

# The Value Architecture of Servitization: Expanding the Research Scope

Patricia Carolina Garcia Martin, Andreas Schroeder and Ali Ziaee Bigdeli\*

*The Advanced Services Group, Aston Business School, Aston University, Birmingham, UK*

## Abstract

*Servitization generates implications for the manufacturers' value creation, delivery and capture processes and also for their customers and business partners. As individual studies have started to investigate the different value processes in servitization and the effects they have on the manufacturers' wider context, it becomes important to consolidate prior research and develop an integrative understanding of value in servitization. The present study is based on a systematic review of the servitization literature, expanding the research scope from a dyadic to a triadic, network and system level of analysis. The study creates a value architecture framework which establishes a comprehensive understanding of value in servitization, with implications for future servitization theory building and strategy development.*

**Keywords:** Value, Servitization, Advanced services, Manufacturing

## 1. Introduction

Servitization, the transformation from product- to service-based business models, is changing the industrial landscape for manufacturers (Baines and Lightfoot, 2013). It provides manufacturers with diverse value outcomes, which have been extensively analysed in the servitization literature. Neely (2008), for instance, highlights how manufacturers benefit from higher revenues when integrating services as part of their offering; whereas Baines et al. (2009b) discuss how services allow manufacturers to achieve competitive advantages that are more difficult to imitate. Yet, it is becoming increasingly clear that these transformations do not only take place within the manufacturer but also involve its customers, suppliers, partners and even competitors (Alghisi and Saccani, 2015). It is, therefore, important to expand the research scope and integrate the diverse range of actors involved in order to better understand the value processes that underlie servitization (Chandler and Vargo, 2011).

The literature has already started to expand the servitization research scope beyond the boundaries of manufacturers to investigate important value processes and their implications. Studies, for example, focus on identifying the specific skills and capabilities required to successfully develop customer-centred value propositions (Baines and Lightfoot, 2013, Rabetino et al., 2017). The process of value co-creation has received particular interest among studies adopting a dyadic level of analysis, considering manufacturers together with their customers; studies examine how close relationships and information-sharing activities help manufacturers identify the product-service combinations that create value for customers (Kohtamäki and Partanen, 2016, Sjödin et al., 2016). Individual studies even expand beyond the dyadic level of analysis to explore how multiple actors' coordination (Eloranta and Turunen, 2016) and alignment of interests (Alghisi and Saccani, 2015) impact on the manufacturers' value creation opportunities.

Two important research gaps emerge as studies expand beyond manufacturers' boundaries to investigate value in servitization. First, a gap emerges in the theoretical understanding of the value processes in servitization and their interdependencies. Servitization studies are largely approaching the value processes in isolation without considering their interaction and interdependence. Kohtamäki and Partanen (2016), for instance, concentrate on value creation for the customer, pointing to the importance of relationship learning in the value creation process; whereas Rapaccini (2015) concentrates on pricing strategies as a key activity in the value capture process. The wider value theory-base emphasises that value for customers does not equal value for suppliers, and that there is a need to understand the interdependencies between value processes to maximise mutual value (Cox, 2004, Lindgreen and Wynstra, 2005). But, the current servitization literature does not yet consider the different value processes collectively and take into account how the key resources and activities implemented in one value process can affect other value processes.

The second gap in the current servitization research is the disparity of value concepts across different levels of analysis. For example, although several studies adopting a dyadic level of analysis emphasise the importance of value-in-use (Payne et al., 2008, Smith et al., 2014), the concept receives little interest among studies adopting higher levels of analysis (i.e., triadic, network, system) to investigate value in servitization. However, a system is not just the sum of its parts and it needs to be understood as a totality (Von Bertalanffy, 1972). To fully understand value in servitization, value concepts must be explored in a holistic manner, analysing their implications throughout each level of analysis (Alghisi and Saccani, 2015, Steiner et al., 2016, Forkmann et al., 2017).

For research to be able to address these gaps it is essential to systematically explore value in servitization. A careful conceptualisation of the value processes enables a more thorough evaluation of servitization, helping to explain its success. In addition, a critical stock-taking of the established research findings across the different levels of analysis is required to further develop servitization theory. The purpose of this study, therefore, is to explore value in servitization in a holistic and integrated manner across value processes and levels of analysis in order to achieve a comprehensive understanding of current contributions and critically set the bases for future research.

To guide this exploration, the present research applies Osterwalder and Pigneur's (2010) established value architecture construct to examine value creation, delivery and capture processes in servitization and identify their specific underlying building blocks and mechanisms. A systematic review of the existing literature on value in servitization was conducted, following the three-step process outlined by Tranfield et al. (2003). First, keyword-based searches on popular scientific databases were carried out to identify the academic papers exploring aspects of the value architecture in servitization. Next, the identified papers were analysed to identify their focal value processes, underlying building blocks and mechanisms and levels of analysis. Finally, the contributions of the papers were examined to identify patterns in their findings and provide an agenda for future research.

The present study and its findings contribute to servitization theory and practice in two principal ways. First, this study provides a holistic and integrative theory-based understanding of value in servitization, which helps to guide manufacturers in their servitization strategies through the identification and illustration of their core value processes and their key building blocks and mechanisms. Further, a framework that integrates the value processes with their implications across different levels of analysis is developed which identifies concrete gaps and informs future research.

Following this introduction, a review of the relevant background on servitization is provided, pointing out the salient theoretical lenses. Then, the research method used for the systematic literature review and analysis is outlined. This is followed by the presentation of the research findings and a discussion on how such findings inform current and future research avenues in servitization. The paper is concluded with a description of the theoretical and managerial contributions and limitations.

## 2. Research Background

### 2.1. Servitization

The term *servitization*, first coined by Vandermerwe and Rada (1988), can be defined as “the innovation of a manufacturer’s capabilities and processes to move from selling products, to selling integrated product-service offerings that deliver value in use” (Baines et al., 2009a: 14). Under this definition, product-service systems refer to integrated offerings of products and services, which can vary from base services aiming to improve the product’s condition (i.e., repair services) to advanced services aiming to improve the product’s capability (i.e., usage monitoring systems) (Baines and Lightfoot, 2013).

The present study only focuses on advanced product-service systems as the form of servitization that allows manufacturers to achieve the highest range of value outcomes. This form of servitization is characterised by: (1) customer-focused integrated product-service offerings instead of separate goods and related services offerings (Vandermerwe and Rada, 1988); (2) the provision of capabilities instead of physical products (Neely, 2008); (3) manufacturers’ extension of risk-management responsibilities through long-term contracts or pay-per-use arrangements (Baines and Lightfoot, 2013).

The extant examples provided in the literature illustrate these characteristics. Raja et al. (2013), for instance, highlight the customer orientation of servitization, by showing how critical it is for manufacturers to obtain an intimate knowledge of their customers’ usage experiences to successfully implement servitization. Similarly, Macdonald et al. (2011) point out how manufacturers have to continuously upgrade their activities to satisfy their customers’ dynamic goals. Karatzas et al. (2017) emphasise how manufacturers’ interaction and information sharing with their partners become crucial to managing the risks associated with providing pay-per-use arrangements instead of ownership contracts.

These examples demonstrate how servitization not only transforms manufacturers’ underlying business orientation but also implies substantial reconfigurations of their activities, resources and partnerships. The following sections review the service dominant (S-D) logic and the value architecture construct as a theoretical background that puts these implications into perspective.

### 2.2. Service Dominant (S-D) Logic

Service dominant (S-D) logic represents a particular lens to examine social and economic exchanges (Vargo and Lusch, 2008a). It stipulates that all exchanges can be viewed in terms of service-for-service exchanges, where value is co-created and directly linked with customers’ usage experiences (Vargo and Lusch, 2008a). Thus, S-D logic directly contrasts with goods dominant (G-D) logic, where value is linked to product quality and customers are considered passive actors in the value creation process. Several authors use S-D logic as the theoretical lens to inform their servitization

research (Macdonald et al., 2011, Macdonald et al., 2016, Sjödin et al., 2016, Lenka et al., 2017), particularly by drawing on its *service* and *value* concepts.

S-D logic defines *service* as the application of resources for the benefit of the entity itself (i.e., the manufacturer) or of another entity (i.e., the customer) (Vargo and Lusch, 2008b). This definition reflects the relevance of the product as a means to provide usage experiences (“application of resources”), which enables the creation, delivery and capture of value (“benefits”) in servitization. As service in S-D logic is co-created with the customer, it is inherently customer oriented and interactional (Vargo and Lusch, 2008a). The servitization literature follows this argument by explaining that the manufacturer’s transformation is not limited to the adding of services to improve products but involves the integration of services as a means to jointly achieve and continuously improve value outcomes (Macdonald et al., 2011, Raja et al., 2013, Smith et al., 2014, Macdonald et al., 2016).

The S-D logic’s and the servitization literature’s concepts of *value* are also tightly aligned. In S-D logic, value is defined as “always intangible, heterogeneously experienced, co-created, and potentially perishable” (Vargo and Lusch, 2008b: 28). The examples provided in the previous section demonstrate how value in the servitization literature is also conceptualised as intangible, detached from the actual physical product and linked to customers’ usage experiences. The requirement for manufacturers to develop continuous upgrades in order to quickly adapt to customers’ dynamic goals points to the potentially perishable nature of value in servitization. Furthermore, the servitization literature perceives value as heterogeneously experienced and co-created, requiring information sharing to provide the right product-service offering while managing specific associated risks. In other words, S-D logic (and its contrast with G-D logic) constitutes a revealing lens to understand the manufacturers’ transformation from a traditional *value-in-exchange* economic orientation to a servitized *value-in-use* interactional orientation (Ulaga and Reinartz, 2011, Bastl et al., 2012).

### 2.3. The Value Architecture

The value architecture construct further expands the S-D logic’s concept of value and provides additional theoretical grounding to frame the value processes in servitization. The value architecture specifies “the rationale of how an organisation creates, delivers, and captures value” (Osterwalder and Pigneur, 2010: 14). Each value process – creation, delivery and capture – comprises a structured flow of activities and partnerships that transform resources into value for a specific actor (Vergidis et al., 2008). Thus, the activities, resources and partnerships constitute the key building blocks required for the successful creation, delivery and capture of value (Osterwalder and Pigneur, 2010, Wallin et al., 2013, Joyce and Paquin, 2016). The value architecture enables a better understanding of the reconfiguration of the key building blocks that takes place when manufacturers servitize.

Looking at each building block specifically, the *key activities* include specific production activities (i.e., the design and delivery of outputs); problem-solving activities (i.e., the development of specific customer solutions); and platform activities (i.e., the management of platform systems) (Osterwalder and Pigneur, 2010). *Key resources* cover the physical inputs (i.e., raw materials, facilities or machines); intellectual inputs (i.e., patents, knowledge, brands or databases); financial inputs (i.e., cash, credit lines or other economic assets); and human inputs (i.e., highly skilled workforces or business relationships) (Osterwalder and Pigneur, 2010). *Key partnerships* generally refer to an organisation's business relationships having a role in the value creation, delivery and capture processes (Allee, 2008). Partner roles include optimisation and economies of scale, reduction of risk and uncertainty, and acquisition of particular resources and activities based on the motivation that drives the relationships (Osterwalder and Pigneur, 2010).

The following paragraphs focus on each of the value processes – creation, delivery and capture – and explore the implications of manufacturers' reconfiguration of key building blocks in servitization.

### 2.3.1. Value creation process

The value creation process describes the way organisations meet customers' expectations (Lepak et al., 2007). Its aim is to design an offering that can better satisfy customers' desired attributes (O'Cass and Ngo, 2011). The value proposition – the statement used to persuade customers to choose an organisation's offering over its competitors' (Anderson et al., 2006) – communicates the offering's attributes to the target customers.

In servitization, understanding the value creation process requires a careful consideration of its co-creative nature (Smith et al., 2014, Kohtamäki and Partanen, 2016). Vargo and Lusch's (2008a: 7) S-D logic specifically stipulates that "the customer is always a co-creator of value". Other authors focus beyond the dyadic manufacturer-customer relationship and highlight the importance that key partnerships have in the creation of value (i.e., to reduce operational complexity) (Eloranta and Turunen, 2016). Hence, manufacturers in servitization are not only challenged to deploy the right configuration of key activities and resources to support effective value co-creation but also need to deploy and maintain an integrated configuration of key partnerships beyond their customers. Consequently, the value creation process in servitization depends on both the manufacturer and its interdependent interactions with a wide variety of actors across different levels of analysis. Yet, existing servitization studies largely focus on these co-creation processes in a segregated manner (i.e., dyadic co-creation in Payne et al., (2008) and network co-creation in Ekman et al. (2016)). The wide variety of interdependent actors that take part in the value creation process has not been sufficiently explored, hindering the development of an integrated servitization theory.

### 2.3.2. Value delivery process

The value delivery process refers to the way organisations understand their customers' operations to provide them with the necessary tools to experience the value proposition (Slater, 1997). In servitization, the nature of the offering may make it difficult to differentiate between value creation and delivery processes. Vargo and Lusch's (2008a:7) definition of S-D logic states that "the enterprise cannot deliver value, but only offer value propositions" to satisfy customers' *value-in-use*. As the servitization value proposition is based on intangible capabilities rather than physical outputs, the manufacturer's role in the value delivery process is to ensure that the value created is also experienced by the customer. The boundaries between creation and delivery in servitization, therefore, are rather blurry as the configuration of key resources, activities and partnerships of both processes become closely related and some authors assess them simultaneously (Macdonald et al., 2011, Raja et al., 2013). However, this joint assessment of the creation and delivery of *value-in-use* only focuses on the dyadic manufacturer–customer relationship, ignoring the wider multi-actor levels of analysis. Consequently, the ability to evaluate such value processes in a network or system level of analysis, where multiple actors would have different creation and delivery roles, becomes a challenge.

### 2.3.3. Value capture process

The value capture process refers to the outcomes that organisations can achieve when retaining value, including monetary (Lepak et al., 2007) and non-monetary value (Reypens et al., 2016). The particular interactional orientation of servitization suggests that manufacturers can capture a diverse range of value outcomes through long-term relationships with their customers. Table 1 highlights the diverse range of value outcomes available. Economic value outcomes refer to the overall financial benefit manufacturers derive from servitization (i.e., increased efficiency). Strategic value outcomes refer to the increased competitiveness that can be achieved in servitization (i.e., access to new markets). Knowledge value outcomes refer to the innovation opportunities arising from servitization (i.e., increasing market intelligence). Personal value outcomes address the legitimacy of the manufacturer's relationship with its customers (i.e., favouring customer retention) (Biggemann and Buttle, 2005, Songailiene et al., 2011).

**Table 1.** Value outcomes for manufacturers

Dimension	Assessment	Value outcome
Economic	Assessment of financial costs and benefits	Supplier's efficiency Economic targets Market share Profits
Strategic	Assessment of competitiveness	Access Strategic position Risk & uncertainty
Knowledge	Assessment of innovativeness	Market intelligence Innovation Co-development
Personal	Assessment of legitimacy	Customer retention Referrals

Of particular importance for understanding the value capture process and its configuration in servitization is the notion of isolating mechanisms. Value outcomes can be captured by different actors at different levels of analysis, which implies a trade-off between the value created and delivered and the value captured (Mizik and Jacobson, 2003). Organisations need to deploy appropriate isolating mechanisms to prevent the replication of value outcomes and maximise value retention within its boundaries (Cox, 2004, Lepak et al., 2007, James et al., 2013).

Isolating mechanisms can include knowledge, expertise, legal protection, a unique position in a network, a net of relationships and unique resources (Lepak et al., 2007). James et al. (2013) show that the appropriateness of a specific isolating mechanism depends on the context in which it is implemented, as well as the type of value outcome which is to be retained. Given the particular context of servitization (manufacturers shifting from *value-in-exchange* to *value-in-use*, from selling products to retaining products' ownership and from product-focused to customer-focused strategies), this research aims to develop a systematic understanding of the isolating mechanisms manufacturers can deploy to prevent the replication of value outcomes across the different levels of analysis in which they are interacting.

The above review draws on S-D logic and the value architecture construct to understand the specific challenges and implications that servitization creates for understanding the underlying value processes. It is important to note that the impact servitization has on the value processes not only involves the manufacturers but also a wide variety of actors whose individual and interdependent roles need to be taken into account to obtain a holistic understanding of servitization.

### **3. Research Method**

The present study is aimed at exploring the value processes underlying servitization and identifying their operationalisation and implications across different levels of analysis. A systematic literature review process was conducted (Tranfield et al., 2003) to analyse the value creation, delivery and capture processes and to develop an integrative research framework of value in servitization across levels of analysis. The systematic literature review process followed the three standard stages (Tranfield et al., 2003): (1) detailed planning and scoping of the search, (2) rigorous execution to identify and select papers, and assess the quality, relevance and strength of the results, and (3) compilation, analysis and reporting of the results of the review. A description of each stage follows.

#### *3.1. Stage 1: planning and scoping*

According to Tranfield et al. (2003), the first stage of a systematic review comprises the selection of criteria that define the review boundaries. Tranfield et al. (2003) signal the lack of strict protocols in management research compared to other disciplines, allowing for flexibility as long as there is an

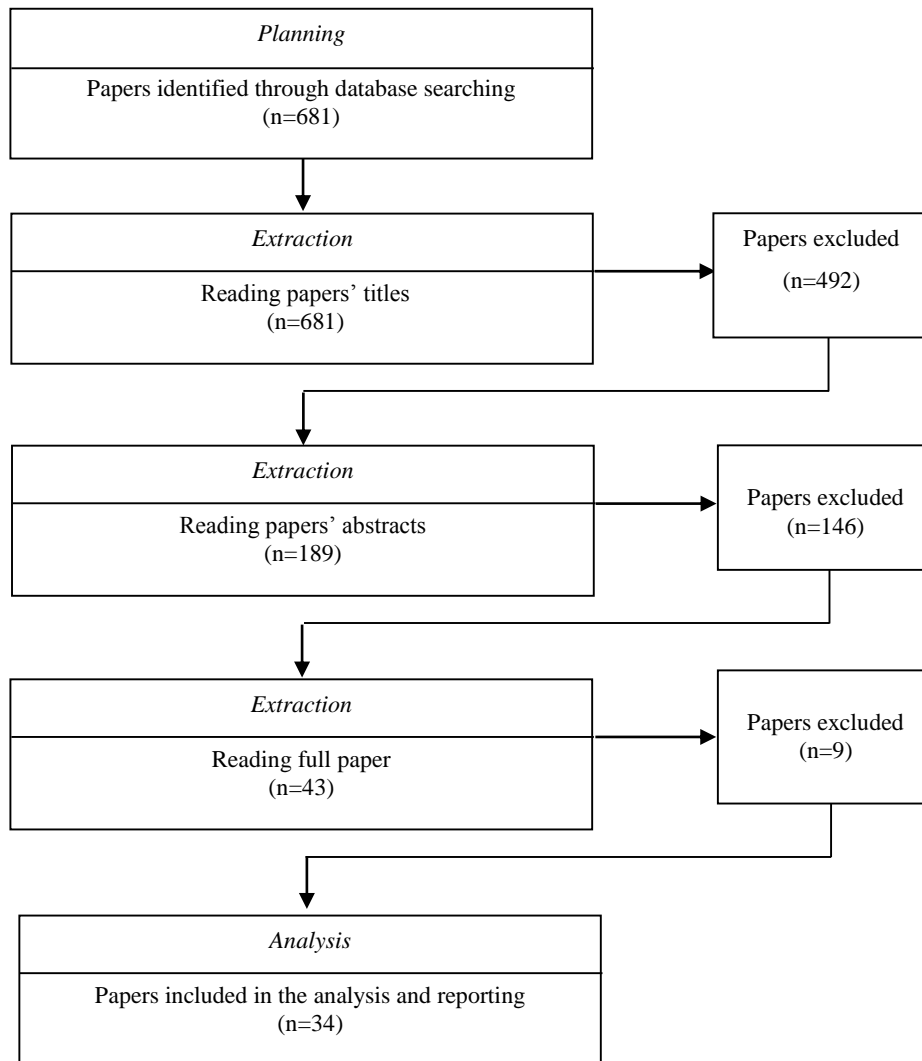


observable fit between the criteria and the explorative purpose. For the present study, the criteria were selected following a process of trial and error developed by the researchers. As a result, the Web of Science, EBSCO and Scopus databases were chosen, based on the richness of publications on the topic of servitization, as evidenced by their use in recent seminal literature reviews on the topic (i.e., Lightfoot et al., 2013, Grubic, 2014, Baines et al., 2017). Owing to the differences in the available search fields, keywords were searched in title and topic in Web of Science, full text in EBSCO, and title, abstract and keywords in Scopus.

The initial selection of search strings combined keywords from the servitization and value architecture literature to ensure the retrieval of relevant papers. The search keywords included: (“servitization” OR “S-D logic” OR “service logic” OR “service science” OR “advanced service#” OR “service transition” OR “service infusion” OR “industrial service#” OR “integrated solution” OR “service-cent#red” OR “service oriented” OR “service integration”) AND (“value” OR “value creation” OR “value co-creation” OR “value delivery” OR “value capture” OR “business mode\*”). After noticing that many of the retrieved papers focused on pure services (i.e., Wagner and Benoit (2015) or Morosan and DeFranco (2016)), “manufactur\*” was included as an add-on keyword to further limit the search to papers focusing on a manufacturing context. The results were further narrowed down by restricting the papers to those from journals that the *Academic Journal Guide 2018* (Association of Business Schools, 2018) has categorised as being of worldwide distinction (4\* rated journals), top in their field (4 rated journals) and highly regarded (3 rated journals). The rationale for this choice was to ensure the maximum quality of the papers retrieved through a widely recognised and accepted criteria in the business and management field (Matthews and Marzec, 2012, Thomé et al., 2016, Ziaee Bigdeli et al., 2018).

### 3.2. Stage 2: execution

The initial pool of papers retrieved resulted in a total of 760 papers from all three databases, and 681 after removing duplicates (see Figure 1). A three-fold process was employed to eliminate those papers that did not match the following selection criteria: (i) originality (papers providing novel contributions either from theoretical or practical perspectives); (ii) relevance (papers focusing on servitization assessed through the definition and characteristics provided in Sections 2.1 and 2.2); and (iii) fit (papers focusing on either value creation, delivery or capture processes assessed through the definitions provided in Section 2.3).



**Figure 1.** Systematic literature review: process for extraction of papers

Based on the above criteria, the initial review focusing on the papers' titles led to the exclusion of 492 papers from the initial pool. The subsequent careful review of the abstracts led to the exclusion of a further 146 papers. Finally, the examination of the remaining 43 papers led to the exclusion of nine more, resulting in a final pool of 34 papers published between 2004 and 2017 for full analysis (see the distribution of papers in Table 2). Common reasons for exclusion include: a) non-research content ("About our Authors", an "Introduction", an "Editorial Commentary", an "Index", studies of "Impact", "Editorial Notes", "Commentaries", a collection of abstracts and literature reviews (refer to selection criteria i)); b) discussing topics unrelated to value; and c) focusing on services but not on servitization, focusing on servitization in the wider context but not on the advanced product-service systems as the focal form of servitization and focusing on S-D logic but not on servitization.

**Table 2.** Selected papers from relevant journals

Name of the journal	ABS ranking	Number of selected papers	Discipline / community
<i>IMM</i>	3	8	Marketing
<i>JAMS</i>	4	5	Marketing
<i>IJPE</i>	3	5	Management
<i>IJOPM</i>	4	5	Operations and SCM
<i>JofM</i>	4*	3	Marketing
<i>PPC</i>	3	2	Operations Management
<i>JBR</i>	3	1	Marketing
<i>P&amp;M</i>	3	1	Operations Management
<i>JPIM</i>	4	1	Operations Management
<i>IJPR</i>	3	1	Operations Management
<i>JSR</i>	4	1	Marketing
<i>SCMIJ</i>	3	1	Operations and SCM
<b>Total</b>		<b>34</b>	

### 3.3. Stage 3: analysis

According to Tranfield et al. (2003: 218), management research requires an initial “full (rough-cut and detailed) ‘descriptive analysis’ of the field. [...] achieved using a very simple set of categories with the use of the extraction forms”. Following this premise, the analysis of the 34 selected papers began with their categorisation, according to the paper’s focal value process. As the servitization literature often integrates value creation and value delivery processes, the analysis considered papers that centre the discussion on the customers’ usage experiences as instances of the value delivery process, even if the term “value delivery” is not directly used by the authors. For instance, Macdonald et al. (2011) focus on *value-in-use* emerging from customers’ usage experiences and, so, it is identified as a case of value delivery, even though the authors do not directly refer to this process in their discussion. After the categorisation, a further detailed examination of the papers’ discussions was developed to identify the key building blocks and the isolating mechanisms underlying the value creation, delivery and capture processes. In addition, the study also mapped out the research findings across different levels of analysis to identify the directions for future research. The categorisations of the level of analysis follow the categories from dyad to system provided by Chandler and Vargo (2011) (see Table 3).

**Table 3.** Levels of analysis (from Chandler and Vargo, 2011)

Description	Level of analysis
Two unique actors are joined by a service-for-service exchange link	Dyad
Two actors indirectly serve one another by serving the same actor	Triad
Synergies of multiple simultaneous direct and indirect service-for-service exchanges	Network
Covers all the levels of service-for-service exchanges; it represents its evolution	System

## 4. Findings

Following the aim of the study, the findings of the systematic literature review are presented in three parts. The first and second parts identify how manufacturers' creation and delivery of value are conceptualised in the servitization literature and explain the key activities, resources and partnerships manufacturers deploy to create and deliver value in servitization. The third part identifies how manufacturers' capture of value is conceptualised in the servitization literature, focusing on the isolating mechanisms they implement to retain the emerging value outcomes.

### *4.1. Manufacturers' value creation process in servitization*

The analysis of the systematic literature review identified the value creation process as a co-creation effort in servitization, where customers have an active role in the creation of value propositions (Payne et al., 2008, Sjödin et al., 2016). This process ensures that the creation of value corresponds with customers' dynamic goals (Smith et al., 2014, Rabetino et al., 2017). The success of this value co-creation process is determined by the underlying configuration of key activities, resources and partnerships (see Table 4).

The key activities identified in the literature include production, problem-solving and platform activities. Production activities refer to the development of the product-service offering as well as the value proposition (Payne et al., 2008, Smith et al., 2014, Sjödin et al., 2016, Rabetino et al., 2017).

**Table 4.** Manufacturers’ value creation process in servitization

VALUE CREATION PROCESS	
Servitization context	Illustrative quotes
<b>KEY ACTIVITIES</b>	<p><b>Production</b></p> <ul style="list-style-type: none"> <li>• Development of product-service offering</li> <li>• Development of value proposition</li> </ul> <p><b>Problem-solving</b></p> <ul style="list-style-type: none"> <li>• Identification of customers’ desired attributes</li> <li>• Customer relationship management</li> <li>• Service-led innovation</li> </ul> <p><b>Platform</b></p> <ul style="list-style-type: none"> <li>• Internal and external alignment of product and service cultures</li> </ul>
<b>KEY RESOURCES</b>	<p><b>Human inputs</b></p> <ul style="list-style-type: none"> <li>• Relational capabilities</li> </ul> <p><b>Intellectual inputs</b></p> <ul style="list-style-type: none"> <li>• Digital platforms</li> </ul>
<b>KEY PARTNERSHIPS</b>	<p><b>Resource and activity integration</b></p> <ul style="list-style-type: none"> <li>• Integration of otherwise unavailable resources</li> </ul>
<b>Supporting servitization literature</b>	
<p>Vargo &amp; Lusch, 2004; Payne et al., 2008; Vargo &amp; Lusch, 2008a; Vargo &amp; Lusch, 2008b; Lusch et al., 2010; Smith et al., 2014; Opresnik &amp; Taisch, 2015; Eloranta &amp; Turunen, 2016; Kohtamäki &amp; Partanen, 2016; Sjödin et al., 2016; Cenamor et al., 2017; Coreynen et al., 2017; Lenka et al., 2017; Rabetino et al., 2017; Raddats et al., 2017; Rymaszewska et al., 2017; Story et al., 2017; Visnjic et al., 2017</p>	

Problem-solving activities cover: the identification of customers’ desired attributes to customise and adapt the product-service offering and value proposition (Coreynen et al., 2017, Lenka et al., 2017); customer relationship management efforts to co-create the product-service offering and effectively

communicate the value proposition to each customer (Payne et al., 2008, Kohtamäki and Partanen, 2016); and service-led innovations to continuously upgrade the product-service offering through data and feedback collected from customers (Opresnik and Taisch, 2015, Rabetino et al., 2017, Rymaszewska et al., 2017, Visnjic et al., 2017). Lastly, platform activities address the internal (within manufacturers' divisions) and external (across partnerships) alignment of product and service cultures to ensure internal coordination, while identifying and tackling opportunistic behaviours (Eloranta and Turunen, 2016, Cenamor et al., 2017, Coreynen et al., 2017, Story et al., 2017).

The key resources identified point to relational capabilities (Smith et al., 2014, Raddats et al., 2017, Rabetino et al., 2017) and digital platforms (Eloranta and Turunen, 2016, Cenamor et al., 2017) to coordinate the development of key activities with the key partnerships involved in the value creation process. The analysis of the literature further indicated that such key partnerships have a direct effect on the improvement of key activities through the integration of resources otherwise unavailable to manufacturers (Lusch et al., 2010, Raddats et al., 2017, Story et al., 2017).

#### 4.2. Manufacturers' value delivery process in servitization

The analysis of the systematic literature review identified that the value delivery process in servitization focuses on the provision and implementation of the product-service offering (Alghisi and Saccani, 2015). The process ensures the satisfaction of customers' dynamic goals through product-service usage experiences (Macdonald et al., 2011). As with the value creation process, specific configurations of key activities, resources and partnerships must be deployed to successfully deliver value to customers (see Table 5).

**Table 5.** Manufacturers' value delivery process in servitization

VALUE DELIVERY PROCESS		
	Servitization context	Illustrative quotes
KEY ACTIVITIES	<b>Problem-solving</b> <ul style="list-style-type: none"> <li>• Co-location towards customers' operations</li> <li>• Audit of customers' usage experiences</li> </ul>	"The delivery of advanced services is accompanied by the manufacturer having a presence within (or adjacent) to their customers' operations." (Baines and Lightfoot, 2014:12)
	<b>Platform</b> <ul style="list-style-type: none"> <li>• Internal and external alignment of goals and interests</li> </ul>	"This makes it imperative that service needs are well defined with clear specification of roles and responsibilities across the supply chain." (Erkoyuncu et al., 2013:6311)
KEY RESOURCES	<b>Intellectual inputs</b> <ul style="list-style-type: none"> <li>• Cumulative knowledge of customers' usage experiences</li> </ul>	"A regular customer satisfaction tracker could then be extended to include not just satisfaction with the provider's service but also with the firm's own usage processes." (Macdonald et al., 2011:680)

<b>KEY PARTNERSHIPS</b>	<p><b>Reduction of risk and uncertainty</b></p> <ul style="list-style-type: none"> <li>• Information sharing</li> </ul>	<p>“Valuable information for service development and/or improvement could also be collected directly from [...] service network partners.” (Alghisi and Saccani, 2015:1227)</p>
<b>Supporting servitization literature</b>		
<p>Macdonald et al., 2011; Erkoyuncu et al., 2013; Raja et al., 2013; Baines and Lightfoot, 2014; Alghisi &amp; Saccani, 2015; Macdonald et al., 2016; Song et al., 2016</p>		

Regarding the key activities identified, problem-solving and platform activities were shown to be essential for the delivery of value. Problem-solving activities highlight the co-location within customers’ operations to increase flexibility and access in the provision and implementation of the product-service offering (Raja et al., 2013, Baines and Lightfoot, 2014), as well as the auditing of customers’ usage experiences to support and reassure them to better accomplish their goals (Baines and Lightfoot, 2014, Macdonald et al., 2016). Platform activities include the internal and external alignment of goals and interests, which defines each actor’s responsibilities and roles (Erkoyuncu et al., 2013) to increase the quality of the provision and implementation of the product-service offering (Macdonald et al., 2016). The key resources identified point to the accumulation of knowledge regarding customers’ usage experiences (Macdonald et al., 2011) and this allows for the anticipation of uncertainties leading to the improvement of problem-solving activities (Erkoyuncu et al., 2013). Similarly, integration and information sharing among key partnerships were shown to reduce risks and uncertainties associated with service development and improvement (Alghisi and Saccani, 2015).

#### *4.3. Manufacturers’ value capture process in servitization*

Finally, the analysis of the systematic literature review identified the improvement of manufacturers’ competitive advantage as the result of the value capture process in successful servitization (Ulaga and Reinartz, 2011). In other words, the successful creation and delivery of value for customers are preconditions for manufacturers to be able to capture value outcomes (Kohtamäki et al., 2013). However, as pointed out by Payne et al. (2008), value for customers does not equal the value outcomes that manufacturers get in exchange. Thus, isolating mechanisms – barriers against the replication of value by third parties – need to be implemented to support manufacturers’ value capture process (see Table 6).

The analysis identified several value outcomes that can emerge from the successful creation and delivery of value in servitization. Economic value outcomes, such as more stable revenues or higher profit margins, are widely cited as servitization benefits for manufacturers (Ulaga and Reinartz, 2011, Kohtamäki et al., 2013). In addition, personal value outcomes, such as customer retention and commitment, show how cooperation and trust among the actors involved in servitization lead to the

higher reliability and quality of the product-service offering (Finne and Holmström, 2013, Steiner et al., 2016, Karatzas et al., 2017). Knowledge value outcomes, such as innovation and competitive advantage, show how servitization allows manufacturers to achieve a unique position in the market (Ulaga and Reinartz, 2011, Rapaccini, 2015).

**Table 6.** Manufacturers’ value capture process in servitization

<b>VALUE CAPTURE PROCESS</b>		
	<b>Servitization context</b>	<b>Illustrative quotes</b>
<b>VALUE OUTCOMES</b>	<p><b>Economic outcomes</b></p> <ul style="list-style-type: none"> <li>• Higher profits</li> <li>• More stable revenues</li> </ul> <p><b>Personal outcomes</b></p> <ul style="list-style-type: none"> <li>• Customer retention</li> <li>• Commitment</li> </ul> <p><b>Knowledge outcomes</b></p> <ul style="list-style-type: none"> <li>• Innovation</li> <li>• Competitive advantage</li> </ul>	<p>“Using its unique data access, the manufacturer [...] achieved an ideal position to provide energy efficiency consulting services to business customers, which became a new source of revenue generation.” (Ulaga and Reinartz, 2011:11)</p> <p>“They have known each other for many years, and trust that every decision taken by both parties is for mutual benefit. The general manager admitted that this helps in resolving issues.” (Karatzas et al., 2017:963)</p> <p>“Unlike pure service players, manufacturers have privileged access to the key physical elements of hybrid offerings; they can best influence and shape the way physical features synergistically interact with service elements.” (Ulaga and Reinartz, 2011:21)</p>
<b>ISOLATING MECHANISMS</b>	<p><b>Offering format</b></p> <ul style="list-style-type: none"> <li>• Product-service offering pricing</li> <li>• Product-service offering presentation</li> </ul> <p><b>Offering content</b></p> <ul style="list-style-type: none"> <li>• Product-service offering composition</li> <li>• Product-service offering upgrades</li> </ul>	<p>“Failing to choose the right presentation format for the right customers will translate into lost opportunities to gain equitable returns on service offerings.” (Steiner et al., 2016:160)</p> <p>“Deliberately designing a component, a finished good, or equipment with the ambition to unlock new service opportunities [...] allows the firm to go to market with innovative new hybrid offerings; that is, it enables effective differentiation.” (Ulaga and Reinartz, 2011:13)</p>
<b>Supporting servitization literature</b>		
<p>Ulaga &amp; Reinartz, 2011; Bastl et al., 2012; Finne &amp; Holmström, 2013; Kohtamäki et al., 2013; Rapaccini, 2015; Steiner et al., 2016; Forkmann et al., 2017; Karatzas et al., 2017; Vendrell-Herrero et al., 2017</p>		

Furthermore, the analysis identified two main isolating mechanisms that support the manufacturers’ capture of value outcomes: the offering format and content. The offering format refers to the way the product-service offering is presented to customers in the form of product-service package options (Rapaccini, 2015) and to the pricing strategy selected for each specific product-service package (Forkmann et al., 2017). Choosing the adequate presentation format and pricing strategy was shown to



increase customers' willingness to subscribe to manufacturers' product-service offerings, creating a barrier against value slippage (Steiner et al., 2016, Forkmann et al., 2017).

The offering content refers to the product-service composition that determines its life-cycle and includes its current physical installed base and digital data assets, as well as its future upgrades (Uлага and Reinartz, 2011). According to Uлага and Reinartz (2011), having control over the offering puts manufacturers in a unique position which acts as an isolating mechanism against third-party competitors. Manufacturers can, in other words, lock in customers through the continuous innovations added to the offering that are based on the specific knowledge they have about the installed base and customers' usage experiences. This could potentially lead to a unique competitive advantage that is difficult for third parties to imitate. The analysis showed that it is important to note that isolating mechanisms support manufacturers' value capture processes but are implemented throughout the value creation and delivery processes.

In sum, the analysis of the systematic literature review identified a set of specific production, problem-solving and platform activities that servitizing manufacturers engage in to facilitate the value creation process and satisfy their customers' dynamic goals. These activities are supported by integrated partnerships that enable the collaborative deployment of human and intellectual resources. The analysis further showed how the value delivery process, in turn, requires the development of problem-solving and platform activities to satisfy customers' needs during the usage experience. These activities are supported by information sharing among partners that enable the accumulation of intellectual resources. The manufacturers' abilities to capture some of the value outcomes that emerge from servitization were shown to be supported by the product-service offering format and content configurations, which act as isolating mechanisms within the specific servitization context.

## **5. Discussion**

The present study set out to develop the understanding of the value architecture in servitization. A systematic conceptualisation of the value architecture has been created and the key building blocks and isolating mechanisms that are employed to successfully create, deliver and capture value in servitization have been identified. These findings provide an opportunity to consider carefully the current state of the research on the value processes in servitization and map out critical avenues for future research in this domain.

An interesting aspect that emerged in the analysis of the findings is the importance of the multi-actor collaboration that characterises servitization. The creation, delivery and capture of value in servitization takes place through integration, alignment and information sharing among multiple actors participating in these processes. Hence, to better understand these value processes, further research is needed to consider in detail the multi-actor context and understand the research implications and opportunities created by different levels of analysis.

For instance, looking at digital platforms as key resources in the value creation process, Cenamor et al. (2017) explain how platforms can help with manufacturers' coordination and information sharing internally and across markets, facilitating the manufacturer's service integration with new customers. Eloranta and Turunen (2016), instead, explore how such platforms facilitate the external goal alignment across a wide range of actors involved in the service process leading to higher trust between the different parties. Although both papers examine the importance of platforms for value creation, Cenamor et al. (2017) investigate within the boundaries of a dyadic level of analysis, while Eloranta and Turunen (2016) include all the actors at a network level.

The conceptualisation of the value architecture in servitization and the identification of the building blocks and isolating mechanisms provide an opportunity to systematically map out the current knowledge of the value processes across different levels of analysis and establish directions for future research. Such a mapping of the current knowledge of the value processes in servitization is provided in Table 7 which draws on Chandler and Vargo's (2011) classification of levels of analysis. The dyadic level of analysis refers to the manufacturer–customer interaction, where customers are recipients of product-service offerings; the triadic level of analysis refers to the indirect relationship of two actors serving the same customer; the network level of analysis refers to the aggregate of multiple dyad- and triad-based interactions; the system level of analysis focuses on the evolution of the network boundaries over time.

Table 7 also differentiates between those research topics that are already well developed and those that are still developing, or are yet undeveloped, across the dyadic, triadic, network and system levels. When findings from different authors convey similar messages, it was taken that these research topics were institutionalised in the community, and thus, were grouped as “developed”. “Developing or undeveloped” topics specify areas where future research needs to strengthen the understanding of the organisational reality of the value processes as results are inconclusive or missing.

### 5.1. Dyad

Table 7 illustrates how servitization research on the dyadic level of analysis is widely represented with different research topics already developed across the value creation, delivery and capture processes. Among these papers, value considerations are targeted at the manufacturer–customer relationship, which is acknowledged in the literature as *value-in-use* and defined in terms of the customer's usage experience with the product-service offering (Vargo and Lusch, 2004).

Developed research topics include the value creation challenges and opportunities that are created in a servitization-based manufacturer–customer relationship, especially in comparison to the traditional manufacturing context (i.e., Kohtamäki and Partanen, 2016, Sjödin et al., 2016, Rabetino et al., 2017). Co-creation emerges as one of the main research topics, discussing the customer at the centre of the value creation process (Kohtamäki and Partanen, 2016; Sjödin et al., Lenka et al., 2017). Key

activities and resources highlighting the role of customers comprise the research topics discussed in the value delivery process (i.e., Song et al., 2016), whereas the value capture research looks at topics including manufacturers' isolating mechanisms such as offering packages and pricing strategies (i.e., Rapaccini, 2015, Steiner et al., 2016).

Yet, building up on the insights already developed on the dyadic level of analysis, several opportunities (or even specific calls) for future research have emerged. Macdonald et al. (2011) and Kohtamäki et al. (2013), for instance, emphasise the need for future servitization research to apply the current conceptual frameworks and empirical insights to diverse industries and product-service offerings to enrich and confirm the validity of the understanding of the value delivery and value capture processes, respectively.


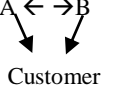
### *5.2. Triad*

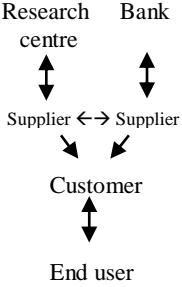
The triadic level of analysis has received comparatively little interest in the servitization literature. Only four of the papers analysed extend their examination of the manufacturer–customer relationship to include a secondary actor, such as an intermediate service supplier (Karatzas et al., 2017), and consider the *indirect value* that emerges from this relationship (Bastl et al., 2012, Finne and Holmström, 2013, Vendrell-Herrero et al., 2017)

Interestingly, the developed research topics targeting this triadic level of analysis are predominantly focused on the manufacturers' ability to capture the value within this triadic constellation with little attention given to how this constellation impacts on the value creation and delivery processes (i.e., implications for customers). More specifically, the developed research focuses on platform activities and the role of a secondary actor in the manufacturers' servitization transformation. Finne and Holmström (2013), for instance, identify how the alignment of interests and operations (platform activities) between manufacturers and downstream actors is crucial to avoid opportunistic behaviours in the triad.

Calls for future research targeting the triadic level of analysis already express concern about the customer not being included enough and highlight the need to examine the specific triadic constellation, taking into consideration the interdependencies of all actors involved. Cenamor et al. (2017), for instance, call for an expansion of the platform approach in servitization to integrate the views of customers, manufacturers and intermediaries to achieve a deeper understanding of the value creation process. Likewise, Song et al. (2016) call for the inclusion of intermediaries in the analysis of service provision to better understand their effect on customers' involvement in the value delivery process.

**Table 7.** Servitization literature: current state of value architecture topics in each level of analysis

	Value concept	Level boundaries	Value creation	Value delivery	Value capture
<b>DYAD</b>	Value-in-use	 <p>Manufacturer ↕ Customer</p>	<p><i>Developed topics:</i></p> <ul style="list-style-type: none"> <li>Theoretical understanding of dyadic value (value-in-use) in comparison to traditional manufacturing (value-in-exchange)</li> <li>Key activities and resources involving manufacturer–customer interactions in the value creation process</li> <li>Challenges and opportunities for manufacturers’ relationships with customers</li> </ul> <p><i>Developing or undeveloped topics:</i></p> <ul style="list-style-type: none"> <li>Psychological and sociological approaches to value co-creation: how individuals shape the process</li> </ul>	<p><i>Developed topics:</i></p> <ul style="list-style-type: none"> <li>Key activities and resources involving the role of customers as the main actors in the value delivery process</li> <li>Customers’ satisfaction: customers’ goals, needs and usage experiences</li> </ul> <p><i>Developing or undeveloped topics:</i></p> <ul style="list-style-type: none"> <li>Increasing validity of current findings: extend research context to different types of industries</li> </ul>	<p><i>Developed topics:</i></p> <ul style="list-style-type: none"> <li>Product-service offering format and content</li> <li>Value outcomes: value emerging for manufacturers involving manufacturer–customer relationships</li> </ul> <p><i>Developing or undeveloped topics:</i></p> <ul style="list-style-type: none"> <li>Increasing validity of current findings: comparison of the effects of different product-service offerings in different contexts (B2C, SMES, etc.)</li> </ul>
<b>TRIAD</b>	Indirect value	 <p>A ← → B ↓ ↓ Customer</p>	<p><i>Developed topics:</i></p> <p>/</p> <p><i>Developing or undeveloped topics:</i></p> <ul style="list-style-type: none"> <li>Key activities and resources: combining internal and external views of manufacturers, customers and intermediaries</li> </ul>	<p><i>Developed topics:</i></p> <p>/</p> <p><i>Developing or undeveloped topics:</i></p> <ul style="list-style-type: none"> <li>Key partnerships: the effect of intermediaries as moderators on service supply performance</li> </ul>	<p><i>Developed topics:</i></p> <ul style="list-style-type: none"> <li>Key platform activities regarding the intermediaries role in manufacturers’ servitization transformation</li> <li>Value outcomes: value emerging for manufacturers and intermediaries involving manufacturer–intermediary relationships</li> </ul> <p><i>Developing or undeveloped topics:</i></p> <ul style="list-style-type: none"> <li>Cannibalisation of intermediary relationships</li> <li>Challenges and opportunities for manufacturers moving upstream</li> </ul>

<b>NETWORK</b>	Value-in-context	 <p>*Example</p>	<p><i>Developed topics:</i></p> <ul style="list-style-type: none"> <li>Theoretical understanding of network value (value-in-context) in comparison to dyadic value (value-in-use)</li> <li>Key partnerships: integration of resources and capabilities involving manufacturer–network actors’ relationships</li> </ul> <p><i>Developing or undeveloped topics:</i></p> <ul style="list-style-type: none"> <li>Key partnerships: effects of network actors’ interdependencies and role ambiguities on value co-creation</li> </ul>	<p><i>Developed topics:</i></p> <ul style="list-style-type: none"> <li>Key partnerships: risk reduction involving manufacturer–network actors’ relationships</li> </ul> <p><i>Developing or undeveloped topics:</i></p> <ul style="list-style-type: none"> <li>Key partnerships: distribution of risks and responsibilities in product-service delivery</li> <li>Customers’ satisfaction: effect of network actors on customers’ goals, needs and usage experiences</li> <li>Key activities and resources involving the role of all network actors in the value delivery process</li> </ul>	<p><i>Developed topics:</i></p> <p>/</p> <p><i>Developing or undeveloped topics:</i></p> <ul style="list-style-type: none"> <li>Product-service offering: effect of interdependencies among manufacturer–network actors</li> <li>Value outcomes: effect of network actors on value emerging for manufacturers</li> <li>Isolating mechanisms: governance and power in the network</li> </ul>
<b>SYSTEM</b>	Evolution of value	<p>Network t1 ↓ Network t2</p> <p>*t1, t2: time periods</p>	<p><i>Developed topics:</i></p> <p>/</p> <p><i>Developing or undeveloped topics:</i></p> <ul style="list-style-type: none"> <li>Theoretical understanding of manufacturers’ servitization journey</li> <li>Value co-creation: evolution of actors’ relationship roles over the servitization journey</li> <li>Key resources, activities and partnerships: evolution of integration and relevance over the servitization journey</li> </ul>	<p><i>Developed topics:</i></p> <ul style="list-style-type: none"> <li>Key activities, resources and partnerships: evolution of uncertainties over the lifecycle of product-service delivery</li> </ul> <p><i>Developing or undeveloped topics:</i></p> <ul style="list-style-type: none"> <li>Customers’ satisfaction: longitudinal data on the evolution of customers’ goals, needs and usage experiences over the servitization journey</li> </ul>	<p><i>Developed topics:</i></p> <p>/</p> <p><i>Developing or undeveloped topics:</i></p> <ul style="list-style-type: none"> <li>Value outcomes: evolution of value emerging for manufacturers over the servitization journey</li> <li>Isolating mechanisms: evolution of product-service offering format and content over the servitization journey</li> <li>Isolating mechanisms: evolution of networks over the servitization journey</li> </ul>

### 5.3. Network

Table 7 further illustrates how the research on the value architecture in servitization is represented in the network. In this level of analysis, value is considered within the boundaries of manufacturers' direct and indirect relationships (*value-in-context*), where resource integration becomes contextually and phenomenologically determined (Vargo et al., 2008).

So far, the developed research topics covering the network level of analysis focus on the value creation and value delivery processes. Story et al. (2017), for instance, illustrate how the integration between manufacturers and their intermediaries helps overcome limitations in each other's capabilities required for value creation. These key partnerships allow each actor to integrate the key resources of others. Developed value delivery research topics also focus on the key partnerships, but largely look towards risk reduction rather than resource integration. For instance, Alghisi and Saccani (2015) discuss how network alignment and communication facilitate the effective provision of the product-service offering.

However, it is notable that studies have not yet fully developed research topics that consider manufacturers' value capture challenges that a network presents. In order to advance the value capture process knowledge in the network level of analysis, for instance, Vendrell-Herrero et al. (2017) highlight the need to investigate the isolating mechanisms and network governance that will impact on manufacturers' value capture process. Forkman et al. (2017) call for studies creating a wider understanding of manufacturer-network interdependencies and how they determine the overall success of servitization. Further opportunities for future servitization research considering the network level of analysis focus on the value creation process. Lenka et al. (2017) and Raddats et al. (2017) specifically call for research that examines the roles and effects of network actors in the joint manufacturer-customer value co-creation sphere. Opportunities for further research targeting value delivery in the network are outlined by Alghisi and Saccani (2015), who call for the examination of the effects network actors have on the customers' goals and usage experiences.

### 5.4. System

As only one of the analysed papers has adopted a system level of analysis, the range of developed research topics that examine the servitization value architecture at this level are limited. In the system, value boundaries are dynamic, where the *evolution of value* includes the changes that take place in the network over time.

Erkoyuncu et al. (2013) only cover the value delivery process by demonstrating how different interests among actors lead to dynamic roles and responsibilities, and this creates uncertainties over the lifecycle of product-service delivery. At this level of analysis, the focus moves from static key

activities, resources and partnerships to emerging and evolving ones, where actors adapt to internal and external variables over time.

As with studies in the triadic level of analysis, it is important that the discussion and future analysis in the system does not overlook the role of customers (i.e., value creation). More specifically, the dynamic nature of the system level of analysis requires the development of future research topics to engage in longitudinal studies to understand the dynamic long-term opportunities and constraints of servitization across the value architecture. Future research needs to adopt the notion of servitization as a dynamic journey across the range of stakeholders to examine the evolution of actors' roles and their effect on the value creation process (Sjödín et al., 2016); the changing product-service presentations and their effect on the value capture process (Steiner et al., 2016); or the emergence of different customers' expectations and their effect on the value delivery process (Raja et al., 2013).

## **6. Contributions**

In addition to the future research opportunities identified above, the study and its findings create several theoretical and managerial contributions.

### *6.1. Theoretical contributions*

Two of the study's core theoretical contributions lie in the conceptualisation of the value processes in servitization and the differentiation of their levels of analysis.

While servitization studies have already started to explore individual aspects of the different value processes (as shown in the analysis), this study is one of the first to form a holistic understanding that systematically integrates the diverse insights across the different value processes. The adoption of the value architecture construct (Osterwalder and Pigneur, 2010) anchors this research within the wider organisational theory, enabling further servitization theory building on the value processes to draw on established propositions from related domains. De Oliveira and Cortimiglia (2017) for example, examine the challenges of business model design for multi-sided e-business platforms in the context of the value architecture construct, while Morgan et al. (2013) adopt the construct to examine the roles of capabilities and governance in open source value networks.

The differentiation between the levels of analysis adopted in prior studies further strengthens the systematic development of servitization theory. The focus on the levels of analysis also highlights the comparative lack of research on network and system levels, with the vast majority of studies concentrating on the dyad. Yet, as research becomes increasingly aware that servitization does not happen in isolation (i.e., Eloranta and Turunen, 2016; Story et al., 2017), future theory building requires a focus on higher levels of analysis to explain the wider industrial and economic implications of servitization. The value architecture framework created in this study not only contributes to this effort by mapping out the different levels of analysis but also by highlighting the specific

opportunities the choice of level of analysis creates for investigating particular aspects of value in servitization.

A dyadic level of analysis provides the appropriate scope for studies targeting the manufacturer–customer relationship and how this enables the creation, delivery and capture of value in servitization. With a focus on customers’ usage experiences (*value-in-use*), the dyad as a research scope provides the opportunity to focus on understanding the manufacturers’ ability to design and deliver product-service offerings to the individual customer. Conversely, the dyad also provides the opportunity to explicitly focus on the customer’s perspective and hereby, to shed light on this critical but often neglected view of the value processes in servitization (Maiwald et al., 2014).

The triadic level of analysis provides the opportunity to explicitly focus on the manufacturers’ integration with service intermediaries. Karatzas et al. (2017), for instance, examine the *indirect value* manufacturers derive from interacting with specific intermediaries and the intricacies of an integrated service performance. As product-service offerings become more complex and require higher levels of expertise (Lusch et al., 2010), the role of intermediaries becomes critical for manufacturers in their servitization efforts. The triad enables research to explore in detail the role of the intermediaries as well as the implications they create for the value processes in servitization.

A network level of analysis provides the appropriate scope to explore servitization in a larger multi-actor context. As part of their servitization efforts, manufacturers develop arrays of dyadic and triadic relationships which interdependently participate in their value processes. Story et al. (2017), for instance, investigate the interconnected capabilities of several actors and the complementary effects that emerge from their combinations within the network. The network enables research to focus on this multi-actor integration where value becomes contextually and phenomenologically determined (*value-in-context*) according to each actor’s needs and priorities.

The system level of analysis provides the research scope to explore the longitudinal nature of servitization. As the servitization efforts of manufacturers and their networks develop over time, the system provides the opportunity to explore the changing roles of the key building blocks and isolating mechanisms and their impact on the evolution of value through the dynamic adaptation of the value creation, delivery and capture processes. Erkoyuncu et al. (2013), for instance, identify the uncertainties of the role dynamics that arise over the lifecycle of the product-service delivery – a notion that is otherwise underestimated when adopting a static research scope. With servitization still considered as being in the early stages of its industrial adoption (Baines and Shi, 2015), the system level of analysis provides a perspective that adequately captures the dynamic nature that will characterise the reality of servitization for the foreseeable future.

The explicit consideration of the levels of analysis also enables a focus on the cross-level implications of servitization and contributes to the identification of research gaps. For example, although the



quality of product-service delivery has been investigated in the dyadic level of analysis (Macdonald et al., 2016), that same aspect remains uncovered in the triadic level as the role of intermediaries in the value delivery process is yet to be studied. Besides, cross-level research generally assumes that phenomena at higher levels of analysis (i.e., system) have downward causal effects on phenomena at lower levels of analysis (i.e., dyadic) (Rousseau, 1985), upwards causal effects have also been observed (Hitt et al., 2007). As an example, Erkoyuncu et al. (2013) investigate the uncertainties of product-service delivery in the system; however, results do not yet consider the role of the customer in the process, leaving the dyadic level of analysis unexplored. The explicit consideration of the levels of analysis provides a frame to systematically investigate specific interdependencies of value aspects between dyadic, triadic, network and system levels of analysis.

## *6.2. Managerial contributions*

The study and its findings also contribute to management practice. The identification of the specific building blocks underlying the value processes in servitization can help managers to develop and improve their servitization strategies. Of particular importance for manufacturers is the identification of resource integration between partners as a critical building block of the value creation process. While manufacturers' servitization strategies commonly include building blocks such as the development of service offerings and value propositions integrating customers' resources (Kohtamäki and Partanen, 2016, Rabetino et al., 2017), the research findings explicitly point to the need of resource integration beyond dyadic boundaries as the way to create superior value for customers.

The identification of isolating mechanisms also constitutes a critical contribution to management practice. Isolating mechanisms support manufacturers' value capture processes and should be of critical consideration for any servitization strategy. However, their implementation is often left as a secondary matter and is only looked at when managers need to capture the value outcomes emerging from the transformation (Steiner et al., 2016). The present study identifies specific isolating mechanisms manufacturers may implement at the early stages of their value creation and delivery processes to ensure that their efforts lead to the value outcomes expected.

The integration of the key building blocks underlying the value processes in servitization across different levels of analysis provides a further important managerial contribution. With manufacturers seeking to tightly integrate with their customers, there is a risk that they do not pay due attention to the wider range of actors involved and the opportunities or threats these can create for their transformation. However, the engagement of additional actors increases the complexity of the creation and delivery of value for customers and threatens manufacturers' value capture opportunities (i.e., value slippage, Lepak et al., 2007). The present study provides manufacturers with the basis to understand and take into account the impact of a wider range of actors, without downplaying the criticality of customers for the development of servitization strategies.

### *6.3. Limitations and conclusion*

Although the study offers several contributions, its limitations must also be recognised. Foremost, the use of the systematic literature review method implies that its built-in limitations may also affect the present study. When using a systematic literature review method to go beyond a simple state-of-the-art report, the state of the prior literature can have a constraining effect on the ability to contribute to theory development (Webster and Watson, 2002). The present study has sought to mitigate this limitation by drawing on and adopting established theoretical lenses (i.e., value architecture) to ensure a coherent and theoretically sound frame is used to map the identified literature.

In addition, the systematic literature review was focused on a selection of high ranked journals and, therefore, not the entire range of publications available was analysed. The exclusion of conference papers or lower-ranked journals to ensure rigor may inadvertently limit the range of perspectives considered, a trade-off that is widely recognised (Rafols et al., 2012). As servitization represents a new field of research with a wider pool of papers being published in lower-ranked journals (Rabetino et al. 2017), it is arguable that the trade-off is particularly explicit. While the present theory-driven objectives justify a focus on high-ranked journals (i.e., theoretical dimensions of servitization likely to receive more attention), future research should consider the particular impact the journal selection may have in a servitization context. Further, the study did not consider the specific industries or country-culture factors in which the servitization transformation is taking place, and this may also have an impact on the value processes and roles of the underlying building blocks.

Despite these limitations, the significant theoretical and managerial contributions of the study have the potential to guide future servitization theory and practice, particularly regarding the role of the value processes and the importance of the levels of analysis for the understanding of value in servitization.

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## REFERENCES

- ALGHISI, A. & SACCANI, N. 2015. Internal and external alignment in the servitization journey – Overcoming the challenges. *Production Planning & Control*, 26, 1219-1232.
- ALLEE, V. 2008. Value network analysis and value conversion of tangible and intangible assets. *Journal of Intellectual Capital*, 9, 5-24.
- ANDERSON, E. G., MORRICE, D. J. & LUNDEEN, G. 2006. Stochastic optimal control for staffing and backlog policies in a two-stage customized service supply chain. *Production & Operations Management*, 15, 262-278.
- ASSOCIATION OF BUSINESS SCHOOLS. (2018). Academic journal guide. Retrieved from <http://charteredabs.org/academic-journal-guide-2018/>, accessed 1 May 2018.
- BAINES, T. & LIGHTFOOT, H. 2013. *Made to serve: How manufacturers can compete through servitization and product service systems*, John Wiley & Sons.
- BAINES, T. & LIGHTFOOT, H. W. 2014. Servitization of the manufacturing firm: Exploring the operations practices and technologies that deliver advanced services. *International Journal of Operations & Production Management*, 34, 2-35.
- BAINES, T. S., LIGHTFOOT, H. W., BENEDETTINI, O. & KAY, J. M. 2009b. The servitization of manufacturing: A review of literature and reflection on future challenges. *Journal of Manufacturing Technology Management*, 20, 547-567.
- BAINES, T., LIGHTFOOT, H., PEPPARD, J., JOHNSON, M., TIWARI, A., SHEHAB, E. & SWINK, M. 2009a. Towards an operations strategy for product-centric servitization. *International Journal of Operations & Production Management*, 29, 4-4.
- BAINES, T. & SHI, V. G. 2015. A Delphi study to explore the adoption of servitization in UK companies. *Production Planning & Control*, 26, 1171-1187.
- BAINES, T., ZIAEE BIGDELI, A., BUSTINZA, O. F., SHI, V. G., BALDWIN, J. & RIDGWAY, K. 2017. Servitization: Revisiting the state-of-the-art and research priorities. *International Journal of Operations & Production Management*, 37, 256-278.
- BASTL, M., JOHNSON, M., LIGHTFOOT, H. & EVANS, S. 2012. Buyer-supplier relationships in a servitized environment: An examination with Cannon and Perreault's framework. *International Journal of Operations & Production Management*, 32, 650-675.
- BIGGEMANN, S. & BUTTLE, F. Conceptualising business-to-business relationship value. Proceedings of the 21st IMP-Conference, Rotterdam, Netherlands, 2005.
- CENAMOR, J., SJODIN, D. R. & PARIDA, V. 2017. Adopting a platform approach in servitization: Leveraging the value of digitalization. *International Journal of Production Economics*, 192, 54-65.
- CHANDLER, J. D. & VARGO, S. L. 2011. Contextualization and value-in-context: How context frames exchange. *Marketing Theory*, 11, 35-49.
- COREYNEN, W., MATTHYSSENS, P. & VAN BOCKHAVEN, W. 2017. Boosting servitization through digitization: Pathways and dynamic resource configurations for manufacturers. *Industrial Marketing Management*, 60, 42-53.
- COX, A. 2004. Business relationship alignment: on the commensurability of value capture and mutuality in buyer and supplier exchange. *Supply Chain Management: An International Journal*, 9, 410-420.
- DE OLIVEIRA, D. T. & CORTIMIGLIA, M. N. 2017. Value co-creation in web-based multisided platforms: A conceptual framework and implications for business model design. *Business Horizons*, 60, 747-758.

- ELORANTA, V. & TURUNEN, T. 2016. Platforms in service-driven manufacturing: Leveraging complexity by connecting, sharing, and integrating. *Industrial Marketing Management*, 55, 178-186.
- ERKOYUNCU, J. A., DURUGBO, C. & ROY, R. 2013. Identifying uncertainties for industrial service delivery: A systems approach. *International Journal of Production Research*, 51, 6295-6315.
- FINNE, M. & HOLMSTRÖM, J. 2013. A manufacturer moving upstream: Triadic collaboration for service delivery. *Supply Chain Management*, 18, 21-33.
- FORKMANN, S., HENNEBERG, S. C., WITTELL, L. & KINDSTRÖM, D. 2017. Driver Configurations for Successful Service Infusion. *Journal of Service Research*, 20, 275-291.
- GRUBIC, T. 2014. Servitization and remote monitoring technology: A literature review and research agenda. *Journal of Manufacturing Technology Management*, 25, 100-124.
- HITT, M. A., BEAMISH, P. W., JACKSON, S. E. & MATHIEU, J. E. 2007. Building theoretical and empirical bridges across levels: Multilevel research in management. *Academy of Management Journal*, 50, 1385-1399.
- JAMES, S. D., LEIBLEIN, M. J. & LU, S. 2013. How firms capture value from their innovations. *Journal of Management*, 39, 1123-1155.
- JOYCE, A. & PAQUIN, R. L. 2016. The triple layered business model canvas: A tool to design more sustainable business models. *Journal of Cleaner Production*, 135, 1474-1486.
- KARATZAS, A., JOHNSON, M. & BASTL, M. 2017. Manufacturer-supplier relationships and service performance in service triads. *International Journal of Operations & Production Management*, 37, 950-969.
- KOHTAMÄKI, M. & PARTANEN, J. 2016. Co-creating value from knowledge-intensive business services in manufacturing firms: The moderating role of relationship learning in supplier-customer interactions. *Journal of Business Research*, 69, 2498-2506.
- KOHTAMÄKI, M., PARTANEN, J., PARIDA, V. & WINCENT, J. 2013. Non-linear relationship between industrial service offering and sales growth: The moderating role of network capabilities. *Industrial Marketing Management*, 42, 1374-1385.
- LENKA, S., PARIDA, V. & WINCENT, J. 2017. Digitalization capabilities as enablers of value co-creation in servitizing firms. *Psychology & Marketing*, 34, 92-100.
- LEPAK, D. P., SMITH, K. G. & TAYLOR, M. S. 2007. Value creation and value capture: A multilevel perspective. *Academy of Management Review*, 32, 180-194.
- LIGHTFOOT, H., BAINES, T. & SMART, P. 2013. The servitization of manufacturing: A systematic literature review of interdependent trends. *International Journal of Operations & Production Management*, 33, 1408-1434.
- LINDGREEN, A. & WYNSTRA, F. 2005. Value in business markets: What do we know? Where are we going? *Industrial Marketing Management*, 34, 732-748.
- LUSCH, R., VARGO, S. & TANNIRU, M. 2010. Service, value networks and learning. *Journal of the Academy of Marketing Science*, 38, 19-31.
- MACDONALD, E. K., KLEINALTENKAMP, M. & WILSON, H. N. 2016. How business customers judge solutions: Solution quality and value in use. *Journal of Marketing*, 80, 96-120.
- MACDONALD, E. K., WILSON, H., MARTINEZ, V. & TOOSSI, A. 2011. Assessing value-in-use: A conceptual framework and exploratory study. *Industrial Marketing Management*, 40, 671-682.

- MAIWALD, K., WIESEKE, J. & EVERHARTZ, J. 2014. The dark side of providing Industrial Product-Service Systems—perceived risk as a key challenge from a customer-centric point of view. *Procedia Cirp*, 16, 241-246.
- MATHEWS, R. L. & MARZEC, P. E. 2012. Social capital, a theory for operations management: A systematic review of the evidence. *International Journal of Production Research*, 50, 7081-7099.
- MIZIK, N. & JACOBSON, R. 2003. Trading off between value creation and value appropriation: The financial implications of shifts in strategic emphasis. *Journal of Marketing*, 67, 63-76.
- MORGAN, L., FELLER, J. & FINNEGAN, P. 2013. Exploring value networks: theorising the creation and capture of value with open source software. *European journal of information systems*, 22, 569-588.
- MOROSAN, C. & DEFRANCO, A. 2016. Co-creating value in hotels using mobile devices: A conceptual model with empirical validation. *International Journal of Hospitality Management*, 52, 131-142.
- NEELY, A. 2008. Exploring the financial consequences of the servitization of manufacturing. *Operations Management Research*, 1, 103-118.
- O'CASS, A. & NGO, L. V. 2011. Examining the firm's value creation process: A managerial perspective of the firm's value offering strategy and performance. *British Journal of Management*, 22, 646-671.
- OPRESNIK, D. & TAISCH, M. 2015. The value of Big Data in servitization. *International Journal of Production Economics*, 165, 174-184.
- OSTERWALDER, A. & PIGNEUR, Y. 2010. *Business model generation: A handbook for visionaries, game changers, and challengers*, John Wiley & Sons.
- PAYNE, A. F., STORBACKA, K. & FROW, P. 2008. Managing the co-creation of value. *Journal of the Academy of Marketing Science*, 36, 83-96.
- RABETINO, R., KOHTAMÄKI, M. & GEBAUER, H. 2017. Strategy map of servitization. *International Journal of Production Economics*, 192, 144-156.
- RADDATS, C., ZOLKIEWSKI, J., STORY, V. M., BURTON, J., BAINES, T. & ZIAEE BIGDELI, A. 2017. Interactively developed capabilities: Evidence from dyadic servitization relationships. *International Journal of Operations & Production Management*, 37, 382-400.
- RAFOLS, I., LEYDESDORFF, L., O'HARE, A., NIGHTINGALE, P. & STIRLING, A. 2012. How journal rankings can suppress interdisciplinary research: A comparison between Innovation Studies and Business & Management. *Research Policy*, 41, 1262-1282.
- RAJA, J. Z., BOURNE, D., GOFFIN, K., ÇAKKOL, M. & MARTINEZ, V. 2013. Achieving customer satisfaction through integrated products and services: An exploratory study. *Journal of Product Innovation Management*, 30, 1128-1144.
- RAPACCINI, M. 2015. Pricing strategies of service offerings in manufacturing companies: A literature review and empirical investigation. *Production Planning & Control*, 26, 1247-1263.
- REYPENS, C., LIEVENS, A. & BLAZEVIC, V. 2016. Leveraging value in multi-stakeholder innovation networks: A process framework for value co-creation and capture. *Industrial Marketing Management*, 56, 40-50.
- ROUSSEAU, D. M. 1985. Issues of level in organizational research: Multi-level and cross-level perspectives. *Research in Organizational Behavior*, 7, 1-37.
- RYMASZEWSKA, A., HELO, P. & GUNASEKARAN, A. 2017. IoT powered servitization of manufacturing – An exploratory case study. *International Journal of Production Economics*, 192, 92-105.

- SJÖDIN, D. R., PARIDA, V. & WINCENT, J. 2016. Value co-creation process of integrated product-services: Effect of role ambiguities and relational coping strategies. *Industrial Marketing Management*, 56, 108-119.
- SLATER, S. F. 1997. Developing a customer value-based theory of the firm. *Journal of the Academy of Marketing Science*, 25, 162-167.
- SMITH, L., MAULL, R. & NG, I. C. L. 2014. Servitization and operations management: A service dominant-logic approach. *International Journal of Operations & Production Management*, 34, 242-269.
- SONG, H., CADEAUX, J. & YU, K. 2016. The effects of service supply on perceived value proposition under different levels of customer involvement. *Industrial Marketing Management*, 54, 116-128.
- SONGAILIENE, E., WINKLHOFER, H. & MCKECHNIE, S. 2011. A conceptualisation of supplier-perceived value. *European Journal of Marketing*, 45, 383-418.
- STEINER, M., EGGERT, A., ULAGA, W. & BACKHAUS, K. 2016. Do customized service packages impede value capture in industrial markets? *Journal of the Academy of Marketing Science*, 44, 151-165.
- STORY, V. M., RADDATS, C., BURTON, J., ZOLKIEWSKI, J. & BAINES, T. 2017. Capabilities for advanced services: A multi-actor perspective. *Industrial Marketing Management*, 60, 54-68.
- THOME, A. M. T., SCAVARDA, L. F. & SCAVARDA, A. J. 2016. Conducting systematic literature review in operations management. *Production Planning & Control*, 27, 1-13.
- TRANFIELD, D., DENYER, D. & SMART, P. 2003. Towards a methodology for developing evidence-informed management knowledge by means of systematic review. *British Journal of Management*, 14, 207-222.
- ULAGA, W. & REINARTZ, W. J. 2011. Hybrid offerings: How manufacturing firms combine goods and services successfully. *Journal of Marketing*, 75, 5-23.
- VANDERMERWE, S. & RADA, J. 1988. Servitization of business: Adding value by adding services. *European Management Journal*, 6, 314-324.
- VARGO, S. L. & LUSCH, R. F. 2004. Evolving to a new dominant logic for marketing. *Journal of Marketing*, 68, 1-17.
- VARGO, S. L. & LUSCH, R. F. 2008a. Service-dominant logic: Continuing the evolution. *Journal of the Academy of Marketing Science*, 36, 1-10.
- VARGO, S. L. & LUSCH, R. F. 2008b. Why “service”? *Journal of the Academy of Marketing Science*, 36, 25-38.
- VARGO, S. L., MAGLIO, P. P. & AKAKA, M. A. 2008. On value and value co-creation: A service systems and service logic perspective. *European Management Journal*, 26, 145-152.
- VENDRELL-HERRERO, F., BUSTINZA, O. F., PARRY, G. & GEORGANTZIS, N. 2017. Servitization, digitization and supply chain interdependency. *Industrial Marketing Management*, 60, 69-81.
- VERGIDIS, K., TURNER, C. J. & TIWARI, A. 2008. Business process perspectives: Theoretical developments vs. real-world practice. *International Journal of Production Economics*, 114, 91-104.
- VISNJIC, I., JOVANOVIC, M., NEELY, A. & ENGWALL, M. 2017. What brings the value to outcome-based contract providers? Value drivers in outcome business models. *International Journal of Production Economics*, 192, 169-181.

- VON BERTALANFFY, L. 1972. The history and status of general systems theory. *Academy of Management Journal*, 15, 407-426.
- WAGNER, J. & BENOIT, S. 2015. Creating value in retail buyer–vendor relationships: A service-centered model. *Industrial Marketing Management*, 44, 166-179.
- WALLIN, J., CHIRUMALLA, K. & THOMPSON, A. 2013. Developing PSS concepts from traditional product sales situation: The use of business model canvas. *Product-Service Integration for Sustainable Solutions*. Springer.
- WEBSTER, J. & WATSON, R. T. 2002. Analyzing the past to prepare for the future: Writing a literature review. *MIS Quarterly*, 26, 13-23.
- ZIAEE BIGDELI, A., BAINES, T., SCHROEDER, A., BROWN, S., MUSSON, E., GUANG SHI, V. & CALABRESE, A. 2018. Measuring servitization progress and outcome: The case of “advanced services”. *Production Planning & Control*, 29, 315-332.