requires a different culture, capabilities and mindsets (e.g. Gebauer et al. 2005; Miller et al. 2002). As Gebauer and Fleisch (2007) noted, setting up a separate organization for services also helps to avoid any potential internal resistance in the traditional product organization. More recent research has found that the choice between separation and integration depends on the service and the specific service strategy that the firm is pursuing. Raddats and Burton (2011), for example, noted that firms pursuing a product differentiation strategy might be better off with a combined product/service business. If, however, the firm seeks service-led growth, a separate organization for the service business might be better. They also stated that a firm could consider setting up a virtual business – which means that the service business is integrated into the traditional structure, but that reporting is done to a separate service SBU – if the services are linked to the firm's own products. Gebauer, Edvardsson, Gustafsson, et al. (2010) took a different approach and posited that customer-support and outsourcing services are better off separated, while development services should be integrated into the business. Saccani et al. (2007) add to this by stating that in-house service provision could be used if the services are complex, or of strategic importance. Firms do not need to choose one best way to organize, Saccani et al. (2007) also noted that multiple supply chain configurations can exist in a single company if there are different customer requests with different contextual factors. Having different organizational forms of organizing for services is also something Kowalkowski et al. (2011) investigated, and they identified that firms

cannot just choose between integration or separation, but that they can also opt for a hybrid approach where both elements are present. Some of the antecedent factors that influence this process have been provided above. One can also see the organizational structure for services as part of a continuum: when basic services are offered, internal development is more common, but when services start to move away from the core business, external development is used more often (Paiola et al. 2013). Naturally, if one starts using external partners, it imposes more risks which is why services that are of strategic importance might be better off internalized in any condition (Saccani et al. 2007). The organization of the service business is also likely to change over time as firms change their service strategy, and they might also need to change the alignment of the organizational and structural elements (Gebauer, Fischer, et al. 2010). One thing is clear from the extant research on integration and separation: the process of determining which road to take is contingent on many different factors and a decision should not be taken lightly.

Besides the discussion on integration or separation, a second theme relates to miscellaneous factors related to business model choice or structural elements. Different elements on a wide range of topics have been identified. Some are based on operation or organizational principles: firms should co-locate facilities with customers (Baines & Lightfoot 2013), test and repair centers should be close to the end customer (Baines, Lightfoot, Peppard, et al. 2009), firms should lower decision making authority in their organizational structure in order to be more effective with services (Eggert et al. 2014), firms should employ cross-functional internal structures (Baines, Lightfoot, Peppard, et al. 2009) or employ cross-communication structures (Antioco et al. 2008), and a shift from autonomous business units to intrafirm collaboration might be in order (Neu & Brown 2005). Others offer more general advice: firms face difficulty in designing a structure-strategy combination because it is contingent on many factors (Ceci & Masini 2011), building a business model should be based on relationships and not on products or services (Ferreira et al. 2013), or on modularity where integration of parts and coordination becomes central (Hellström 2014), and firms should address

all of the elements of a business model and not just a few separate ones (Kindström 2010). Some studies have also explicitly addressed the difficulty of combining new service elements with the old product business. Brax and Jonsson (2009), for example, discussed the interplay between old practices and new service values and state that firms should be careful not to discard any product competences they have; likewise, in their case study, Johnstone et al. (2009) found that in practice it can be difficult to deliver both excellent products and develop new service capabilities. Interestingly, Storbacka et al. (2013) stated that the specific types of products also play a role. In an installed base context, the organizational transition is more gradual, but this can result in a mismatch between different organizational elements. In input-to-process contexts (e.g. commodity firms), choices with regards to the transition often have been made explicitly and thus these mismatches do not develop gradually.

Another major theme in the context of structural organizational elements is value chain integration or movements. It is clear that when firms move towards (more advanced) services, they need to have new capabilities. Sometimes it makes sense to develop them in-house or to outsource / externalize them (as discussed above), but sometimes firms tend to form networks where the needed capabilities or resources are spread out. This way firms can “acquire” new capabilities that were otherwise unavailable to them (Penttinen & Palmer 2007). Davies (2004) described this process when talking about system integrators: firms that outsource and manage (other) manufacturers to create integrated solutions. Several other authors seem to agree with this. Finne and Holmström (2013) stated that the capabilities and resources that are needed for service provision can be spread out in the value chain (i.e. in multiple companies), and integrators can help bring these together to create an offering; Spring and Araujo (2013) noted that understanding other firms’ capabilities in the network and orchestration of this network provides new opportunities for service offerings. Matthyssens and Vandenbempt (2008) suggested that the more advanced the services, the more integration with the supply chain is in order. However, in a later study, they stated that a major challenge for service transition is the fact that firms

often do not possess the network capabilities necessary (Matthyssens & Vandenbempt 2010). But systems integration is not the only reason to develop more interconnected networks. Eloranta and Turunen (2015a) discussed platforms and noted that they can also exist for different reasons such as to connect specific actors or to share resources. It should also be noted that firms do not exclusively move towards system integration. Davies et al. (2007) found that, while some firms do move towards system integration, there is also evidence of the more traditional vertically integrated system sellers (when a firm has repositioned itself in the value chain in order to have all of the capabilities in-house).

The specific organizational structure of the firm also influences offering-related elements (B2). The majority of research on this linkage seems to be focused on how organizational structure influences service innovation. Gebauer et al. (2008) found that there is a positive impact of the internal organization, information sharing and multifunctional teams on service innovation; advanced machinery and IT of the firms also shows a positive relationship (Santamaría et al. 2012); Lightfoot and Gebauer (2011) stated that there is a complex relationship between specific determinants, which includes organizational structure, on service innovation in firms. Returning to the value chain, Shelton (2009) posited that changing elements in it or elements of how product / services are developed, can also aid in new innovations in services. An additional advantage of having multiple networks as a structural elements is that it provides the opportunity to deliver different services in various heterogeneous situations (Kowalkowski et al. 2013). Holmström et al. (2010) also noted that offering more advanced services, requires more information from the demand chain (i.e. customers), hence integrating operational elements with customers will provide more information about their business processes and might aid in developing new services (innovations) in the future.

Not much research in the sample was focused on the link between organizational structure and intangible organizational elements (B3). However, Gebauer, Edvardsson

and Bjurklo (2010) found that organizational structure moderates the service orientation, or, in other words, a separate service business boosts the service orientation in the firm's culture.

#### *2.4.2.2 Offering-Related Elements (B2)*

Like the structural organizational elements, research on the offering-related elements is quite diverse and substantial, and different themes can be identified as well. A first major theme in this category relates to service innovation and (modular) development. Research has been clear on the fact that suppliers should aim for repeatable solutions / services by standardizing elements ("modularity") and reusing experiences (Biggemann et al. 2013; Gremyr et al. 2010; Davies et al. 2006). This does not mean, however, that everything should be standardized. Firms should try to aim to develop capabilities to do both. That is, firms should balance the development of customized solutions with the standardization of common solutions (Visintin 2012; Kowalkowski et al. 2015). This process of adding services is usually incremental in the beginning, but it can turn more systematic as the total value of the service sales increases in the company (Kowalkowski et al. 2012). At that stage, it becomes more important to handle new service development proactively (and in a more structured way) because it becomes a critical factor for success and competitive advantage (Kindström & Kowalkowski 2009). In fact, Gebauer et al. (2011) established a link between the innovativeness of the firm and higher performance (although this link is stronger when innovativeness is focused on either products or services). However, when firms start with the initial development of services it will be more effective when it is based on services that are closely related to the core business of the company (Fang et al. 2008). Likewise, it has been suggested that firms should focus on product-support services first since this will help to build insight and competences with services, and it can act as a foundation for future innovative services (Eggert et al. 2014). Eggert et al. (2011) also noted that firms should align their services with the level of product innovation. With low product innovation, both product-support services and more advanced services support profitability; with higher levels of product innovation, product-

support services support profitability, but more advanced services would require significant investments. De Brentani (1995) presented perhaps has the most extensive study on new service development and develops several scenarios that aid in service success or service failure, a few of which that have been discussed earlier.

A second major theme concerns performance measurement and contracts. When firms shift towards basic services, and/or more advanced services, the established methods of contractual design and performance measurement are often not sufficient any more. There are several factors that underline this notion. In practice, services are often bundled with products and priced as one (Lay et al. 2010), and customers can expect the services to be provided for free / or have gotten used to that situation (Witell & Löfgren 2013; Kindström & Kowalkowski 2009). For customers it can potentially also be difficult to see value in the new offering, or to be able quantify this, so any price calculations for the new offering need to be communicated well (Windahl & Lakemond 2010). For basic services not much has to change, and they can still be run on transactional agreements and cost-based pricing (Saccani et al. 2014; Rapaccini 2015). When firms move towards more advanced services however, it can be more difficult to make contracts since the boundaries of the traditional product shift. In the new situation, the supplier might take over part of the process of the customer and thus the risks and benefits are different than in comparison to traditional offers. More advanced services might have to make use of fewer formal contractual elements, but incorporate more relational and trust-based elements (Saccani et al. 2014). Likewise, they might need to use more “innovative” pricing strategies. An example of this are the so-called outcome-based contracts where customers pay for the result of a process, not for the product or service itself (Ng & Nudurupati 2010). However, incorporating new pricing strategies also requires new capabilities with regards to costs calculation and accounting (Rapaccini 2015). Hence, effective contract design (win-win situations, where costs and risks are shared equally) becomes vital for successful service delivery (Datta & Roy 2011). Changing the business model from services for free to services for a fee is difficult however. Witell and Löfgren (2013)

found that, depending on how rapidly the business model changes are made, the consequences of customer retention and future growth can be severe.

Success of services can also depend on the product characteristics on which they are based. Rapaccini and Visintin (2015) stated, for example, that if the basic product's value is low then it might be better to offer just basic services. In contrast, if the value is higher, more advanced services can be utilized. Likewise, developing vendor-agnostic services (i.e. services that support multiple products, not just the ones developed by the focal firm) is likely less risky than just servicing a firm's own products (Raddats & Easingwood 2010). Opresnik and Taisch (2015) offered an interesting avenue when discussing big data strategies and servitization. They posited that products that collect a lot of data can influence the strategies available. One can imagine that having more information available leads to new and better insights, which in turn can be developed into new or improved offerings. Another factor that should be considered is that when the offering of the firm is more intangible, the chances of buyers buying it will be lower (Valtakoski 2015). Firms can counter this by opting for standardization of the service portfolio, trying to find wide adoption of the service or increase the levels of trust between the buyer and the firm itself (Valtakoski 2015).

A final theme that influences servitization is that of service technology or tools. Multiple authors have developed a link between advanced service / information technology and service delivery and/or success (Baines & Lightfoot 2013; Belvedere et al. 2013; Brax 2005; Penttinen & Palmer 2007; Antioco et al. 2008). Thus, it seems that having more advanced technologies enables the provision of services through more successful delivery, and results in more information availability, which leads to higher potential for complex offerings. An interesting development in this theme is the study by Wuest et al. (2015). They developed the concept of a product avatar as a platform for servitization through which product-life cycle information can be distributed and through which stakeholders can be connected (for selling future upgrades and connecting companies).

Some of the literature on offering-related elements also links back to the structural organizational elements (B1). In general, it seems that new offerings of the firm affect the way in which the organization structures itself. This can perhaps best be seen as a circle: firms take steps towards more advanced services, these new services change the relationship with the buyers through which more information is available and through which a deeper relationship is established. This, in turn, urges further organizational change, and the circle continues after that. Sacconi et al. (2007) noted, for example, that the complexity of the product affects the way in which the suppliers organize their after-sales supply chain. Likewise, Sacconi et al. (2014) stated that moving towards more advanced services requires more information (both technical and on business process) of the customer and this further increases the operational linkages between both parties. Bastl et al. (2012) observed something similar where operational linkages between buyers and suppliers change over time in order to support the provision of integrated solutions. As a final example of this phenomenon, Holmström et al. (2010) noted that the integration of structural elements provides more information on the customers and their processes, which allows them to make more advanced services. However, this process also works in reverse: the more information is collected during service provision, the more insight is developed for future services, which would require more structural organizational changes. Naturally, specific elements of the service can also shape the structure of organization. Nordin (2008) observed that the more specialized the service and the higher the strategical importance, the more likely that it will be developed internally. Likewise, he also found that the more complex a service and the lower the standardization, the more likely it will be developed internally as well. Kowalkowski et al. (2011) add to this that the more related the service is to the product and the more predictable the service is (i.e. in terms of capacity management and scheduling of services), the more it favors internalization. Moreover, high services volume, high criticality to the customer, and higher resource scarcity and complexity for services moves firms to internalize as well. Finally, vendor-agnostic services seem to favor externalization.

#### *2.4.2.3 Intangible Organizational Elements (B3)*

Research on intangible organizational elements seems to be less diverse and less substantial than the previous two groups of literature. Perhaps the intangibility of factors in this category has made it difficult to identify the exact linkages between them and other factors in the servitization process. As it stands however, most of the research in this category can be described as quite superficial. The large majority of the studies simply state that a service business requires a different culture or a different business orientation. Brax (2005) observed that services require a different way of thinking throughout the organization; Gebauer et al. (2005) and Ulaga and Reinartz (2011) simply stated that firms should establish a service culture; Neu and Brown (2005) concluded that one of the success factors for service delivery includes customer service orientation; Salonen (2011) asserted that a service transition requires a change in the organizational culture. However, some studies offer a deeper look into how intangible factors might shape the servitization process. Antioco et al. (2008), for example, found that a business orientation that is focused on supplying product-support services increases the services volume. Gebauer, Edvardsson and Bjurklo (2010) explained how the service orientation in the corporate culture of the firm has a positive impact on the service business performance. Interestingly, they noted that separating the service organization of the business has no additional impact on the link between service orientation of the firm and the business performance. Datta and Roy (2011) stated that a service provider should remain flexible and accommodating to varying customer service demands, something that would require a more service-oriented culture. There might also be a danger in changing the culture of the firm too much. Brax and Jonsson (2009) posited that while customer and service-orientation should be nourished, firms should be aware that this does not negatively impact the technical or product competences of the firm. Finally, Gebauer et al. (2011) noted that the higher the customers' needs complexity, the higher the customer centricity of the organization has to be. This confirms that the move towards more advanced services also requires changing the organizational culture of the firm in order to put the customer central in the minds of everyone in the firm.

Some research has also looked at how intangible organizational factors might affect offering-related elements of an organization (B2). Homburg et al. (2002) observed that the definition of service orientation is quite vague. They proposed that the number of services offered, the number of customers using them, and the emphasis the firm places on these services quantifies the service orientation. This would mean that higher levels of service orientation in the firm, equals more services. Vice versa, more service development would thus affect the service orientation of the firm. The development of specific services might also be contingent on specific learning capabilities the firm has (Laperche & Picard 2013). Likewise, Ng and Nudurupati (2010) discussed how to deliver successful “outcomes” (i.e. services where the customer buys the output, not the actual product) and how a customer-oriented culture is a necessity for this. Finally, Lightfoot and Gebauer (2011) established a positive link between an innovation culture at a firm and service innovation success.

In general, the research in this stream lacks depth and clear linkages. Naturally, studying intangible elements such as culture and service-orientation can be difficult because it is ingrained in people, and not easily observable or quantifiable. Nevertheless, this opens avenues for future research.

#### *2.4.2.4 Managers' characteristics (B4)*

A fourth category that affects the servitization process contains elements that are related to managers' characteristics. It is clear that managers play an essential role in the success of servitization in the firm. It has been shown that they should lead and commit to the service development (Ulaga & Reinartz 2011), that they should be active and visible in changing the organization towards a service-orientation (Neu & Brown 2005), that part of their essentiality is based on the fact that many factors need to change in the organization and managers are pivotal in this (Raddats et al. 2015), and that they should make sure that their departments are customer-oriented and that the department has the right attitudes and skills for this (Matthyssens & Vandenbempt 2010). However, managers can also be detrimental to the servitization process. Gebauer et al. (2005) stated that the service paradox, where increased investments in

the service business do not generate higher service returns, can be caused by lack of managerial motivation or cognitive barriers. They suggested that managers should understand the potential of services, that they should increase the service awareness throughout the organizational and that they should accept the risks that can be involved in the service transition. Gebauer (2009) added to this by stating that other cognitive limitations, such as disbelieving the margins of services, or overemphasis on tangible features, need to be overcome as well. On the other hand, managers should be aware that there is or will be internal resistance and that this needs to be overcome. But, as Gebauer and Fleisch (2007) found, they would be better off by focusing on creating acceptance of the service strategy and trying to get the relevant departments and people involved into the service strategy and service transition.

Managers also play a role in different parts of the servitization process. Tuli et al. (2007) observed that when managers change organizational elements or processes during the service transition, this will often be met with resistance from other managers that have vested interests. In order to gain a better understanding of the potential of services and to overcome internal resistance, managers might want to adopt new cost monitoring systems that clearly show how services impact their business (Gebauer & Fleisch 2007). Managers can also affect specific offering-related elements (B2). Gebauer et al. (2008), for example, found that management support has a positive impact on service innovation projects. Smith et al. (2014) suggested that managers use a systems perspective when looking at the value propositions of their offerings, since changing one value proposition can have unintended consequences on others since they are in large part interactive. Some literature has also looked at how managers can affect intangible organizational elements (B3). An example of this is Antioco et al. (2008), who noted that TMT commitment and visionary leadership are antecedents to the business orientation of the firm. In order to increase the revenue from services, managers would also need to get rid of old behavioral processes of the product business (Gebauer & Fleisch 2007). Although the servitization literature does not contain a multitude of articles discussing what a service culture is, Gebauer,

Edvardsson and Bjurklo (2010) suggested that the implementation of a service culture depends on specific variables such as the service orientation of the managers and how managers behave within the firm. Thus, one can observe that managers have a clear impact on how the culture of the organization evolves. Hence, it is important that managers are fully committed to the service business in order to change the organization towards a higher level of service orientation.

A final theme that discusses managers' impact on servitization deals with the link between managers and employees in a servitized environment (B5). Naturally, employees play a large part in the servitization process since they are in direct contact with the customer and are an embodiment of the service-orientation of the firm. Extant literature identifies various factors that might need to change in the service transition. Managers should, for instance, ensure appropriate goals for employees (Gebauer et al. 2008); they should decentralize decision making authority to lower levels since these lower level employees understand customer specifics and needs better (Neu & Brown 2005); management should develop accurate performance measurements for sales employees, otherwise they might emphasize product sales over service sales and thus obstruct the service business (Visnjic Kastalli et al. 2013); likewise, managers might need to change their hiring, assessment and training of sales employees, just setting quotas and incentives does not work (Ulaga & Loveland 2014). When taking on the service transition it is also of importance than managers actively try to change employees' attitudes. They could try to describe why the organization is making the change, what a service is, why the firm needs to customer-oriented and how the transition will happen (Bjurklo et al. 2009). Finally, managers should be aware that there is a risk of a split between service and product employees. The two groups work in different ways where service employees are more autonomous, in direct contact with the customer, and often highly-regarded by the clients. Thus empowerment should be balanced with integration / belonging to the actual organization (Peillon et al. 2015).

#### *2.4.2.5 Employee Characteristics (B5)*

The final category that exerts influence on the servitization process contains employee characteristics. Some influence on the employees has already been discussed above, but there are other factors as well. Different authors have identified the need of employee training in order to ensure that they have the right skills and attitudes (e.g. Antioco et al. 2008; Ulaga & Reinartz 2011). But it is not just training that needs to be altered. Since the change towards service offerings can be quite a departure from the traditional business, many HR elements might need to be changed. Hence, it has been identified that firms struggle in practice with implementing appropriate HR strategies (Johnstone et al. 2009). Employees need to understand customer needs and value-in-use (Bjurklo et al. 2009), employees need to combine product knowledge and technical skills with relationship management skills (Baines, Lightfoot, Peppard, et al. 2009; Neu & Brown 2005), they need to be more service-oriented (Raddats et al. 2015), or have a customer-centric mindset (Raddats & Easingwood 2010), and new incentives for documentation of activities might be in order since solution / service development and delivery is more complex (Tuli et al. 2007). In fact, all of these elements carry importance for a firm wanting to make a successful transition. It should also be noted that the service-orientation of employees depends on the specific service strategy the firm employs (see for example: Gebauer, Edvardsson, Gustafsson, et al. 2010). When changing these service strategies (e.g. by offering more advanced services), the connected HR strategies need to be altered as well. This does not just concern employee training, but also hiring practices, compensation and incentives (Gebauer, Fischer, et al. 2010). A special role in this process has been reserved for the sales department of the organization, and various authors have focused more in-depth on this. Not just new capabilities are necessary for the sales force (Salonen 2011), but in general the sales function has to change. Incentive and lead generation systems need to be adjusted to represent the fact that delivery is now a key part of the new sales process; a problem-solving approach should be honored, and sales employees should focus on new innovative ideas that go beyond the technical aspects (Kindström et al. 2015). It is also key to realize that selling services or solutions is different than selling

traditional offerings. Sales proficiencies should be based on deep understanding of the customer(s' processes), involving a network of actors, practicing value selling, and proactively managing expectations of the client (Ulaga & Loveland 2014). Thus, as Ulaga and Loveland (2014) pointed out, good sales employees for products, might not be good sales employees for new offerings or services since the traits needed for both differ; different personality types and persons can be better at different types of sales.

Some studies have identified linkages between the firms' employees and effect on offering-related elements (B2). Lightfoot and Gebauer (2011), Kindström et al. (2013), and Gebauer et al. (2008) found evidence of impact of the service employees on the service innovation process. The latter, for example, stated that involving frontline employees has a positive impact on service innovation as well as the training and education of them. Santamaría et al. (2012) identified the same; training activities are positively linked to service and process innovation. In their success factors for outcome-based contracts, Ng and Nudurupati (2010) noted that the success depends on the empowerment of employees, having clear roles, and having the right types of behavior and attitudes of employees (this due the fact that it reduces uncertainty provided by the new types of contracts). Employee characteristics also seem to influence the intangible organizational elements (B3), although this linkage has not been explored extensively. Gebauer, Edvardsson and Bjurklo (2010), for instance, suggested that service culture is influenced by the service orientation of the employee values and the employee behavior. Although their study was focused on the consumer sector, Homburg et al. (2002) found that the number of full-time employees is positively related the service-orientation, while part-time employees negatively affect this link. The extent to which this holds true in industrial, business-to-business firms is unclear.

#### **2.4.3 Studies on the linkage between servitization and servitization outcomes**

The final group of literature focuses on the process conclusion of servitization and the different outcomes it offers. There is a similarity to some of the antecedent factors

here. The industry structure and dynamics, organizational elements (static and dynamic), and customer-related factors both influence the servitization process and are influenced by it.

#### *2.4.3.1 Industry Structure and Dynamics (C1)*

In the description of the antecedent factors, several linkages between the environment, the servitized firm, and the “future” environment were already identified. Some of them will be briefly reiterated here. As mentioned, Turunen and Finne (2014) found that moving towards servitization encourages competitors to make the same transition as well (known as the legitimacy effect). So if a firm servitizes it means that the firm will potentially increase the number of competitors in that branch in the future. But this is not necessarily a bad thing. Biggemann et al. (2013) observed that once a solution has been developed, it can then be standardized, which will increase the future demand. Likewise they posited that novel solutions can cause reactions from the competition, which means that the creation of a single solution for a client can create a new market in which to compete. Cusumano et al. (2015) identified something similar, where the development of services can create markets, it can create a dominant design, or a market disruption, and it will change the competitive dynamics in the field. Servitizing can also help to de-commoditize the industry. When firms network, integrate and move towards more advanced offerings it can help break industry standards (Matthyssens & Vandenbempt 2008). Interestingly, Benedettini et al. (2015) noted that firms that offer services such as financing or distribution are exposed to high levels of external bankruptcy risks, which can be due to exposure to more complex customer needs, or a larger set of uncertainties.

#### *2.4.3.2 Organizational elements (C2)*

In the antecedent factors there were two different categories for organizational elements: static and dynamic. These have been clustered together here because research is scarce on the outcomes and it does not offer a clear division between either factor. Naturally, one element that is likely to change in servitization is the value

chain position of the firm. But since this has been discussed extensively under structural organizational elements (B1), it will not be repeated here. Only a few linkages have been identified between the servitization outcomes and the organizational elements. Baines and Shi (2015) noted that servitization has a positive impact on the resilience and efficiency of the company (although it can result in a loss of traditional product revenue streams). In their discussion on dynamic capabilities and microfoundations, Kindström et al. (2013) stated that dynamic capabilities are often path dependent, so when a firm tries to develop the microfoundations during the servitization process they will influence the future dynamic capabilities of the firm. In a similar manner, Visnjic Kastalli and Van Looy (2013) found that if firms add services over time (incrementally), they will benefit from service learning effects. Lastly, Matthyssens and Vandenbempt (2008) suggested that breaking the commoditization pattern of an industry is a long process and the development of the right capabilities takes time. Thus, making small steps during the initial servitization efforts will help to shape the capabilities the firm can use in the future. Although not much research has been conducted in this area, it seems logical that the servitization process can be viewed as an iterative one. Firms make small steps to servitize, which in turn affects the capabilities and learning for the future, which will help to shape future servitization efforts.

#### *2.4.3.3 Customer-related factors (C3)*

The servitization process conclusion also affects specific customer-related factors. This is similar to the abovementioned outcome factors in that customer-related factors influence servitization, but servitization in turn also influence customer-related factors. First, successful servitization and the sales of more complete service offerings changes the buyer-supplier relationship over time. The exchange of information will be more open, operational ties will be strengthened, and more relational norms will be applied besides legal contracts (Bastl et al. 2012; Sacconi et al. 2014). Firms also take a more proactive approach (where they do not just respond to customer specifications), more emphasis will be placed on trust and close dialogue, and the responsibilities for

successful delivery of the solution are shared where both supplier and buyer work to develop and implement (and monitor) the supplied offering (Brady et al. 2005). Likewise, manufacturers cannot solely rely on old monitoring and services practices. They try to identify how the customer uses the product and how it can be improved in the future (Brax & Jonsson 2009). Because of the increased information exchange and linkages between both firms, buyer and supplier can also start working together in order to find the next step in service offering: what is the full need the customer has and how can the firm help fulfil this? (Piccoli et al. 2009). It should be noted that this deepening of the relationship is not always easy. In practice, many problems can arise due to these shifting arrangements and expectations (for examples see: Johnstone et al. 2009; Witell & Löfgren 2013).

What actually changes on the bottom line is that loyalty and customer satisfaction can be increased by offering more advanced service offerings (Pan & Nguyen 2015); differentiation and customer loyalty can be improved through advanced offerings (Rapaccini & Visintin 2015); and customers receive value through increased benefits (i.e. better results) or through diminished sacrifices (i.e. less effort) (Jaakkola & Hakanen 2013). In fact, this increasing exchange and deepening of the relationship is one of the paths through which firms can continue to servitize their offerings step by step (Penttinen & Palmer 2007). Naturally, not every customer can see the added benefit in integrated solutions (Jaakkola & Hakanen 2013), or they might not be able to see the value of the offering for their firm (Windahl & Lakemond 2010). And, as noted earlier, the more a firm moves towards advanced offerings, and the more intangible the offerings become, the lower the chance that buyers will actually purchase it (Valtakoski 2015). Overall, even though there might be obstacles that need to be overcome, it seems that servitization has a positive influence on the buyer-supplier relationship, that it deepens the bonds between both firms, and that value can be co-created to a larger extent on the long-term.

#### *2.4.3.4 Performance elements (C4)*

The last category contains studies that link the process conclusion to the performance and financial outcomes. While high revenues cannot be expected early on (Gebauer & Fleisch 2007), and while revenues of services are low for manufactures in practice (Lay et al. 2010), services can improve financial performance in mature industries (Cusumano et al. 2015), provided that the right services are offered and that they fit with the product innovation activities (Eggert et al. 2011, see above). Whether it is sales, revenue or profits, multiple authors have identified non-linear relationships between servitization and the (financial) performance outcomes. Fang et al. (2008), for example, stated that the impact of service transition on a firm's value starts to become positive after a critical mass of services sales has been reached (20-30% of total sales). This negative start can be linked to implementation issues according to the authors. A threshold effect can exist where profitability is not immediate, but a certain threshold for service volume and organizational changes needs to be reached (Malleret 2006). A similar effect is found by Kohtamäki, Partanen, Parida, et al. (2013) who stated that the link between industrial service offerings and sales growth is non-linear, but that increased network capabilities exerts positive influence on this link. Visnjic Kastalli and Van Looy (2013) found something similar when looking at the link between services sales and profitability. It seems that "low-hanging fruits" can increase profits, but that service provision on a larger scale decreases this link, only to turn positive again when talking about high levels of service activity (learning effects and economies of scale aid in the long-term profitability). On the other hand, Parida et al. (2014) noted that simply adding services to a product portfolio decreases financial performance and that a comprehensive change in the organization is necessary. Thus, the non-linear effect identified in other studies might not work with all service types and in all situations, indicating that the situation is more complex than it appears.

There are other benefits of servitization as well, such as increased customer satisfaction, loyalty, retention and increased market share (Homburg et al. 2002). The servitized offerings might not just be better economically, but also environmentally

(Lindahl et al. 2014). There are however multiple contingent factors on performance. Eggert et al. (2014) found, for example, that revenues and profits from service provision do not have to move in the same direction; firms with broader service portfolios seem to have lower profitability levels than those with narrower portfolios (although this can change in time due to learning effects), and a loyal customer base increases the service profitability as well. Another factor seems to be that firms operating higher-up in the value chain can use both differentiation and customer satisfaction as a means to improve performance, while firms operating lower-down can only achieve in through customer satisfaction (Bustinza et al. 2015). Finally, as was briefly mentioned earlier, Witell and Löfgren (2013) stated that how the service business model was developed or changed matters too. When firms move abruptly from service for free, to services for a fee, services sales will be lost. More incremental changes means fewer losses, but it does mean that the future sales will grow more slowly. In sum, it appears to be the case that servitization offers distinct benefits in terms of performance and financial results. However, with certain threshold effects and non-linear relationships, firms should be aware that servitization is not a panacea and that performance expectations should be moderated and a long-term vision should be taken.

#### **2.4.4 Overall evaluation**

Although the academic field of servitization is relatively young, much research has been published in recent years that has helped to evolve the field and to clarify the process of industrial servitization and integrated solutions. Before moving towards the directions for future research, a few elements that characterize current research will be discussed. With regards to the methodology, the majority of the articles that have been published (and that were included in the sample) were case studies. Almost 60% of the sample, 87 articles, were case studies of which 18 were single case studies. The number of case studies in the servitization field could even be more evident and commonplace when considering lower-impact journals as well. Although the current

sample does not include those journals, it seems conceivable that they will include more descriptive (single) case studies.

In general, the amount of case studies in the sample is perhaps not surprising because case studies can provide answers to how and why something is done (Yin 2003). Potential issues in the research design can be found however when looking at type of case studies. A large majority of the studies in the sample seem to be descriptive and/or exploratory in nature. What is needed are not more exploration or descriptions, but confirmatory case study research (Perry 1998). This entails that case studies should use prior theory and knowledge in the field, establish research hypotheses, and set out to answer them. Otherwise, case studies can only be considered as exploratory and descriptive (Johnston et al. 1999), as is the case in the field currently. In a similar vein, Hillebrand et al. (2001, p.653) suggest that case studies aim for theoretical generalization, which they define as *“declaring the results of case research valid for a larger population on the basis of both structural similarity and logical argumentation.”* This has certain implications for case study research design since confirmation and theory building is at the heart of it. Thus, more replication of previous cases to confirm/negate findings, replications in different contexts to understand whether or not the findings can be extended, and cases refining previous research are in order (Hillebrand et al. 2001). In doing so, the servitization field can move towards more confirmatory research and can establish logical argumentation lines and relationship between various factors. Thus, seeing as how qualitative research trumps the majority of the research on servitization, more diverse methods and different angles of approach could be beneficial to the field.

Next, the sample contained 22 conceptual articles, 18 quantitative articles, 12 articles with mixed methodology, 9 systematic literature reviews, and 4 that have been classified as “other”. Please review Table 4 for more information. Another observation with regards to the sample details and the research so far is that a very limited number of articles (n=5) have been using a quantitative longitudinal approach. Because

servitization is such a dynamic process that requires many elements of the organization to change, whether those are structural elements, cultural elements or firm capabilities, taking a longer timeframe and looking at different constructs could provide more insight. Moreover, especially when trying to identify underlying phenomena (such as dynamic capabilities, path dependency or organizational learning), longitudinal studies can provide unique insight (Siggelkow 2007). Overall, there have been some developments with regards to methodological choices in servitization in the last few years: action research (e.g. Dimache & Roche 2013), ethnographical (“netnographical”) research (e.g. Prior 2013), “interventionist” studies (e.g. Laine et al. 2012) and synthesis of previous case study research (e.g. Kowalkowski et al. 2015; Storbacka et al. 2013) have been utilized as well.

**Table 4: Methodological Characteristics of the Sample**

<b>Type of paper</b>	<b># of papers</b>	<b>Characteristics</b>
Conceptual	22	-
Qualitative	87	Single case studies: 18
Quantitative	18	Longitudinal: 5
Mixed methods	12	-
Systematic literature review	9	-
Others	4	Practitioners journal: 3 Research direction: 1

Another characterizing trait of current methodologies in servitization is the fact that most of the research seems to be centered in Europe. Looking at the authors and their affiliations of the articles included in the sample this is perhaps no surprise. The large majority of them are working at universities or institutions located in Europe. Although there are some exceptions to be found, for example Barquet et al. (2013), Fang et al. (2008), Li (2011), and Pan and Nguyen (2015), the majority of research has been conducted on European companies. Finally, with regards to the sample, and besides the fact that most of the studies on servitization are based on case studies, it is also apparent that the majority is either conceptual in nature, or continues building on

previous research. There is not much extant research that applies specific theories to test specific assumptions, which has also been identified by other authors (e.g. Eloranta & Turunen 2015b). There are exceptions to this tendency and some studies do focus on specific theories in order to study a phenomenon (e.g. Kindström et al. 2013), but the majority of research in servitization does not.

The content of the research on servitization so far seems to have focused on a few select areas. One of these concerns the structural organizational elements and development of them. Should a firm integrate or separate the service business? How do value chain movements or integration aid servitization? Another concerns the offering-related elements that an organization has or develops. What are the drivers of service innovation and how do they impact service development? How can firms benefit from modular development? In the changing buyer-supplier relationship, how should performance be measured and how should the (contractual) obligations be determined and fulfilled? These, and other questions, are central in those streams of literature. The other streams of literature and linkages between them have been described and studied to a lesser extent. This especially concerns the intangible organizational elements, which have not been studied extensively, even though the impact of culture has been mentioned quite often as a necessity for service success. Overall, it seems that the structural and tangible elements of servitization have been described rather well, perhaps due to the fact that this is easier to study than intangible elements. Obviously, this has clear implications for future research. Finally, there also seems to be some influx of new ideas that are applied to servitization such as the business game concept (Laine et al. 2012), platforms for servitization (Eloranta & Turunen 2015a), and the development of product avatars for servitization (Wuest et al. 2015). Not only do these new ideas offer fresh insight into the theoretical development of servitization, they can also play a role in the practical application of servitization due to their inherent and relatively easy applicability. In sum, though the research on several areas of servitization has been fruitful and has offered insight, it is essential that more areas are integrated together (to a larger extent) and that

underdeveloped areas receive some highlight as well. The next chapter will outline the suggestions for future research.

## **2.5 FUTURE RESEARCH OPPORTUNITIES**

In recent years, the body of work on servitization has grown significantly (e.g. Velamuri et al. 2011; Tukker 2015; Rabetino, Harmsen, et al. 2015). This has allowed the field to expand in different directions, and to explore different phenomena and different questions. However, there is still much work to be done to both mature the research field of servitization and to deepen the knowledge on individual elements or groups of topics. Some general considerations and opportunities to improve and mature the field are provided first. Following this, specific research opportunities per group are suggested.

### **2.5.1 General research considerations**

In general, there are several characteristics that clearly define the servitization research field as a whole. First, the vast majority of studies are case studies. While case studies can provide answers to how and why questions (Yin 2003), they are mostly descriptive in nature and limited to the specific context. While statistical generalizability is not possible (Hillebrand et al. 2001), theoretical generalizability is generally not always an outcome in current research. Yes, general tendencies can be found in multiple case studies, but since this is not supported by explanatory or confirmatory research designs, generalizations or prescriptions cannot be made outside of the specific context or cases. This can also be a potential pitfall for current research: if one assumes that the data found in the case studies can be extrapolated and applied to other situations it can lead to faulty assumptions in theory and to failed applications in practice. Thus, what is needed is more diversification of research. Not just case studies, but also quantitative research; not just descriptions of current companies, but more generalizable and prescriptive data and suggestions. If this move away from descriptive and/or exploratory case studies can be achieved, and if the field is able to offer more prescriptive information, it will not only aid in theory

development, but it will also help to improve servitization of companies in practice due to clearer conditions and information.

As mentioned, the majority of research is either focused on European companies or is coming from European scholars. A diversification of research institutions and studied firms would mature the field as well. As it stands, it is unclear if servitization is mainly a European phenomenon, or if it is applicable in other parts of the world as well, to what extent and with which particularities. Naturally, research from adjacent fields such as product-service systems (which focusses more on the engineering and environmental side of product-service integration) has a large influx of articles from other institutions and countries (e.g. Japan), but this is often more focused on the design and engineering of PSS (for an overview of these authors see Lightfoot et al. 2013; Rabetino, Harmsen, et al. 2015). Likewise, service science is another adjacent field that focuses more on services as a system and has originated from IS field and within IBM in the United States (Lightfoot et al. 2013). In the end, the servitization field could benefit from a more diverse perspective on different countries and cultures. Does industrial servitization work everywhere? To what extent does (national) culture play a role in the changing buyer-supplier relationships? Is there a difference between servitization in maturing and emerging markets? How are the internal changes for servitization affected by national and/or cultural situations? A myriad of questions and options for research are still left to be explored and all of them would provide interesting and vital information for the maturation of the research field. Not only that, practitioners could benefit from this information as well, especially when it comes to internationally operating companies and the consequences of servitization for them.

Likewise, the use of theories has been mentioned in the previous chapter as well. As it stands, not much research uses extant theories that are available in the strategy and management literature. Most of the current research is either based on (case study) data or continues where previous servitization literature left off. Even though the servitization literature acknowledges the necessity of resources and capabilities, as can

be seen in the discussion of the literature, not many articles use the resource-based view (e.g. Barney 1991) or dynamic capabilities (e.g. Teece et al. 1997) perspective to actively build theory. In most cases, the resource-based view and dynamic capabilities perspective are cited and applied, but not developed or analyzed in depth. Thus, as previous studies report (cf. Gebauer et al. 2012; Windahl & Lakemond 2010), these theories are used, but they are neither used with the intent of advancing the theory, nor to deepen the knowledge of the servitization field. In fact, they are applied more to describe or to explore certain phenomena within servitization, but not to predict workings or to build new theory. An interesting perspective could be the extent to which servitization itself can be considered a dynamic capability. Since it is not a one-time move, but more of an iterative process, to what extent can firms develop capabilities as “servitizers”? More clarity with regards to the specific organizational resources and other capabilities (or microfoundations for these capabilities) would be welcomed as well.

Besides this, the servitization field seems to be composed of management scholars using marketing (or service) theories. Thus, the field could benefit as well from more influx of theories that are applied to the context of servitization (Gebauer et al. 2012). Strategy-as-practice (practice theory) could prove to be an interesting avenue for future research in order to see how servitization is applied in practice and the specific micropractices that firms / managers use (e.g. Whittington 2006; Chia & MacKay 2007). In effect, practice research looks at how people actually do something, rather than treating concepts abstractly, and aims to bring *“human actors and their actions and interactions to the centre stage of strategy research”* (Jarzabkowski & Spee 2009, p.70). Future research in servitization could also apply organizational identity and sensemaking theory (e.g. Weick 1995), in order to investigate the effects of servitization on firm identity, managers, and groups of employees (especially when it relates to ambiguous situations or uncertainties caused by the transition towards more service provision). Finally, future research could also apply firm boundary theory (e.g. Holmström & Roberts 1998; Santos & Eisenhardt 2005) to servitization. Salonen &

Jaakkola (2015) used the theory in order to assess the internalization versus externalization debate in servitization, but future research could extend their work. Possible avenues for future research includes knowledge and assets transfers due to changing firm boundaries and the consequences this has for the firm (as well as future implications, such as potential new entrants), agency problems and costs in servitization, and future service innovation and development (Holmström & Roberts 1998; Salonen & Jaakkola 2015). Naturally, opportunities for future theory usage in the servitization field need not be limited to these examples.

Looking at Figure 1 and Figure 2 it becomes apparent that certain linkages are researched to a large extent and others are barely noted. Various lines of reasoning can be used to explain this, such as the ease with which a certain topic or linkage can be studied, but that is not within the scope of this paper. Yet, it does signal that scholars should focus their research on these underexplored linkages where not much information has been identified. Examples include the effect of intangible organizational elements on structural organizational elements, offering-related elements, managers' characteristics or employee characteristics. Another is the linkage between structural organizational elements and intangible organizational elements. Scholars should also try to discern more specific linkages between the industry and the servitization process. All four antecedent categories on structural organizational elements, product / service elements, and intangible organizational elements remain unexplored.

Finally, current research seems preoccupied with model development that is aimed at clarifying service business models or directions for companies (or "service typologies"). While this research is valuable in itself, the amount of business model development and service typologies in the sample was disproportionate compared to other types of research. These different models are not necessarily in conflict with each other - most of them offer complimentary perspectives - but at this point in time the added benefits of each business model is progressively lower and lower. As Jacob & Ulaga (2008)

noted, these classifications can be considered as a first step that is necessary in order for the research to progress. However, extant research seems to be stuck on this first step, since it is still the focus of much research even today. The total list of research on this subject would be too much to specify, but examples include: Gebauer (2008), Gebauer, Fischer, et al. (2010), Holmström et al. (2010), Kapletia and Probert (2010), Kowalkowski et al. (2015), Lay et al. (2009), Matthyssens and Vandenbempt (2010), Penttinen and Palmer (2007), Raddats and Easingwood (2010), Rapaccini and Visintin (2015), Smith et al. (2014), Storbacka et al. (2013), Ulaga and Reinartz (2011), Wikström et al. (2009), and Windahl and Lakemond (2010). Each model offers different dimensions or a different perspective, yet they remain idiosyncratic. What is needed are not more models, but more continuation based on previous models. Currently, most research develops a new model for every study, while there are plenty of others available. Not only is this not progressive, it also hinders further development in the field due to the fact that there are so many business models (i.e. one cannot see the forest for the trees). Thus, the field would benefit from deeper research that actually focuses on the implications of these business models and service typologies, rather than just suggesting further conceptual classifications (or ones based on case studies). Simply put, concretizing research on servitization instead of generating more abstract and conceptual ideas is in order.

## **2.5.2 Research opportunities within each stream**

### *2.5.2.1 Antecedents*

Looking at the industry structure and dynamics in servitization, several new avenues for research can be identified. Various factors have already been considered in previous research, but more focused research on environmental factors (such as Turunen & Finne 2014, and Cusumano et al. 2015) is welcomed. Moreover, most work in this field seems to be conceptual in nature and thus longitudinal quantitative research that focuses on the changing industry context would be a first avenue for new research. Secondly, while some research has started to address the link between competitive dynamics (and competitive “states” such as hypercompetition), many

opportunities are still present in this area. For example: while studies have indicated that income streams from services can be more stable (e.g. contracts for continued maintenance that do not rely on continued effort to make sales), it is as of yet unclear how this is affected by increasing competition. Are these “stable” streams of income still stable when increased competition drives the price down, and/or the quality up? Likewise, other research based on hypercompetition or competitive dynamics can be addressed as well. For example: Turunen and Finne (2014) discussed the legitimacy effect and the adoption of servitization by firms, but more practical research on how competition affects adoption, changing dynamics, and the exit of firms in servitized environments could prove insightful. Also, to what extent does the red queen effect (Derfus et al. 2008) hold true in servitized environments (i.e. ever increasing efforts in the servitized business only results in maintaining the current competitive position). Third, some research has addressed the entry and exit of firms in the industry (e.g. Turunen & Finne 2014), but studies have been lacking with regards to the changing value chain system and structure of the industry. Extant research has shown that the structure of an industry evolves over time through vertical integration, disintegration and reintegration (Cacciatori & Jacobides 2005). These changes in the industry structure, and the subsequent changing firm boundaries, have not been addressed properly in the servitization literature, with the possible exception of Rabetino & Kohtamäki (2013). More research on this is welcomed however. Related to this, and connecting to the structural configuration of a servitized organization, are the make-or-buy decisions. Studies in the servitization field have looked at this, but they have not considered whether or not the firm can actually make this decision. That is, if there is an available market to ‘buy’ the necessary capabilities and skills. Jacobides (2005) has shown that the availability of these options cannot not be taken for granted, and that it changes over time through industry dynamics. This would be an interesting perspective to study in the context of servitization as well. Fourth, other elements have also been linked to servitization, such as the business cycle (Windahl & Lakemond 2010) and fragmentation of industries (Matthyssens & Vandenbempt 2010). However, little is known about these factors. Thus, future research could look at how the

business cycle changes the dynamics of servitization, the servitization adoption of firms, and changing customer interest during various phases on the business cycle. Likewise, future research could look at the difference between fragmented and concentrated industries: does fragmentation spur servitization efforts? Or: do more concentrated industries (i.e. less competition) hinder servitization efforts and development over time? Finally, more research could look at how servitization can help firms achieve market dominance, and what the effect of first-mover advantages (or disadvantages) holds for firms that are servitizing.

Research on static organizational elements also holds potential for future research, although existing studies are more focused and more coherent than with regards to the industry context. Value chain position and servitization has been studied quite intensively for example (e.g. Gebauer, Paiola, et al. 2010; Penttinen & Palmer 2007), and extant research has also considered the size of the company. However, regarding the latter there seems to be some disagreement about how size can affect servitization, especially in the context of SMEs (for discussion: see the previous section). Thus, it would be of interest for future research to conclude definitively if SMEs have more trouble servitizing or if the link is not that clear and/or strong. Other potential areas for research, that have not been highlighted yet, are the availability of monetary or slack resources (i.e. does this facilitate the servitization process) and the age of the firm (do younger firms servitize more easily and often?). This plays into Stinchcombe's (1965) liabilities of newness (e.g. additional costs incurred by new, young firms), and subsequent constructs such as the liabilities of smallness (e.g. additional costs incurred by small firms) (Wholey & Brittain 1986). Efforts to answer these questions could provide more insight into how these static elements influence servitizing firms.

Studies on dynamic organizational elements, such as capabilities, competences and routines, and their effects on the servitization process have been limited and scarce in nature. Research has acknowledged that capabilities do play a role in the servitization

process, but while they have often been mentioned, few studies have elaborated upon them. That is, few studies have explicitly and practically addressed them. Potential questions that future research can aim to answer include providing an overview of the capabilities/competences that can influence servitization and how this works. So far, extant research has identified operational, network, (specific) dynamic, and learning capabilities. But much remains to be done in order to specify these capabilities, how they exactly influence the servitization process and how firms can utilize them in practice. Another area of research concerns so-called “sticky capabilities” and servitization: capabilities firms have in their arsenal and their influence on servitization and how they shape this process (e.g. does the presence of certain capabilities positively or negatively influence the servitization process?). An adjacent area to this would be path dependency and inertia. So far not much resource on servitization has touched upon this, but it would be valuable to gain knowledge about how path dependency and organizational inertia can shape servitization and how it influences future adoption/changes in the process. That is, to what extent is servitization path dependent?, how do previous decisions (in the context of servitizing) affect future possibilities?, et cetera. Of course, such as endeavor would require a longitudinal research design.

Finally, because servitization profoundly alters the buyer-supplier relationship, it is not surprising that research has focused on this to a large extent. Not just the relationship changes; it has also been found that specific client-related factors affect how the servitization process is initiated. Still, a possible avenue for new research could be the development of more practical and tangible prescriptions with regards to customer needs. Which specific customer factors affect the servitization process at which point in time and at which what stages? How do customer-related factors influence the choice or extent of servitized offerings? Do firms still probe and research integrated offerings even though the current client base is not particularly interested in them (i.e. creating a new market)?

### *2.5.2.2 Servitization*

Although heavily based on cross-sectional research designs, the majority of research has focused on the processual elements of servitization. Still, there are many questions that remain and thus different possibilities for future research. Looking at the structural organizational elements, for example, there remain some doubts about the most common components. Studies have identified clear reasons why firms integrate or separate their service business, but not everyone shares the same opinion. Likewise, with regards to setting up structural elements of organizations, earlier research suggests that internal separation of the service and product business is best (i.e. a “front” and a “back” organization), later research has presented a more nuanced view. But how do these two elements hold up in different circumstances (e.g. fast changing environment)? When should firms decide to outsource their service business, integrate it to the existing structure, or integrate it in a separate division? A quantitative study could try to discern how firms in practice have organized this, and what elements tend to be separated and integrated. Longitudinal case studies that focus on companies that actively change their business set-up over the course of many years could also yield interesting results. Moreover, there is potential for future research when it comes to firm boundaries in practice. For instance, research on vertical integration through mergers & acquisitions versus cooperative systems. Both have advantages, but the former might not be possible depending on the size or slack resources of the company. However, research has identified the benefits of both system integrators and system sellers, and both can be found in practice (e.g. Davies et al. 2007). Further studies on the benefits of both forms of integration and value chain movements could provide insight into how this is done in practice, and the reasoning behind these choices. Research could also look at alternative ways of getting resources and capabilities, such as platforms in servitization (Eloranta & Turunen 2015a). Another potential research avenue concerns the rhythm and pace of servitization. If firms build the necessary skills and capabilities over time as they extend their service offering, it could prove insightful to see if there is a pattern of speed and/or regularity between different firms. That is, do firms initially extend their service portfolio quickly and then slow down as they

approach more advanced services, or is the initial service portfolio construction done more slowly, and do firms “speed up” their development as they approach the, usually more profitable, advanced services? Finally, when considering firm movements throughout the value system, future research could investigate larger sets of actors (not dyadic or triadic relationships) and the effects larger networks have on servitization and its success.

Offering-related elements are a second major theme when it comes to the servitization process. The majority of research here is focused on innovation, modularity and performance measures (/contracts). With regards to the first two, several different factors have been identified that might influence the product/service process. However, the concept of modularity in a service context seems quite abstract in the reviewed literature and thus could benefit from some practical insight. Some questions that could use more clarification: How do companies organize for service modularity? How does modularity specifically affect future service innovations? How can modular services best be offered, priced and sold? What elements help to gain success with modularity? The second major theme, performance measurement and contracts, has received a decent amount of attention as well. Yet most of the research seems to focus on more advanced services: how can firms measure and predict prices for operational services, and how can they communicate this new way of pricing / offering to the customer? Extant research has not focused much on the more basic services and the changes they require. While it is true that these services require less organizational and relational changes, there is one specific situation that could use more research. This is with regards to the “services for free” mentality of customers. Witell and Löfgren (2013) studied this in practice, and found that firms struggle to change this mentality of their customers. Abrupt changes might affect future growth potential, but incremental changes keep the “services for free” mentality intact. Future research should continue to study this and offer guidance to practitioners. An interesting new approach for offerings could be to advance the research by Opresnik and Taisch (2015), who look at big data strategies for servitization, by taking into

account how this data can be used or sold in order to achieve more value from the installed base of the firm.

The third theme is related to intangible organizational elements. As discussed earlier, this area of research is less diverse, less substantial and can even be called superficial. Different areas are explored only to a limited extent, so future research has the potential here to clarify the effects of culture, commitment, organizational identity, business orientation, et cetera, to a larger extent. In general, this area has remained vague, so more research and more concreteness would be a benefit by itself. Specifically, future research should look at the so-called “service culture” and the influence it has. Primarily: what is a service culture?, what elements constitute a service culture?, how can one measure the extent of a service culture?, and how can a company go about and change their traditional culture towards a more service-oriented one (while at the same not losing their product expertise and mindset)? Likewise, what is the influence of a service culture on other factors of servitization (such as offering-related elements, or structural organizational elements)? Moreover, what are the interdependencies between managerial characteristics, employee characteristics and specific elements of service culture? Finally, as can be seen in the previous chapter, current studies use different terminology to describe similar things: service culture, service-orientation, service business orientation, service focus, et cetera, all imply the same concept. Thus, creating a common framework and terminology when talking about the changing culture and mindset of industrial firms could be a good starting point. Future research could apply organizational identity and sensemaking concepts in order to get a better understanding of intangible organizational elements in servitization, especially when it relates to employees’ and managers’ characteristics (e.g. Weick 1995; Weick et al. 2005; Thurlow & Mills 2009).

The fourth and fifth areas in the servitization process focus on the managers’ and the employees’ characteristics. Both of these are related to specific HR elements that become important as soon as companies start to servitize: the qualities, assets,

mindsets, and attitudes that are successful for the product business do not seem to be the same as those for a successful service business. Hence, firms must not only change the mindsets of their employees and managers (and remove cognitive barriers), they must also re-educate them and provide them with the right values that are necessary for success. Extant research has already defined clear factors that are of importance. However, future research can continue to build upon them. First, research can try to determine to what extent it is possible for firms to change their managers' and employees' characteristics in practice and to remove their cognitive barriers. Or, is it better for firms to start 'from the ground up' by setting up a new division, hiring new managers and employees, and inspiring new values? Likewise, how does this differ in the integration or separation of the service business: is a separate service business easier to change in terms of mindsets, skills and attitudes? Other research can look at more specific elements related to employees and managers. One example of this is sales employees. Previous research has defined their importance (e.g. Ulaga & Loveland 2014), but can (and if so, how) firms create hybrid sales roles where sales employees sell both products and services, and how should their performance be measured? (Especially since sales employees might be more incentivized to sell large product orders, and not small service contracts.) Another example would be the influence of service "champions" or informal leaders in organizations and the effect they have. Finally, since research has shown that certain HR elements need to be changed, and has shown the importance of them, it could prove to be insightful to follow companies in the early stages of the servitization process and determine how they identify, think about, and solve these issues.

#### *2.5.2.3 Outcomes*

When looking at the outcomes of a firm's servitization process, there are some similarities with the future research potential of antecedent industry factors. Future research on competitive dynamics and hypercompetition should be focused on both the antecedent factors (e.g. competitors' moves), as well as the firms process conclusion on the industry. In particular, future research could investigate market-

shaping effects of servitization to a larger extent. What are the conditions of this effect? Does the effect only occur when firms use innovative and more advanced services, or is the effect noticeable with basic services as well? Another avenue for future research could use action-reaction research (e.g. Chen 2009) to identify how competitors react to more servitized offerings from a firm. Do they start building internal capabilities for servitization as well? Does increased competition favor the externalization of the service business (i.e. rapid development)?

Likewise, the link between antecedent organizational factors (whether static or dynamic) and the effects of the servitization process on organizational factors is strong as well. Thus, research that is conducted on resources or capabilities needed for servitization, sheds light not only on how this affects the process, but also how the process changes them. Thus, future research looking at learning effects or capability improvement can take both into account at the same time.

The changing relationship between the buyer and supplier has been relatively well researched within the servitization context. Studies have indicated that operational and relational roles change over time as the service offerings increases. Likewise, the offering of advanced services has distinct benefits, such as increased customer loyalty and differentiation from the competition. Less is known about how basic services alter the relationship between buyer-supplier; future research could investigate this. Moreover, it would be of interest to conduct a longitudinal case study between a supplier and a buyer (or buyers) in order to find out how the exact relationship changes when the supplier starts to offer basic services, and later on, more advanced services.

In general, research has identified several different contingent factors and effects when it comes to performance outcomes of servitization. As can be seen from the earlier discussion on the literature, non-linear effects of increased service offering and sales growth or revenue exist, as well as different factors that should be taken into

account that moderate this link. While extant research has identified this, more research is welcomed to clarify and confirm existing effects in different situations, as well as (potentially) identify new effects in existing situations. Especially with regards to the link between service growth and sales, revenue and profit implications, research could look at larger sets of data to confirm, or deny, if these identified factors hold true in other contexts as well. Quantitative research spanning different countries would be ideal for this. Finally, most research so far has looked at servitization successes and not many have looked servitization failures. Yet it could prove to be very insightful to consider servitization failures and to try and gain an understanding on why this happens, and if there are any commonalities / patterns discernible.

A summary of future research opportunities within the different groups of literature on servitization can be found in Table 5.

**Table 5: Future Research Opportunities**

	<b>Research area</b>	<b>Research opportunities</b>
<b>Antecedents</b>	Industry structure and dynamics	- Competitive dynamics and hypercompetition in the context of servitization - Different market conditions (fragmentation/concentrated, emerging/maturing markets, et cetera)
	Static organizational elements	- Further investigate the linkage between size (e.g. SMEs) and servitization adoption - Effects of firm age and slack resources on servitization adoption
	Dynamic organizational elements	- Further research examining competences/capabilities that positively / negatively influence servitization - Effect of sticky capabilities / path dependency / inertia on servitization
	Customer-related factors	- More practical prescriptive studies on which customer-related factors affect servitization - If current client base does not favor servitized offerings, do firms still explore servitization for new markets?
<b>Servitization</b>	Structural organizational elements	- Longitudinal studies on how firms have organized for services (integration, separation, hybrid; effects of advanced services)
	Offering-related elements	- Practical insight and clarification on service modularity - Guidance on how to change pricing strategies for service in product firms (especially when they are currently free)
	Intangible organizational elements	- Studies that explore service culture (or business orientation) and the effects it has on different processes and servitization
	Managers' and employees' characteristics	- HR-related factors: how to change product mindset? Is it better to build a service business from the ground up (i.e. separation)? - Performance measurement and incentive systems for sales employees ("hybrid" sales persons possible or recommendable?)
<b>Outcomes</b>	Industry structure and dynamics	- Market-shaping effects of servitization and their conditions - Action-reaction studies (competitive dynamics)
	Organizational elements	- Similar to the antecedent factors, research could deepen knowledge on learning effects and different types of capabilities and how servitization affects them (or changes them over time)
	Customer-related factors	- Longitudinal studies investigating the buyer-supplier(s) relationship(s), and how (and what) changes over the course of increased service offerings (from basic to advanced)
	Performance outcomes	- Quantitative research that looks at the link between service offerings and sales, revenue and profit growth in a large set of data spanning multiple countries - Servitization failures: discernable commonalities and patterns?

## 2.6 CONCLUSIONS AND LIMITATIONS

### 2.6.1 Contribution

By using a systematic methodology to identify 152 articles, this review encompasses the majority of research on servitization published in high-impact journals. Thus, the

present article offers a picture of the state-of-the-art of the research in the field, and shows what progress has been made in which area. By summarizing extant studies, this review shows that there are roughly three groups of literature in servitization. The first group deals with the antecedents of the servitization process. Dealing with the servitization process itself, the second group involves different elements such as the organization structure, factors related to the integration of product/service offerings, the intangible organization's assets, and managers' and employees' characteristics. Finally, the third group of literature deals with the process conclusion of servitization and the specific outcomes that are obtained.

Although there are many elements in the integrative framework of servitization, the aim of this review is to show the linkages between different elements. The overview of the processual elements of servitization (Figure 1) is a major step in processual analysis in order *"to catch reality in flight"* (Pettigrew 1997, p.347). Hopefully this will aid future research efforts by showcasing what has been researched to a large extent, and what remains underexplored. Thus, a core contribution of this review is an elaboration on the direction for future research on servitization. For each perspective and element in the integrative framework new directions for research have been suggested. Besides this, general suggestions to advance and mature studies on servitization have been provided too. Hopefully, this review will help current and future scholars by providing a synthesis of current research that will enable them to contribute to research on servitization while deepening the understanding of the whole process.

Finally, it should be noted that the servitization literature is but one field of research that studies the integration of products and services and the services economy (Baines, Lightfoot, Peppard, et al. 2009). Although articles from other research communities were not considered explicitly in this review, it is logical to state that the integration and cross-pollination of the different ideas developed in them can help advance the research and the literature. Hopefully, this synthesis of the servitization literature can

be used by other research communities as well in order to advance the knowledge on product-service integration and to guide future bridging efforts.

### **2.6.2 Managerial implications**

Even though it is eminently theoretical, this review offers and highlights several insights that might be of importance for managers in practice. First, this review reaffirms that servitization is complex in nature and that it consists of many different elements. There are a multitude of challenges for firms making the transition towards more (advanced) service offerings. Managers should not just look at individual aspects of their firm, but also take into account the entire picture, which contains many elements that must be in place in order for servitization to succeed. This includes not only structural elements like organizing for a service business and making value chain movements, but also realigning and creating internal processes, developing a service culture, reconfiguring tangible and intangible assets, training and incentivizing employees to strive for the service business, and setting up new performance measurements and contracts for the integrated offerings. Overall, servitization calls for a new set of organizational practices.

However, it is important for managers to realize that they themselves play an essential role in the servitization process too. In particular, top- and middle-management leadership seems to be a key success factor. Therefore, any cognitive barriers managers have with regards to the service business (such as disbelieving the potential of services for the firm) need to be removed. Likewise, middle-managers have to be motivated and offer visionary leadership throughout the organization for the process to succeed. In addition, managers should understand that the servitization process might not be dependent solely on the firm's internal processes. Antecedent factors related to initial industry conditions (i.e. the competition, competitive dynamics, and the industry characteristics), endowment of organizational resources and capabilities, and customer-related elements all have the possibility to influence the servitization of the firm. Thus, managers should aim to gain an understanding of the industry, the

competition and their offers, the resources and capabilities available in-house, and the specific customer wishes and mindset before initiating any servitization efforts. Consequently, managers may derive benefits from increased usage of business intelligence systems when servitizing their offerings.

Although servitization is typically seen as a continuum ranging from services as an add-on to products as an add-on, it is important for managers to understand that the optimal position of servitized offerings may be located at different positions alongside the continuum. Not every customer wants to have advanced services or integrated solutions, and changing the firm in such a drastic way is not only difficult, but it might require a long time period to succeed as well. While different business logics can co-exist, there is a non-linear effect on firm performance. The offering of advanced services requires a more profound organizational change. Thus, manufacturing firms can move in this direction only when the customers demand more advanced services, and only when the internal organization is ready to offer them. Hence, managers should be aware of this continuum thinking and realize that it does not apply to every industry and firm in manufacturing.

### **2.6.3 Limitations**

As with any review, this article has various limitations. First, due to the required characteristics of the sample, a wealth of research has not been considered here. Two facts should be noted: 1) due to the minimum impact factor of 1.00 multiple journals and authors publishing on servitization, as well as earlier research on servitization (i.e. the “classics”) have been left out (e.g. Mathieu 2001); 2) since most practitioners journals, like the Harvard Business Review, do not use keywords for their articles, these were not found in the initial searches, which means that influential articles like Wise and Baumgartner's (1999) were not included either. Nevertheless, this need not be a critical exclusion. The studies included in the sample are built upon previous research, and thus the ideas and findings have a cumulative effect. Second, the set of keywords and databases that were used during the search might not have

encompassed the entirety of the servitization field, and thus relevant articles could have been excluded from the sample. Third, while all the articles were read carefully, the author may have mistaken or misinterpreted data presented in them and thus have misclassified or misattributed certain information. Lastly, and perhaps most importantly, this review constitutes a subjective interpretation of the information provided in the sample. It is but one way to interpret the literature and different scholars might have had different interpretations of the same information. Likewise, the categorization of the sample and the identified topics and linkages are but one interpretation as well.

## REFERENCES

- Antioco, M. et al., 2008. Organizational antecedents to and consequences of service business orientations in manufacturing companies. *Journal of the Academy of Marketing Science*, 36(3), pp.337–358.
- Araujo, L. & Spring, M., 2006. Services, products, and the institutional structure of production. *Industrial Marketing Management*, 35(7), pp.797–805.
- Artto, K., Valtakoski, A. & Kärki, H., 2015. Organizing for solutions: How project-based firms integrate project and service businesses. *Industrial Marketing Management*, 45(1), pp.70–83.
- Badinelli, R. et al., 2012. Viable service systems and decision making in service management. *Journal of Service Management*, 23(4), pp.498–526.
- Baines, T.S. et al., 2007. State-of-the-art in product-service systems. *Proceedings of the Institution of Mechanical Engineers, Part B: Journal of Engineering Manufacture*, 221(10), pp.1543–1552.
- Baines, T.S. et al., 2005. Strategic positioning: an integrated decision process for manufacturers. *International Journal of Operations & Production Management*, 25(2), pp.180–201.
- Baines, T.S., Lightfoot, H., Benedettini, O., et al., 2009. The servitization of manufacturing: A review of literature and reflection on future challenges. *Journal of Manufacturing Technology Management*, 20(5), pp.547–567.
- Baines, T.S., Lightfoot, H., Peppard, J., et al., 2009. Towards an operations strategy for product-centric servitization. *International Journal of Operations & Production Management*, 29(5), pp.494–519.
- Baines, T.S. & Lightfoot, H.W., 2013. Servitization of the manufacturing firm. *International Journal of Operations & Production Management*, 34(1), pp.2–35.
- Baines, T.S. & Shi, V.G., 2015. A Delphi study to explore the adoption of servitization in UK companies. *Production Planning & Control*, 26(14-15), pp.1–17.
- Barney, J.B., 1991. Firm resources and sustained competitive advantage. *Journal of Management*, 17(1), pp.99–120.
- Barquet, A.P.B. et al., 2013. Employing the business model concept to support the adoption of product–service systems (PSS). *Industrial Marketing Management*, 42(5), pp.693–704.
- Bastl, M. et al., 2012. Buyer-supplier relationships in a servitized environment. *International Journal of Operations & Production Management*, 32(6), pp.650–675.
- Belvedere, V., Grando, A. & Bielli, P., 2013. A quantitative investigation of the role of information and communication technologies in the implementation of a product-service system. *International Journal of Production Research*, 51(2), pp.410–426.

- Benedettini, O., Neely, A. & Swink, M., 2015. Why do servitized firms fail? A risk-based explanation. *International Journal of Operations & Production Management*, 35(6), pp.946–979.
- Beuren, F.H., Gomes Ferreira, M.G. & Cauchick Miguel, P.A., 2013. Product-service systems: a literature review on integrated products and services. *Journal of Cleaner Production*, 47, pp.222–231.
- Biege, S., Lay, G. & Buschak, D., 2012. Mapping service processes in manufacturing companies: industrial service blueprinting. *International Journal of Operations & Production Management*, 32(8), pp.932–957.
- Biggemann, S. et al., 2013. Development and implementation of customer solutions: A study of process dynamics and market shaping. *Industrial Marketing Management*, 42(7), pp.1083–1092.
- Bjurklo, M., Edvardsson, B. & Gebauer, H., 2009. The role of competence in initiating the transition from products to service. *Managing Service Quality*, 19(5), pp.493–510.
- Boehm, M. & Thomas, O., 2013. Looking beyond the rim of one's teacup: a multidisciplinary literature review of Product-Service Systems in Information Systems, Business Management, and Engineering & Design. *Journal of Cleaner Production*, 51, pp.245–260.
- Brady, T., Davies, A. & Gann, D.M., 2005. Creating value by delivering integrated solutions. *International Journal of Project Management*, 23(5), pp.360–365.
- Brax, S., 2005. A manufacturer becoming service provider – challenges and a paradox. *Managing Service Quality: An International Journal*, 15(2), pp.142–155.
- Brax, S. & Jonsson, K., 2009. Developing integrated solution offerings for remote diagnostics: A comparative case study of two manufacturers. *International Journal of Operations & Production Management*, 29(5), pp.539–560.
- de Brentani, U., 1995. New industrial service development: Scenarios for success and failure. *Journal of Business Research*, 32(2), pp.93–103.
- Bustinza, O.F. et al., 2015. Servitization and Competitive Advantage: The Importance of Organizational Structure and Value Chain Position. *Research-Technology Management*, 58(5), pp.53–60.
- Cacciatori, E. & Jacobides, M.G., 2005. The Dynamic Limits of Specialization: Vertical Integration Reconsidered. *Organization Studies*, 26(12), pp.1851–1883.
- Cavaliere, S. & Pezzotta, G., 2012. Product–Service Systems Engineering: State of the art and research challenges. *Computers in Industry*, 63(4), pp.278–288.
- Ceci, F. & Masini, A., 2011. Balancing specialized and generic capabilities in the provision of integrated solutions. *Industrial and Corporate Change*, 20(1), pp.91–131.

- Chen, M.J., 2009. Competitive dynamics research: An insider's odyssey. *Asia Pacific Journal of Management*, 26(1), pp.5–25.
- Chia, R. & MacKay, B., 2007. Post-processual challenges for the emerging strategy-as-practice perspective: Discovering strategy in the logic of practice. *Human Relations*, 60(1), pp.217–242.
- Cusumano, M.A., Kahl, S.J. & Suarez, F.F., 2015. Services, industry evolution, and the competitive strategies of product firms. *Strategic Management Journal*, 36(4), pp.559–575.
- Datta, P.P. & Roy, R., 2011. Operations strategy for the effective delivery of integrated industrial product-service offerings. *International Journal of Operations & Production Management*, 31(5), pp.579–603.
- David, R.J. & Han, S.-K., 2004. A systematic assessment of the empirical support for transaction cost economics. *Strategic Management Journal*, 25(1), pp.39–58.
- Davies, A., 2004. Moving base into high-value integrated solutions: a value stream approach. *Industrial and Corporate Change*, 13(5), pp.727–756.
- Davies, A. & Brady, T., 2000. Organisational capabilities and learning in complex product systems: Towards repeatable solutions. *Research Policy*, 29(7-8), pp.931–953.
- Davies, A., Brady, T. & Hobday, M., 2006. Charting a path toward integrated solutions. *MIT Sloan Management Review*, 47(3), pp.39–48.
- Davies, A., Brady, T. & Hobday, M., 2007. Organizing for solutions: Systems seller vs. systems integrator. *Industrial Marketing Management*, 36(2), pp.183–193.
- Derfus, P.J. et al., 2008. The Red Queen Effect: Competitive Actions and Firm Performance. *Academy of Management Journal*, 51(1), pp.61–80.
- Dimache, A. & Roche, T., 2013. A decision methodology to support servitisation of manufacturing. *International Journal of Operations & Production Management*, 33(11/12), pp.1435–1457.
- Durugbo, C., 2013. Competitive product-service systems: lessons from a multicase study. *International Journal of Production Research*, 51(19), pp.5671–5682.
- Eggert, A. et al., 2011. Industrial services, product innovations, and firm profitability: A multiple-group latent growth curve analysis. *Industrial Marketing Management*, 40(5), pp.661–670.
- Eggert, A. et al., 2014. Revenue and Profit Implications of Industrial Service Strategies. *Journal of Service Research*, 17(1), pp.23–39.
- Eloranta, V. & Turunen, T., 2015a. Platforms in service-driven manufacturing: Leveraging complexity by connecting, sharing, and integrating. *Industrial Marketing Management*, (in press).

- Eloranta, V. & Turunen, T., 2015b. Seeking competitive advantage with service infusion: a systematic literature review. *Journal of Service Management*, 26(3), pp.394–425.
- Erkoyuncu, J.A. et al., 2010. Understanding service uncertainties in industrial product–service system cost estimation. *The International Journal of Advanced Manufacturing Technology*, 52(9-12), pp.1223–1238.
- Erkoyuncu, J.A., Durugbo, C. & Roy, R., 2013. Identifying uncertainties for industrial service delivery: a systems approach. *International Journal of Production Research*, 51(21), pp.6295–6315.
- Fang, E. (Er), Palmatier, R.W. & Steenkamp, J.-B.E., 2008. Effect of Service Transition Strategies on Firm Value. *Journal of Marketing*, 72(5), pp.1–14.
- Ferreira, F.N.H. et al., 2013. The transition from products to solutions: External business model fit and dynamics. *Industrial Marketing Management*, 42(7), pp.1093–1101.
- Finne, M. & Holmström, J., 2013. A manufacturer moving upstream: triadic collaboration for service delivery. *Supply Chain Management: An International Journal*, 18(1), pp.21–33.
- Gaiardelli, P. et al., 2014. A classification model for product-service offerings. *Journal of Cleaner Production*, 66, pp.507–519.
- Gebauer, H., 2009. An attention-based view on service orientation in the business strategy of manufacturing companies. *Journal of Managerial Psychology*, 24(1), pp.79–98.
- Gebauer, H., 2008. Identifying service strategies in product manufacturing companies by exploring environment–strategy configurations. *Industrial Marketing Management*, 37(3), pp.278–291.
- Gebauer, H. et al., 2008. Innovation of product-related services. *Managing Service Quality*, 18(4), pp.387–404.
- Gebauer, H., Edvardsson, B., Gustafsson, A., et al., 2010. Match or Mismatch: Strategy-Structure Configurations in the Service Business of Manufacturing Companies. *Journal of Service Research*, 13(2), pp.198–215.
- Gebauer, H. et al., 2012. Service-driven manufacturing. *Journal of Service Management*, 23(1), pp.120–136.
- Gebauer, H., Edvardsson, B. & Bjurklo, M., 2010. The impact of service orientation in corporate culture on business performance in manufacturing companies. *Journal of Service Management*, 21(2), pp.237–259.
- Gebauer, H., Fischer, T. & Fleisch, E., 2010. Exploring the interrelationship among patterns of service strategy changes and organizational design elements. *Journal of Service Management*, 21(1), pp.103–129.

- Gebauer, H. & Fleisch, E., 2007. An investigation of the relationship between behavioral processes, motivation, investments in the service business and service revenue. *Industrial Marketing Management*, 36(3), pp.337–348.
- Gebauer, H., Fleisch, E. & Friedli, T., 2005. Overcoming the Service Paradox in Manufacturing Companies. *European Management Journal*, 23(1), pp.14–26.
- Gebauer, H., Gustafsson, A. & Witell, L., 2011. Competitive advantage through service differentiation by manufacturing companies. *Journal of Business Research*, 64(12), pp.1270–1280.
- Gebauer, H., Paiola, M. & Edvardsson, B., 2010. Service business development in small and medium capital goods manufacturing companies. *Managing Service Quality: An International Journal*, 20(2), pp.123–139.
- Gebauer, H., Paiola, M. & Sacconi, N., 2013. Characterizing service networks for moving from products to solutions. *Industrial Marketing Management*, 42(1), pp.31–46.
- Ginsberg, A. & Venkatraman, N., 1985. Contingency Perspectives of Organizational Strategy: A Critical Review of the Empirical Research. *Academy of Management Review*, 10(3), pp.421–434.
- Gremyr, I., Löfberg, N. & Witell, L., 2010. Service innovations in manufacturing firms. *Managing Service Quality: An International Journal*, 20(2), pp.161–175.
- Hakanen, T., 2014. Co-creating integrated solutions within business networks: The KAM team as knowledge integrator. *Industrial Marketing Management*, 43(7), pp.1195–1203.
- Hakanen, T. & Jaakkola, E., 2012. Co-creating customer-focused solutions within business networks: a service perspective. *Journal of Service Management*, 23(4), pp.593–611.
- Hellström, M., 2014. Solution business models based on functional modularity – the case of complex capital goods. *Journal of Service Management*, 25(5), pp.654–676.
- Hillebrand, B., Kok, R.A.W. & Biemans, W.G., 2001. Theory-Testing Using Case Studies. *Industrial Marketing Management*, 30(8), pp.651–657.
- Hobday, M., 2005. Systems integration: a core capability of the modern corporation. *Industrial and Corporate Change*, 14(6), pp.1109–1143.
- Holmström, B. & Roberts, J., 1998. The Boundaries of the Firm Revisited. *Journal of Economic Perspectives*, 12(4), pp.73–94.
- Holmström, J., Brax, S. & Ala-Risku, T., 2010. Comparing provider-customer constellations of visibility-based service. *Journal of Service Management*, 21(5), pp.675–692.
- Homburg, C., Hoyer, W.D. & Fassnacht, M., 2002. Service Orientation of a Retailer's Business Strategy: Dimensions, Antecedents, and Performance Outcomes. *Journal of Marketing*, 66(4), pp.86–101.

- Hutzschenreuter, T. & Kleindienst, I., 2006. Strategy-Process Research: What Have We Learned and What Is Still to Be Explored. *Journal of Management*, 32(5), pp.673–720.
- Jaakkola, E. & Hakanen, T., 2013. Value co-creation in solution networks. *Industrial Marketing Management*, 42(1), pp.47–58.
- Jacob, F., Kleipaß, U. & Pohl, A., 2014. Nature and role of customer satisfaction in the solution business. *European Management Journal*, 32(3), pp.487–498.
- Jacob, F. & Ulaga, W., 2008. The transition from product to service in business markets: An agenda for academic inquiry. *Industrial Marketing Management*, 37(3), pp.247–253.
- Jacobides, M.G., 2005. Industry change through vertical disintegration: How and why markets emerged in mortgage banking. *Academy of Management Journal*, 48(3), pp.465–498.
- Jarzabkowski, P. & Spee, A.P., 2009. Strategy-as-practice: A review and future directions for the field. *International Journal of Management Reviews*, 11(1), pp.69–95.
- Johansson, P. & Olhager, J., 2004. Industrial service profiling: Matching service offerings and processes. *International Journal of Production Economics*, 89(3), pp.309–320.
- Johansson, P. & Olhager, J., 2006. Linking product–process matrices for manufacturing and industrial service operations. *International Journal of Production Economics*, 104(2), pp.615–624.
- Johnston, W.J., Leach, M.P. & Liu, A.H., 1999. Theory testing using case studies in Business-to-Business research. *Industrial Marketing Management*, 28(3), pp.201–213.
- Johnstone, S., Dainty, A. & Wilkinson, A., 2009. Integrating products and services through life: an aerospace experience. *International Journal of Operations & Production Management*, 29(5), pp.520–538.
- Kapletia, D. & Probert, D., 2010. Migrating from products to solutions: An exploration of system support in the UK defense industry. *Industrial Marketing Management*, 39(4), pp.582–592.
- Kindström, D., 2010. Towards a service-based business model – Key aspects for future competitive advantage. *European Management Journal*, 28(6), pp.479–490.
- Kindström, D. & Kowalkowski, C., 2009. Development of industrial service offerings: a process framework. *Journal of Service Management*, 20(2), pp.156–172.
- Kindström, D., Kowalkowski, C. & Alejandro, T.B., 2015. Adding services to product-based portfolios. *Journal of Service Management*, 26(3), pp.372–393.

- Kindström, D., Kowalkowski, C. & Sandberg, E., 2013. Enabling service innovation: A dynamic capabilities approach. *Journal of Business Research*, 66(8), pp.1063–1073.
- Kohtamäki, M., Partanen, J., Parida, V., et al., 2013. Non-linear relationship between industrial service offering and sales growth: The moderating role of network capabilities. *Industrial Marketing Management*, 42(8), pp.1374–1385.
- Kohtamäki, M., Partanen, J. & Möller, K., 2013. Making a profit with R&D services — The critical role of relational capital. *Industrial Marketing Management*, 42(1), pp.71–81.
- Kowalkowski, C., 2011. Dynamics of value propositions: insights from service-dominant logic. *European Journal of Marketing*, 45(1/2), pp.277–294.
- Kowalkowski, C. et al., 2012. Service infusion as agile incrementalism in action. *Journal of Business Research*, 65(6), pp.765–772.
- Kowalkowski, C. et al., 2015. What service transition? Rethinking established assumptions about manufacturers' service-led growth strategies. *Industrial Marketing Management*, 45(1), pp.59–69.
- Kowalkowski, C., Kindström, D. & Witell, L., 2011. Internalisation or externalisation?: Examining organisational arrangements for industrial services. *Managing Service Quality*, 21(4), pp.373–391.
- Kowalkowski, C., Witell, L. & Gustafsson, A., 2013. Any way goes: Identifying value constellations for service infusion in SMEs. *Industrial Marketing Management*, 42(1), pp.18–30.
- Kujala, S. et al., 2011. Factors influencing the choice of solution-specific business models. *International Journal of Project Management*, 29(8), pp.960–970.
- Laine, T., Paranko, J. & Suomala, P., 2012. Using a business game concept to enhance servitization: a longitudinal case study. *Managing Service Quality: An International Journal*, 22(5), pp.428–446.
- Laperche, B. & Picard, F., 2013. Environmental constraints, Product-Service Systems development and impacts on innovation management: learning from manufacturing firms in the French context. *Journal of Cleaner Production*, 53, pp.118–128.
- Lay, G. et al., 2010. The relevance of service in European manufacturing industries. *Journal of Service Management*, 21(5), pp.715–726.
- Lay, G., Schroeter, M. & Biege, S., 2009. Service-based business concepts: A typology for business-to-business markets. *European Management Journal*, 27(6), pp.442–455.
- Lee, S.S. et al., 2015. Evaluating new concepts of PSS based on the customer value: Application of ANP and niche theory. *Expert Systems with Applications*, 42(9), pp.4556–4566.

- Li, L., 2011. Marketing of competence-based solutions to buyers in exploratory relationships: Perspective of OEM suppliers. *Industrial Marketing Management*, 40(7), pp.1206–1213.
- Lightfoot, H., Baines, T.S. & Smart, P., 2013. The servitization of manufacturing: A systematic literature review of interdependent trends. *International Journal of Operations & Production Management*, 33(11/12), pp.1408–1434.
- Lightfoot, H.W. & Gebauer, H., 2011. Exploring the alignment between service strategy and service innovation. *Journal of Service Management*, 22(5), pp.664–683.
- Lim, C.-H. et al., 2012. PSS Board: a structured tool for product–service system process visualization. *Journal of Cleaner Production*, 37, pp.42–53.
- Lindahl, M., Sundin, E. & Sakao, T., 2014. Environmental and economic benefits of Integrated Product Service Offerings quantified with real business cases. *Journal of Cleaner Production*, 64, pp.288–296.
- Löfberg, N., Witell, L. & Gustafsson, A., 2015. Service manoeuvres to overcome challenges of servitisation in a value network. *Production Planning & Control*, 26(14-15), pp.1188–1197.
- Löfberg, N., Witell, L. & Gustafsson, A., 2010. Service strategies in a supply chain. *Journal of Service Management*, 21(4), pp.427–440.
- MacBryde, J., Paton, S. & Clegg, B., 2013. Understanding high-value manufacturing in Scottish SMEs. *International Journal of Operations & Production Management*, 33(11), pp.1579–1598.
- Malleret, V., 2006. Value Creation through Service Offers. *European Management Journal*, 24(1), pp.106–116.
- Mathieu, V., 2001. Product services: From a service supporting the product to a service supporting the client. *Journal of Business and Industrial Marketing*, 16(1), pp.39–53.
- Matthyssens, P. & Vandenbempt, K., 2008. Moving from basic offerings to value-added solutions: Strategies, barriers and alignment. *Industrial Marketing Management*, 37(3), pp.316–328.
- Matthyssens, P. & Vandenbempt, K., 2010. Service addition as business market strategy: identification of transition trajectories. *Journal of Service Management*, 21(5), pp.693–714.
- Meier, H., Völker, O. & Funke, B., 2010. Industrial Product-Service Systems (IPS2). *The International Journal of Advanced Manufacturing Technology*, 52(9-12), pp.1175–1191.
- Miller, D. et al., 2002. The problem of solutions: Balancing clients and capabilities. *Business Horizons*, 45(2), pp.3–12.
- Neu, W.A. & Brown, S.W., 2005. Forming Successful Business-to-Business Services in Goods-Dominant Firms. *Journal of Service Research*, 8(1), pp.3–17.

- Newbert, S.L., 2007. Empirical Research on the Resource-Based View of the Firm: An Assessment and Suggestions for Future Research. *Strategic Management Journal*, 28(2), pp.121–146.
- Ng, I. et al., 2012. Transitioning from a goods-dominant to a service-dominant logic. *Journal of Service Management*, 23(3), pp.416–439.
- Ng, I. & Nudurupati, S.S., 2010. Outcome-based service contracts in the defence industry – mitigating the challenges. *Journal of Service Management*, 21(5), pp.656–674.
- Nordin, F., 2008. Linkages between service sourcing decisions and competitive advantage: A review, propositions, and illustrating cases. *International Journal of Production Economics*, 114(1), pp.40–55.
- Nordin, F. & Kowalkowski, C., 2010. Solutions offerings: a critical review and reconceptualisation. *Journal of Service Management*, 21(4), pp.441–459.
- Olhager, J. & Johansson, P., 2012. Linking long-term capacity management for manufacturing and service operations. *Journal of Engineering and Technology Management*, 29(1), pp.22–33.
- Oliva, R. & Kallenberg, R., 2003. Managing the transition from products to services. *International Journal of Service Industry Management*, 14(2), pp.160–172.
- Opresnik, D. & Taisch, M., 2015. The value of Big Data in servitization. *International Journal of Production Economics*, 165, pp.174–184.
- Osegowitsch, T. & Madhok, A., 2003. Vertical integration is dead, or is it? *Business Horizons*, 46(2), pp.25–34.
- Paiola, M. et al., 2013. Moving from products to solutions: Strategic approaches for developing capabilities. *European Management Journal*, 31(4), pp.390–409.
- Pan, J.-N. & Nguyen, H.T.N., 2015. Achieving Customer Satisfaction through Product-Service Systems. *European Journal of Operational Research*, 247(1), pp.179–190.
- Parida, V. et al., 2014. Mastering the Transition to Product-Service Provision Insights into Business Models, Learning Activities, and Capabilities Results. *Research Technology Management*, 57(3), pp.44–52.
- Park, T.-Y., 2012. How a latecomer succeeded in a complex product system industry: three case studies in the Korean telecommunication systems. *Industrial and Corporate Change*, 22(2), pp.363–396.
- Park, Y., Geum, Y. & Lee, H., 2012. Toward integration of products and services: Taxonomy and typology. *Journal of Engineering and Technology Management*, 29(4), pp.528–545.
- Pawar, K.S., Beltagui, A. & Riedel, J.C.K.H., 2009. The PSO triangle: designing product, service and organisation to create value. *International Journal of Operations & Production Management*, 29(5), pp.468–493.

- Peillon, S., Pellegrin, C. & Burlat, P., 2015. Exploring the servitization path: a conceptual framework and a case study from the capital goods industry. *Production Planning & Control*, 26(14-15), pp.1264–1277.
- Penttinen, E. & Palmer, J., 2007. Improving firm positioning through enhanced offerings and buyer–seller relationships. *Industrial Marketing Management*, 36(5), pp.552–564.
- Perry, C., 1998. Processes of a case study methodology for postgraduate research in marketing. *European Journal of Marketing*, 32(9/10), pp.785–802.
- Pettigrew, A.M., 1997. What is processual analysis? *Scandinavian Journal of Management*, 13(4), pp.337–348.
- Phillips, F., Ochs, L. & Schrock, M., 1999. The product is dead - long live the product-service! *Research Technology Management*, 42(4), pp.51–56.
- Phumbua, S. & Tjahjono, B., 2012. Towards product-service systems modelling: a quest for dynamic behaviour and model parameters. *International Journal of Production Research*, 50(2), pp.425–442.
- Piccoli, G. et al., 2009. Process completeness: Strategies for aligning service systems with customers' service needs. *Business Horizons*, 52(4), pp.367–376.
- Prior, D.D., 2013. Supplier representative activities and customer perceived value in 308 complex industrial solutions. *Industrial Marketing Management*, 42(8), pp.1192–1201.
- Rabetino, R., Kohtamäki, M., et al., 2015. Developing the concept of life-cycle service offering. *Industrial Marketing Management*, 49, pp.53–66.
- Rabetino, R., Harmsen, W. & Kohtamäki, M., 2015. Bridging Research Communities in Servitization. In *4th International Conference on Business Servitization, 19-20 November, 2015, Madrid, Spain*.
- Rabetino, R. & Kohtamäki, M., 2013. System integration, integrated solutions and industry organization: A value system approach. In *29th IMP Conference, 30th August - 2nd September 2013, Atlanta, Georgia*.
- Raddats, C. & Burton, J., 2011. Strategy and structure configurations for services within product-centric businesses. *Journal of Service Management*, 22(4), pp.522–539.
- Raddats, C., Burton, J. & Ashman, R., 2015. Resource configurations for services success in manufacturing companies. *Journal of Service Management*, 26(1), pp.97–116.
- Raddats, C. & Easingwood, C., 2010. Services growth options for B2B product-centric businesses. *Industrial Marketing Management*, 39(8), pp.1334–1345.
- Rajagopalan, N., Rasheed, A.M.A. & Datta, D.K., 1993. Strategic Decision Processes: Critical Review and Future Directions. *Journal of Management*, 19(2), pp.349–384.

- Rapaccini, M., 2015. Pricing strategies of service offerings in manufacturing companies: a literature review and empirical investigation. *Production Planning & Control*, 26(14-15), pp.1247–1263.
- Rapaccini, M. & Visintin, F., 2015. Devising hybrid solutions: an exploratory framework. *Production Planning & Control*, 26(8), pp.654–672.
- Reim, W., Parida, V. & Örtqvist, D., 2014. Product–Service Systems (PSS) business models and tactics – a systematic literature review. *Journal of Cleaner Production*, 97, pp.61–75.
- Roehrich, J.K. & Caldwell, N.D., 2012. Delivering integrated solutions in the public sector: The unbundling paradox. *Industrial Marketing Management*, 41(6), pp.995–1007.
- Saccani, N., Johansson, P. & Perona, M., 2007. Configuring the after-sales service supply chain: A multiple case study. *International Journal of Production Economics*, 110(1-2), pp.52–69.
- Saccani, N., Visintin, F. & Rapaccini, M., 2014. Investigating the linkages between service types and supplier relationships in servitized environments. *International Journal of Production Economics*, 149, pp.226–238.
- Salonen, A., 2011. Service transition strategies of industrial manufacturers. *Industrial Marketing Management*, 40(5), pp.683–690.
- Salonen, A. & Jaakkola, E., 2015. Firm boundary decisions in solution business: Examining internal vs. external resource integration. *Industrial Marketing Management*, 51, pp.171–183.
- Santamaría, L., Jesús Nieto, M. & Miles, I., 2012. Service innovation in manufacturing firms: Evidence from Spain. *Technovation*, 32(2), pp.144–155.
- Santos, F.M. & Eisenhardt, K.M., 2005. Organizational boundaries and theories of organization. *Organizational science*, 16(5), pp.491–508.
- Sawhney, M., Balasubramanian, S. & Krishnan, V. V., 2004. Creating growth with services. *MIT Sloan Management Review*, 45(2), pp.34–43.
- Schmenner, R.W., 2009. Manufacturing, service, and their integration: some history and theory. *International Journal of Operations & Production Management*, 29(5), pp.431–443.
- Schrödl, H. & Turowski, K., 2014. Risk management in hybrid value creation. *Decision Support Systems*, 58, pp.21–30.
- Shelton, R., 2009. Integrating product and service innovation: Industry leaders complement their product offerings with service innovations to boost overall customer value. *Research Technology Management*, 52(3), pp.38–44.
- Siggelkow, N., 2007. Persuasion With Case Studies. *Academy of Management Journal*, 50(1), pp.20–24.

- Smith, L., Maull, R. & Ng, I., 2014. Servitization and operations management: a service dominant-logic approach. *International Journal of Operations & Production Management*, 34(2), pp.242–269.
- Spring, M. & Araujo, L., 2013. Beyond the service factory: Service innovation in manufacturing supply networks. *Industrial Marketing Management*, 42(1), pp.59–70.
- Spring, M. & Araujo, L., 2009. Service, services and products: rethinking operations strategy. *International Journal of Operations & Production Management*, 29(5), pp.444–467.
- Stinchcombe, A.L., 1965. Social structure and organizations. In J. G. March, ed. *Handbook of Organizations*. Chicago: Rand McNally and Firm, pp. 142–193.
- Storbacka, K., 2011. A solution business model: Capabilities and management practices for integrated solutions. *Industrial Marketing Management*, 40(5), pp.699–711.
- Storbacka, K. et al., 2013. Solution business models: Transformation along four continua. *Industrial Marketing Management*, 42(5), pp.705–716.
- Sun, H. et al., 2012. Evaluation method of product–service performance. *International Journal of Computer Integrated Manufacturing*, 25(2), pp.150–157.
- Teece, D., Pisano, G. & Shuen, A., 1997. Dynamic capabilities and strategic management. *Strategic Management Journal*, 18(7), pp.509–533.
- Thurlow, A. & Mills, J.H., 2009. Change, talk and sensemaking. *Journal of Organizational Change Management*, 22(5), pp.459–479.
- Tukker, A., 2015. Product services for a resource-efficient and circular economy - a review. *Journal of Cleaner Production*, 97, pp.76–91.
- Tuli, K.R., Kohli, A.K. & Bharadwaj, S.G., 2007. Rethinking customer solutions: From product bundles to relational processes. *Journal of Marketing*, 71(3), pp.1–17.
- Turunen, T.T. & Finne, M., 2014. The organisational environment's impact on the servitization of manufacturers. *European Management Journal*, 32(4), pp.603–615.
- Uлага, W. & Loveland, J.M., 2014. Transitioning from product to service-led growth in manufacturing firms: Emergent challenges in selecting and managing the industrial sales force. *Industrial Marketing Management*, 43(1), pp.113–125.
- Uлага, W. & Reinartz, W.J., 2011. Hybrid offerings: How manufacturing firms combine goods and services successfully. *Journal of Marketing*, 75(6), pp.5–23.
- Valtakoski, A., 2015. Initiation of buyer–seller relationships: The impact of intangibility, trust and mitigation strategies. *Industrial Marketing Management*, 44, pp.107–118.
- Vandermerwe, S. & Rada, J., 1988. Servitization of business: Adding value by adding services. *European Management Journal*, 6(4), pp.314–324.

- Vasantha, G.V.A. et al., 2012. A review of product–service systems design methodologies. *Journal of Engineering Design*, 23(9), pp.635–659.
- Velamuri, V.K., Neyer, A.-K. & Möslein, K.M., 2011. Hybrid value creation: a systematic review of an evolving research area. *Journal für Betriebswirtschaft*, 61(1), pp.3–35.
- Visintin, F., 2012. Providing integrated solutions in the professional printing industry: The case of Océ. *Computers in Industry*, 63(4), pp.379–388.
- Visnjic Kastalli, I. & Van Looy, B., 2013. Servitization: Disentangling the impact of service business model innovation on manufacturing firm performance. *Journal of Operations Management*, 31(4), pp.169–180.
- Visnjic Kastalli, I., Van Looy, B. & Neely, A., 2013. Steering Manufacturing Firms Towards Service Business Model Innovation. *California Management Review*, 56(1), pp.100–123.
- Wang, P. et al., 2011. Status review and research strategies on product-service systems. *International Journal of Production Research*, 49(22), pp.6863–6883.
- Weick, K.E., 1995. *Sensemaking in Organisations*, London: Sage Publications.
- Weick, K.E., Sutcliffe, K.M. & Obstfeld, D., 2005. Organizing and the Process of Sensemaking. *Organization Science*, 16(4), pp.409–421.
- Whittington, R., 2006. Completing the Practice Turn in Strategy Research. *Organization Studies*, 27(5), pp.613–634.
- Wholey, D.R. & Brittain, J.W., 1986. Organizational Ecology: Findings and Implications. *Academy of Management Review*, 11(3), pp.513–533.
- Wikström, K. et al., 2009. Services in project-based firms – Four types of business logic. *International Journal of Project Management*, 27(2), pp.113–122.
- Windahl, C. & Lakemond, N., 2006. Developing integrated solutions: The importance of relationships within the network. *Industrial Marketing Management*, 35(7), pp.806–818.
- Windahl, C. & Lakemond, N., 2010. Integrated solutions from a service-centered perspective: Applicability and limitations in the capital goods industry. *Industrial Marketing Management*, 39(8), pp.1278–1290.
- Wise, R. & Baumgartner, P., 1999. Go downstream the new profit imperative in manufacturing. *Harvard Business Review*, 77(5), pp.133–142.
- Witell, L. & Löfgren, M., 2013. From service for free to service for fee: business model innovation in manufacturing firms. *Journal of Service Management*, 24(5), pp.520–533.
- Wuest, T., Hribernik, K. & Thoben, K.-D., 2015. Accessing servitisation potential of PLM data by applying the product avatar concept. *Production Planning & Control*, 26(14-15), pp.1198–1218.

- Yin, R.K., 2003. *Case Studies Research: Design and Methods*, London: Sage.
- Zhang, X. et al., 2014. The pricing of product and value-added service under information asymmetry: a product life cycle perspective. *International Journal of Production Research*, 53(1), pp.25–40.
- Zhen, L., 2012. An analytical study on service-oriented manufacturing strategies. *International Journal of Production Economics*, 139(1), pp.220–228.