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SERVITIZATION OF MANUFACTURING:

are we turning a blind eye?

Research-in-Progress (Developmental Paper)

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Abstract

Servitization is a current organisational and, arguably a societal phenomenon which has received much attention in Marketing, Management and Operations literature. The term describes a process of business model reconfiguration which allows traditional manufacturers to change their focus from producing tangible goods to producing outcome-based services. The phenomenon is driven by development of new technologies such as Internet of Things (IoT), communication and integration platforms. The effects of servitization are manifold and wide-reaching, including re- und de-skilling of employees, reconfiguration of supplier-customer relationships, changes to consumer behaviours and creation of new virtual entry-barriers for manufacturers from developing countries. Yet, the Information Systems researches have not engaged in the debate. Comprehensive literature reviews from 2013, 2017 and 2019 mention no IS journals. The aim of this paper is to introduce the servitization phenomenon to the IS community and to spark a debate on our collective involvement.

Keywords: Servitization, Product Service Systems, Research Notes, Positioning Paper

1.0 Introduction

A large body of research has been dedicated to the phenomenon of “servitization”. The term was first introduced by Vandermerwe and Rada (1988) who described it as a process during which manufacturing companies offer more supplementary services to the point when the “services are beginning to dominate” (p. 314). Some literature uses the term “Product Service System” to describe the outcomes of the servitization process (Baines, Lightfoot, Benedettini, & Kay, 2009; Coreynen, Matthyssens, De Rijck, & Dewit, 2018; Dahmani, Boucher, Peillon, & Besombes, 2016; Gurtu, 2019; Lightfoot, Baines, & Smart, 2013; Mont, 2002). Many Original Equipment Manufacturers (OEMs) have embarked on the servitization journey in industrialized countries (Crozet, 2017; Reiss, 2010; Tether, 2012}. This process of re-configuration of organisation’s offering, capabilities and culture has wider dualistic societal implications: being reinforced through changes in the society and causing societal change. On the one hand, servitization is driven by changes in technology, global economy and customer’s expectations (Andrews, Dmitrijeva, Bigdeli, & Baines,

2018; Baines et al., 2009; Coreynen et al., 2018; Kinnunen & Turunen, 2012; Kohtamäki & Helo, 2015; Raddats, Kowalkowski, Benedettini, Burton, & Gebauer, 2019). On the other hand, move from a production-centric logic to service-centric logic impacts the very fabric of organisational ways to (co-) operate: with changes to employee profiles, consumer behaviours, environmental impact, and communication, coordination and integration across the entire value creation chain (Mont, 2002; Robinson, Chan, & Lau, 2016; Sharma & Singh, 2017; Trusson, Hislop, & Doherty, 2018).

The phenomenon of enriching product offerings with services has caught the eye of the academic community in the late 1970s (Bikfalvi, Lay, Maloca, & Waser, 2013). However, in the early 2010's the product-service systems were described as still being in the "initial stages" (Gurtu, 2019). The interest in the subject is picking up: Gurtu (Gurtu, 2019) identified 519 articles published before 2010 and further 1,100 published between 2011 and 2016. Specifically, the UK appears to support a growing academic community (Baines et al., 2017). Notably, different literature reviews (Baines et al., 2009; Baines et al.; Gurtu, 2019; Lightfoot et al., 2013; Raddats et al., 2019; Robinson et al., 2016) do not consider or mention any of the IS Journals. Indeed, a search in MISQ on JSTOR for the word "Servitization" returned exactly one match (a call for papers in 2010).

Servitization researchers view different facets of the servitization process: how services are developed, the marketing and managerial challenges of servitization, transformation processes from manufacturing to service and measures of service quality and organisational outcomes (Bikfalvi et al., 2013). Despite the conclusion that service science evolved from the IS stream (Lightfoot et al., 2013) there appears to be a deafening silence on our part with regards to servitization, its use of technology and subsequent impacts on the society.

This aim of this paper is to identify under-researched areas from the Information Systems perspective and to highlight possible future developments.

Three major terms dominate the literature on servitization: Product-Service-Systems, Servitization and Service Paradox. Originally defined as a process of enriching the products with supporting services to an extent that services will become more prominent in the organisation's offering (Vandermerwe & Rada, 1988), servitization has been also termed an *innovation process* (Dahmani et al., 2016). Researchers agree that the process requires changes to the organisation's structure, strategy and culture (Ambroise, Prim-Allaz, Teyssier, & Peillon, 2018; Dahmani et al., 2016; Gebauer, Fleisch, & Friedli, 2005;

Kinnunen & Turunen, 2012; Mont, 2002). Manufacturers need to realign their marketing strategies from selling value potential embedded in their products to selling use-based outcomes (Sousa & da Silveira, 2017).

The term Product-Service-Systems (PSS) is dominant in Scandinavian literature (Baines et al., 2009). As the name suggests, PSS are systems of offerings which combine tangible and intangible goods to achieve a pre-defined outcome, thus changing the production and consumption patterns (Mont, 2002). There are several ways of designing and implementing these systems (Reiss & Günther, 2010). However, PSS contribute to focussing organisation efforts to create outcome-based product offerings and are thus often used interchangeably with the term “servitization” (Baines et al., 2009). Finally, it has been observed and confirmed that many organisations “fail” to achieve expected positive organisational outcomes despite servitization efforts (Crozet & Milet, 2017). The phenomenon of increased service offerings, increased revenue and (contrary to expectations) lower customer satisfaction and lower profits has been termed “service paradox” (Gebauer et al., 2005).

Servitization, PSS and the service paradox have been evaluated from different vantage points and a variety of disciplines. The following section provides a summary of relevant literature and research streams, ordered by the stages in the servitization process (Figure 1).

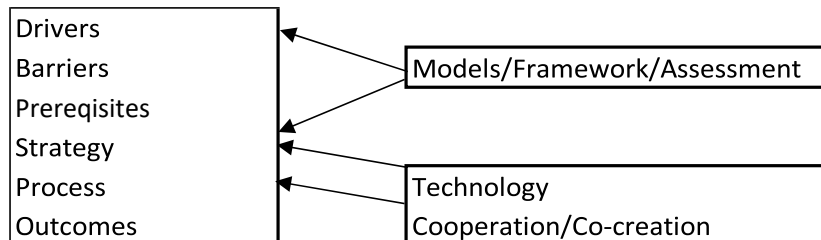


Figure 1 - Servitization focus areas in current literature

2.0 Literature review

There are several possible ways to dice and slice literature on servitization. Some literature reviews focused on subject areas: Marketing and Innovation, Service management, Operations Management, Product-Service-Systems, General Management and Service Science (Lightfoot et al., 2013; Raddats et al., 2019). Another approach is to separate the papers on what is being researched: the process of developing new services, the marketing and management of services, the transformation process from products to services, or the attempts to measure the effects of servitization (Bikfalvi et al., 2013). Finally, Ziaee Bigdeli, Baines, Bustinza, and Guang Shi (2017) structured their review based on the area under investigation: Context (where), Content (what), and Process (how). To make the structure

of the literature review in this paper is loosely aligned with the servitization journey (Figure 1): starting with the identification of drivers and barriers to servitization, followed by the prerequisites and strategy development, and closing with the implementation process and the (expected) outcomes. Different models, assessment and taxonomy frameworks, technological tools and challenges, as well as integration (from data as well as organisational points of view) are introduced along the way at the appropriate stages.

2.1 Drivers for servitization

There is a broad agreement that servitization is a transformational process (Andrews et al., 2018; Baines et al., 2009; Coreynen et al., 2018; Kinnunen & Turunen, 2012; Kohtamäki & Helo, 2015; Mont, 2002; Raddats et al., 2019; Robinson et al., 2016; Sharma & Singh, 2017; Trusson et al., 2018). At the beginning of this process, there is a realisation that change is required. Manufacturing firms aim at (1) increasing their financial performance through increased profitability, additional revenue streams and higher margins, (2) strategically gaining competitive advantage through unique product-service bundles and access to new markets, and (3) improving their marketing abilities through maintaining and strengthening customer relationships and offering compelling differentiators (Baines et al., 2009; Kinnunen & Turunen, 2012).

These aims are dictated not just by entrepreneurial spirits of the management or the owners but also by external pressures from globalisation such as new market demands, increasing competition from cheaper markets and changing customer expectations (Bikfalvi et al., 2013; Coreynen et al., 2018; Kinnunen & Turunen, 2012). In this changing environment, manufacturers are attributing greater importance to the role of services (Kohtamäki & Helo, 2015); recognizing that producing high-quality products without supplementary services is no longer a sustainable survival strategy (Bikfalvi et al., 2013; Crozet & Milet, 2017). For example, the manufacturing output of UK's producers has largely remained constant between 1990 and 2019 (Statistics, 2019a) whilst the profits have been on decline between 1997 and 2010, recovered slightly between 2011 and 2018 and are falling again for 2017, 2018 and 2019 (Martinez, Bastl, Kingston, & Evans, 2010; Statistics, 2019b).

However, the servitization journey is equally influenced by the maturity of the organisation (internal readiness to accept change), the maturity of the markets (customer's willingness and desire to consume services), technological advances (e.g. Internet of Things (IoT), connectivity etc) and the organisation's overall position within the ecosystem (existence of

partner, supplier and support networks for service delivery) (Andrews et al., 2018). These factors can be drivers, as well as barriers to servitization.

2.2 Barriers to servitization

Current literature identifies several “hurdles” on the servitization journey. However, the theme that rings through many papers is the human resistance to change. This resistance is prevalent in manufacturer’s as well as in consumer’s minds.

Members of an organisation fail to recognise the value of service: an engineer designing multi-million engines will not get excited about a 10K support contract. Further, organisations might reject servitization because they do not see it as their core competence (Oliva & Kallenberg, 2003). There is also an internal cultural conflict between manufacture-centric and service-centric orientation (Lenka, Parida, Sjödin, & Wincent, 2018). This shift affects the manufacturing as well as the sales and marketing parts of the organisation (Martinez et al., 2010; Mont, 2002). Finally, due to lack of experience, organisations find it difficult to predict consumer demands and behaviours (Mont, 2002).

On the consumer side, the barriers are just as challenging. Consumers are reluctant to share process information and data for fear of competition (considering processes or machine-use data part of their intellectual property) (Gebauer et al., 2005). Further, servitization often implies a change in the traditional equipment ownership: the OEMs now owns the product and the customer consumes “service” or the “output” (for example, using car-sharing instead of owning a car). Many customers struggle to accept that change (Mahut, Daaboul, Bricogne, & Eynard, 2017). The service logic is different from product logic. Customers believe that removing some of the services from the service-offering should make the service cheaper (e.g. cars without a built-in sat-nav are cheaper). However, some of those services might be the necessary component which allows the package to come at a cheaper price in the first place (e.g. preventative maintenance allows to extend warranty to 10 years) (Martinez et al., 2010). Servitization faces barriers on the upstream side as well. Successful servitization relies on tight integration of consumers, manufacturers and suppliers. This requires the manufacturer to build a new relationship with suppliers and service providers, who might resist the change as they see their position in the market threatened (Mont, 2002; Oliva & Kallenberg, 2003). These barriers highlight pre-requisites for the development of a successful servitization strategy.

2.3 Prerequisites for servitization

Large international organisation such as ABB, Ericsson, IBM and Rolls Royce are cited as examples of successful servitization (Baines et al., 2009; Bikfalvi et al., 2013; Davies, Brady, & Hobday, 2006; Kohtamäki & Helo, 2015; Lightfoot et al., 2013; Mahut et al., 2017; Wang, Lai, & Shou, 2018) (and this paper just fell into to same trap). However, there is no evidence that the firm's size or industry has any impact on the outcomes (Bikfalvi et al., 2013; Crozet & Milet, 2017). Thus, neither the organisation's size, nor its global reach, nor specific industry is a prerequisite for servitization.

However, to-date, manufacturers are not yet fully exploiting their potential to offer value-added services (Coreynen et al., 2018). Manufacturers possess unique skills which provide them with a competitive advantage when offering direct services (Baines, Lightfoot, & Smart, 2011). OEMs have (1) a skillset in design and development that enables them to technologically enhance their products to make them "service ready"; (2) in-depth knowledge of their product to design and advise on best-practice use and maintenance routines; and (3) the ability to apply best-of-breed manufacturing process to service. For example, Schindler – a German manufacturer of lifts and elevators, have developed an add-on IoT device which is compatible with most lift models (manufacturer agnostic) which monitors the lifts actual operational hours and triggers preventive maintenance when required. Liebherr, another German manufacturer of construction equipment, is sending out "talking manuals" – engineers who advise on the recommended maintenance if their equipment, to major building sites¹. Finally, many innovative processes e.g. Kanban and Lean originated in manufacturing and were successfully applied in service industries (Seddon, O'Donovan, & Zokaei, 2011). In addition to the ability to create and maintain products and apply best-practices from manufacturing to service, there are other prerequisites to successful formulation and implementation of service strategies, and changing the organisational processes, operations and revenue models (Kohtamäki & Helo, 2015).

The prerequisites to servitization aim at alerting the policy and strategy makers at potential focus-culture conflict (Figure 2).

focus	CUSTOMER	Satisfying Product Provider	Value Adding Service Champion
	MANUFACTURING	Introvert Bulk Producer	Indecisive Focus Seeker
		PRODUCT	SERVICE

culture

Figure 2 - Manufacturer Service Readiness (Kinnunen, 2012)

Based on the starting position, organisations and individual managers may need to look at acquiring and developing additional skills and capabilities (Kinnunen & Turunen, 2012; Oliva & Kallenberg, 2003).

Organisational changes and capabilities

Organisations need to be prepared to adapt their processes and structures to be able to deliver services. This requires redirection of financial and managerial resources, development of new business models and products, incorporation of new technologies (e.g. IoT), changes to marketing and go-market-strategies, as well as a mental change from transaction to relationship logic (Dahmani et al., 2016; Oliva & Kallenberg, 2003). Organisations will need to consider adaptation of their processes, people and technologies, including forging of new alliances to gain access to new resources necessary to deliver service (Baines et al., 2017; Bikfalvi et al., 2013).

Managerial capabilities

The management capabilities required for servitization of manufacturing touch on three areas: Innovation, Deployment and Business Logic (Coreynen et al., 2018; Kanninen, Penttinen, Tinnilä, & Kaario, 2017; Mahut et al., 2017).

Innovation: the development of product service systems, i.e. the appropriate mix of product and services. This requires an in-depth understanding of customers' processes, and an understanding of how to gather and interpret the usage data. Additionally, the new system

requires skills to design and adapt the infrastructure to service delivery to create a service delivery infrastructure

Deployment: the monetization of these offerings, i.e. the marketing, financing and billing mechanisms. The managerial skills include development of new outcome or use-based revenue systems, ability to design flexible offerings (e.g. mix-and-match product-service packages). Additionally, the management needs to be able to explain and promote the new models inside and outside of the organisation.

Business Logic: the people management associated with the changes to the organisation and its environment, i.e. internal changes, re-definition of relationships with the suppliers and customers. It requires the managers to develop relationship-building competences, moving away from product-centric relationships to outcome-centric relationships. Managers need to become knowledgeable and gain expertise in customers' processes and key performance indicators. This knowledge might impact Innovation and lead to development of customer-specific PSSs.

Another stream of research is focussing on analysing and prescribing the strategizing processes.

2.4 Servitization Strategy

The importance of formulating a servitization strategy is two-fold: it sets the road to servitization, and, on the other hand, impacts all other processes in the manufacturing process (Baines et al., 2011).

The current literature agrees that the strategy is driven by the decision on what type of services should be offered to complement, enhance or replace the physical products of the manufacturer. There are several taxonomies which have been proposed in the last five years as a distilled version and combinations of previous research (Figure 3). The proposed strategies are mostly evaluated based on their potential to deliver economic benefits (Servitization Value Potential).

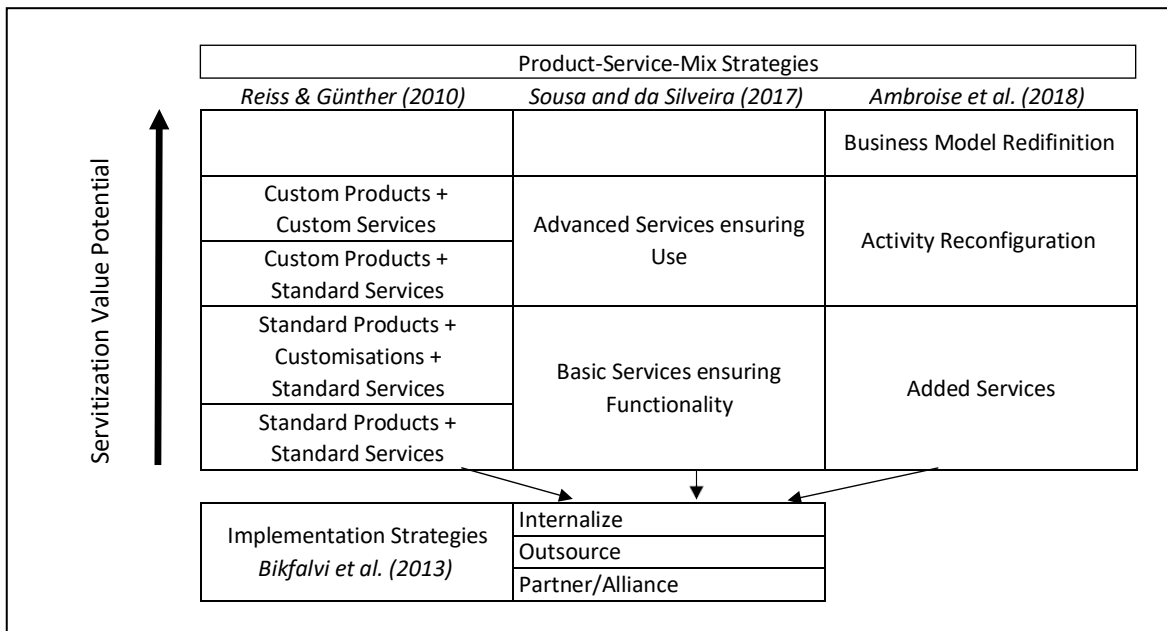


Figure 3 - Summary of Servitization Strategies

Focussing purely on PSS – a combination of products and services, as opposed to pure value-added services, the importance of the Product and the Service will change, depending on the level of customisation applied to the product (Figure 4).

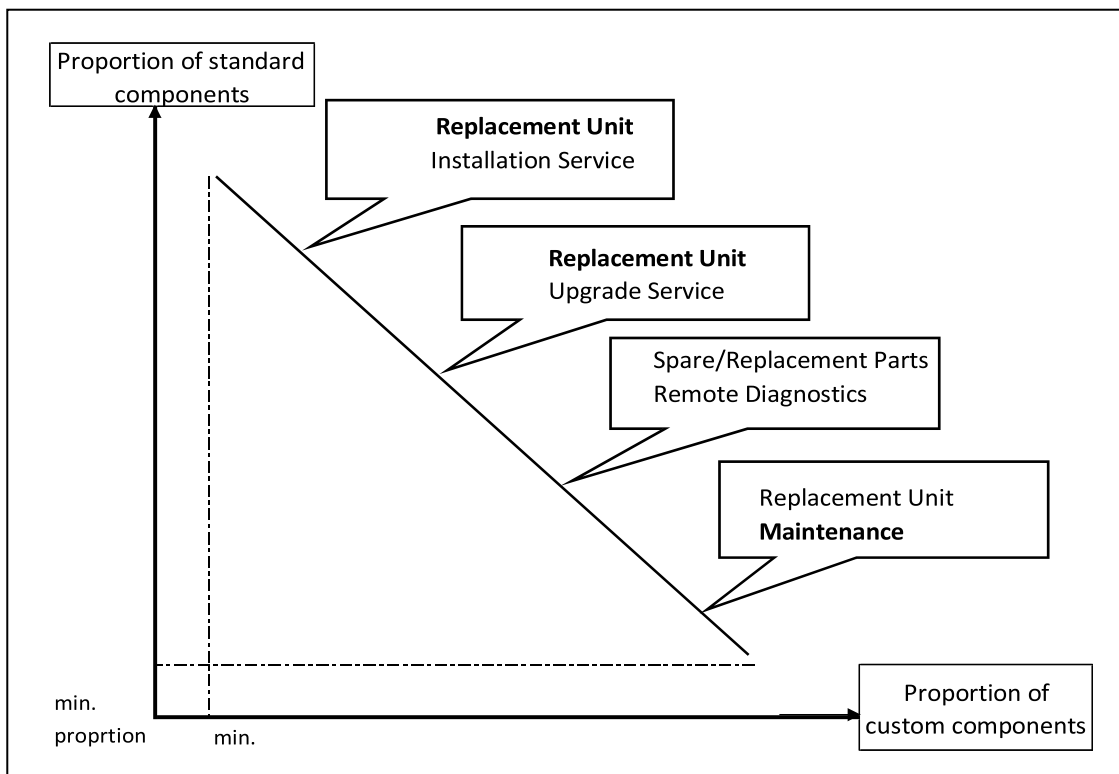


Figure 4 - Customisation vs Standardisation in PSS offering (Reiss et al 2010)

Reiss and Günther (2010) argue that the higher level of customization will place more emphasis on the service-component of the offering. Manufacturers are encouraged to

evaluate the standardisation of their product and to decide whether to invest into value-added services or to enhance their products (the relative importance between product and service is highlighted in **bold** in Figure 4).

Like Reiss and Günther's approach, the alternative taxonomy suggests differentiating strategies based on the *aim* of the service offering (Sousa & da Silveira, 2017). Basic services aim at ensuring the functionality of the product (thus at ensuring that the product could be used if needed). They include installation, planned and preventative maintenance, product maintenance releases (e.g. the software-updates that tend to happen just when you are about to finish that conference paper). The other category of servitization strategies is aimed at promoting the adoption and use of the product (and thus at fostering the results of the product use). These include training, continuous monitoring and regular product upgrades and replacements. The alternative nomenclature for advanced and basic services has been offered by Wang et al. (2018), referring to those as Services Supporting Products (SSP) and Services Supporting Customers (SSC) respectively.

Yet another stream classifies strategic approaches based on their overall impact on business configuration. Based on the business transformation model (Venkatraman, 1994), three types of strategies are identified according to their transformational characteristics: Added Services, Activity Reconfiguration and Business Model Redefinition (Ambroise et al., 2018).

Organisations in pursuit of an Added Services Strategy maintains their product focus and sees services as product enhancements. The strategic goal is to increase the value of the product itself by adding services. A typical example is the (in B2C cases legally necessary) product warranty or a guaranteed spare-parts supply for a pre-defined number of years. These services are "non-intrusive" and do not impact customer's activities and processes. Organisations following the Activity Reconfiguration Strategy seek a deeper integration into the business activity chain of their customers. The product ownership may remain with the manufacturer, and the customer is consuming the "output". Often-cited examples are Xerox who no longer sell photocopiers but document services and Ericsson instead of providing the physical network infrastructure now took over the operations of their customers' networks.

Finally, organisations in pursuit of Business Model Redefinition seek to change their own operating model and the operating model of their customers. The physical good and the ownership of that good does not play any significant role any longer. For example, one of

the mining manufacturers in Germany moved from selling mining equipment (\$2+ Million heavy machinery) to first selling mined volume (tons of coal or salt mined per unit of time, typically a month) to then selling tons transferred. This changed included deep embedding of the manufacturer not just in the “production” process of their customers (i.e. mining) but also the management of the transportation of the goods, including fleet maintenance and scheduling, using IoT sensors to decide when a new truck should be sent down to the mining site to be loadedⁱ.

The last proposed taxonomy is that of servitization implementation strategies (Bikfalvi et al., 2013). One of the requisites of servitization is the acquisition of skills to deliver service. Possible strategies include Internalisation, Outsourcing and Alliances. Internalisation requires investment (financial as well as time) in development or acquisition of the required skills, however, allows the company to maintain control over its intellectual property (IP), speed of servitization and future direction. Outsourcing is characterised by a faster time-to-market and allows provision of services in difficult to reach areas. For example, a manufacturer of ship generators needs to be able to service ships in almost every major port around the world. Due to access and travel restrictions, they cannot use their own engineers in Saudi ports and rely on an extensive 3rd-party network around the Gulf area to deliver services. Alliances require a strong collaboration, integration and continuous information and knowledge sharing. There is also an increased need for integration (Ambroise et al., 2018; Martinez et al., 2010; Robinson et al., 2016). Organisations will mix-and-match different implementation strategies depending on the environments in which they operate.

2.5 Servitization Process

Akin to the pre-requisites which should be there at the beginning of a servitization process (“what to have”), there are recommended steps which should be taken before embarking on the servitization journey (“what to do”) (Table 1).

Understand the nature of service business	Focusing service offers on the value proposition to the customer
Identify current services and customer needs	
Define service strategy	Defining a clear service strategy
New business models and pricing logics	Establishing a market-oriented and clearly defined service development process
Improve capabilities, set goals and incentives	Initiating relationship marketing
Manage Service as own function	Establishing a separate service organization
	Creating a service culture
<i>Kanninen, 2017</i>	<i>Gebauer, 2005</i>

Table 1 - Servitization recommended preparation steps

The organisations are urged to investigate their customers' needs, expectations and processes before starting the servitization process and before formulating a strategy. As outcomes of the "preparation phase", managers should have a defined strategy and a service offering, and a separate service organisation should be set up (Ambroise et al., 2018; Gebauer et al., 2005; Kanninen et al., 2017).

The implementation of the servitization strategy takes the organisation through different phases (Table 2). The phases are labelled differently by different authors and the borders are fluid, however, the general argument is that an organisation moves in (more or less well) defined steps from few services to pure-service. More servitization is associated with deeper changes to the organisation's processes and structures. Arguably, higher levels of servitization should also deliver more positive organisational outcomes, however, this is not always the case, as will be discussed in the next section.

Exploration - Initial learning about servitization and its implications					
Engagement - Evaluation and communication of the business potential of servitization	Equipment Provider (single service provider)	Consolidate Basic Services / SSP to remain competitive	Adding services to installed base	Added Services: maintain existing structures and integrate service	Servitization extent ↓
Expansion - Develop PSS and change organizational structure to demonstrate viability	Solution Provider (product-service bundles)	Expand Advanced Services / SSC to become profitable	Services to installed base over the entire life-cycle	Activity Reconfiguration: enhance Customer Interface and Service Culture, focus on development of Service Delivery Systems	
Exploitation - Optimization of innovation and delivery of an advanced services portfolio	Performance Provider (full horizontal integration)		Additional services	Business Model Reconfiguration: Separate Service organisation with focus on Service Culture	
<i>Andrews, 2018</i>	<i>Kohtamäki, 2015</i>	<i>Sousa, 2017; Wang, 2018</i>	<i>Oliva, 2003</i>	<i>Ambroise, 2018</i>	

Table 2 - Servitization transformation paths

Regardless of the simplified tabular presentation, the transformation process from pure manufacturing to pure service is neither linear nor unambiguous (Lenka et al., 2018; Mahut et al., 2017). Many organisations continue developing their manufacturing capabilities in parallel to their service capabilities. Indeed, researchers argue that at higher servitization levels, a separate service function should be established (Ambroise et al., 2018; Gebauer et al., 2005; Kinnunen & Turunen, 2012). The separation of manufacturing and service organisation invariably creates a need for more integration of the organisational unit. In addition to the internal integration challenges, process and system integrations along the value creation chain are necessary. Manufacturers moving into service will need to accept more responsibility for the products and services of their suppliers and, at the same time, take on responsibility for the activities on the customer's side. This will require a deeper backwards-integration to their suppliers as well as forward-integration into their customers' processes (Baines et al., 2011).

Organisations at the lower level of servitization use services to enhance their existing products to remain competitive (Kohtamäki & Helo, 2015). They offer services which ensure continuous operation of their products (Sousa & da Silveira, 2017), extending some of these services (e.g. planned maintenance) to their installed base (Oliva & Kallenberg, 2003). The implementation of this service strategy is cheaper in financial and political terms (Wang et al., 2018). The service delivery system can remain relatively basic and existing structures can be used to deliver additional services (Ambroise et al., 2018). At this phase, the organisation can evaluate their offerings, capabilities and culture, prove and

communicate the service-value internally and externally, start changing the organisational culture towards service-orientation.

At the middle-level of the servitization, advanced services are offered to provide added value, and to drive the use of the products (Sousa & da Silveira, 2017). The organisation develops advanced product-service offerings and can deploy and deliver these offerings at a higher performance (Andrews et al., 2018; Kohtamäki & Helo, 2015). The separation of manufacturing and service units is more prominent and the changes to the organisational structure are more severe (Ambroise et al., 2018; Andrews et al., 2018). The organisation can implement business logics which allow marketing of services independent of the products. These additional services are offered through the entire product life-cycle (Oliva & Kallenberg, 2003). However, investment in the development of additional services and the skills and capabilities required to deliver these services is also increasing. The additional demands from the service organisation and additional investments into the service organisation at this stage may lead to reduced customer satisfaction and reduced profits – causing the “service paradox” (Ambroise et al., 2018; Gebauer et al., 2005; Wang et al., 2018). The effects of the service paradox are discussed in the “outcomes” section.

At the final level, the organisation is re-defined and re-focussed on delivering services. The separation of manufacturing and service units is complete with a clear service-focused culture developed and established in the service unit (Ambroise et al., 2018; Gebauer et al., 2005; Kanninen et al., 2017). The organisation is aspiring a full horizontal integration with its suppliers and customers (Baines et al., 2011; Kohtamäki & Helo, 2015) and becomes an integral part in the customer’s value creation activities. The services offered go beyond the manufacturer’s own products and install base, providing new revenue streams (Oliva & Kallenberg, 2003). The organisation requires extended capabilities of service delivery and may seek further integration with 3rd party service providers to offer advanced services (Bikfalvi et al., 2013). Organisations at this stage continuously improve their service offerings and capabilities to exploit them and to create competitive advantage (Andrews et al., 2018).

Seeking to achieve better financial performance, ensure customer loyalty and gain competitive advantage, organisations pursue different outcomes which may or may not be realised.

2.6 Servitization Outcomes

Expected positive outcomes of servitization range from financial performance, to higher customer satisfaction, and positive environmental impact (Bikfalvi et al., 2013; Mont, 2002). Additionally, it is argued that a service offering may positively contribute to marketing of new physical products (Bikfalvi et al., 2013). Studies suggest that higher levels of servitization and offerings which include services targeted at customer's outcomes rather than product functionality have the potential to create greater financial benefits (Wang et al., 2018). A study of over 40,000 French manufacturers revealed that firms which start selling services were able to improve their profitability by over 8%, while increasing their workforce size by 0.2-0.4% (Crozet & Milet, 2017). Conflicting results regarding the industry's impact on financial performance were reported in two recent studies. One study suggested that pure manufacturing firms had a greater chance than any other to improve their financial performance (Wang et al., 2018). While the other study found that there are no major differences across industries, with producers from agri-food, minerals, and machinery and electrical equipment sectors achieving higher performance (Crozet & Milet, 2017).

Research shows that most manufacturers see an increase in sales revenue when the service offering is expanded. Some organisations also report higher production outputs (Crozet & Milet, 2017). This is in line with research suggesting that add-on services support the marketing of existing products (Ambroise et al., 2018; Kohtamäki & Helo, 2015; Sousa & da Silveira, 2017). The positive financial performance in different servitization phases is further supported by well-developed Customer Interfaces, Service Delivery Systems, and Cultures. With the former being more prominent at the early stage, Service Delivery Systems having the highest impact at the middle-stage, and Culture having the greatest impact at the full servitization stage respectively (Ambroise et al., 2018). However, the amplitude of the financial benefits has been challenged. French organisations were able to increase their profitability by just 0.4% and their sales by 0.6% (Crozet & Milet, 2017). Similarly, the non-financial performance (customer satisfaction, innovation, etc.) appears to make higher gains against pure financial performance (Wang et al., 2018).

After the initial "uplift" in sales and profits, many organisations notice a decline in profits and customer satisfaction despite a broader service offering and more sales (Sousa & da Silveira, 2017). The decline in organisational financial performance has been termed a "Service Paradox" (Gebauer et al., 2005). Later studies confirmed that increases in service

revenue have no significant impact on organisational performance (Wang et al., 2018). To sustain and expand the service offering, organisations require additional investments into understanding the customer's needs and developing more specialised and bespoke service offerings (Ambroise et al., 2018; Reiss & Günther, 2010). Further investments are required to obtain capabilities and resources to deliver these advanced services (Gebauer et al., 2005; Wang et al., 2018). An under- or over-investment causes customer dissatisfaction and higher cost of service delivery, both of which cause the service paradox.

The service paradox describes the negative effect of servitization on the manufacturer-customer relationship. Caused, in parts, by the manufacturer's inability to deliver advanced services at the same high-level, high quality as their products (Gebauer et al., 2005; Wang et al., 2018). However, the broad consensus is that servitization positively impacts on the manufacturer-customer relationship, moving it from transaction-based interactions to relationship-based cooperation (Andrews et al., 2018). Other relationships, specifically those with partners, suppliers and employees need re-definition and result in potentially unexpected and unintended outcomes.

In a servitized environment, manufacturers depend on extensive service-networks to be able to offer additional services. Service partners could provide access to remote areas (Bikfalvi et al., 2013), as well as skills and resources (Robinson et al., 2016; Wang et al., 2018). The reliance on existing partner-networks may shift the power balance and put the manufacturer into a defensive position. For example, Ford's attempt to offer post-sale services has been blocked by its dealership network (Oliva & Kallenberg, 2003).

Many studies suggest that servitization requires changes to the structure and culture of an organisation. These changes inevitably have an impact on employees. Including possible de-skilling of engineers from problem-solver-designers to service personnel (Trusson et al., 2018).

Finally, researchers highlight a positive impact of servitization on the environment. Offering repair and upgrade services may cause a societal change from "throw-away" to "repair" society and thus reduce our material consumption (Mont, 2002). The positive impact of dematerialization (replacement of products by services, sharing of resources) could further reduce energy consumption (Sharma & Singh, 2017). However, the effects of some services could have a reverse effect. For example, financial services such as leasing and 0%-finance are known to increase consumption, with people buying things they would not otherwise be able to afford (Mont, 2002).

3.0 Discussion

There is an extensive body of literature on servitization and PSS, covering diverse areas including drivers and barriers to servitization, strategy and implementation, evaluating servitization outcomes (Wang et al., 2018). Servitization is a recognised, contemporary and developing phenomenon which is affecting many organisations.

Servitization scholars highlight areas for further research, including the management of service operations, environmental impacts, servitization effects on manufacturers, and calls for stronger theory explaining the phenomenon rather than describing and measuring it (Baines et al., 2017; Bikfalvi et al., 2013; Lightfoot et al., 2013; Nandhakumar & Montealegre, 2003). There appears to be a limited body of critical research, e.g. investigating the new barriers to enter servitization for developing economies (Ziaee Bigdeli et al., 2017) or negative impacts of de-skilling the workforce (Trusson et al., 2018).

IS researchers appear to be absent from the ongoing debate. Literature review in 2013 lists 13 journals, including no IS journals (Lightfoot et al., 2013). A further systematic literature review in 2017 investigates 232 articles from 14 journals, none of which are from Information Systems. The most comprehensive (in terms of volumes) review to-date looked at 1763 articles. The top 11 journals, accounting for 18% of all publications, are not-IS journals.

The central questions of this paper are (1) whether IS community is “missing the boat” and is ignoring an organisational phenomenon, and (2) if IS community should be concerned with servitization, what types of questions should we be asking?

Servitization is made possible and relies on Digital Technologies. Technological advances such as IoT, REST (an integration standard allowing to rapidly develop interconnected IT systems), Integration platforms (allowing to deploy integration services with relatively small effort compared to developing integration between two IT systems via code), Internet connectivity, powerful mobile devices, etc. enable vertical and horizontal integration of IT infrastructures and thus support collaboration activities along the servitization chain. Levels of collaboration and information sharing required for successful servitization are higher than in traditional product-centric environments (Ambroise et al., 2018; Bikfalvi et al., 2013; Kohtamäki & Helo, 2015; Martinez et al., 2010; Raddats et al., 2019; Robinson et al., 2016; Sharma & Singh, 2017). Thus, *Information Systems* scholars should be interested in the phenomenon.

What are the questions an IS scholar would be asking, which go beyond the scope of marketing, general management, operations and innovation literature?

First, there is an obvious “IT”-question: what is the exact role of IT in the servitization process? ERP Systems have been “researched to death”, with many studies looking at successful and failed implementation, measuring organisational outcomes and impacts. Do (Field) Service Management Systems (FSMS) follow the same implementation and operation patterns? Is the adoption of FSMS driven by the same factors and criteria?

The IT-adoption question inevitably leads to a people-focus.

Many of the FSMS use Uber-like features which allow customers to track their engineers. Does the knowledge of being continuously monitored by technology, management, colleagues and customers impact employees’ well-being, acceptance of technology and motivation?

Servitization changes where people work. The technology changes how people work. What impact does servitization have on existing employees? Critical studies have evaluated the skill-set required for service delivery (Lightfoot et al., 2013) and the changes of employee’s skills due to servitization (Trusson et al., 2018). However, the question of how employees adapt to these changes have not yet been raised and answered. Can an assembly-line worker be re-trained to deliver face-to-face service (and would they want to)? A telecoms company in Europe is struggling to “encourage” their engineers to engage in selling activities (e.g. selling a TV package when installing an internet router)ⁱ.

Current research rarely looks “inside” the service organisation (Kohtamäki & Helo, 2015). The potential cultural clash between the product-focus and service-focus cultures has been highlighted (Ambroise et al., 2018; Gebauer et al., 2005; Kinnunen & Turunen, 2012; Mont, 2002) but not yet investigated.

The role of the customer in the servitization process has been neglected. Servitization is mainly addressed from the viewpoint of the manufacturer as the actor servitizing *towards* their customers, rather than implementing services *with* them {Raddtats, 2019}. Similarly, the manufacturer as a consumer of servitization has not yet been investigated {Bains, 2017}. The claim that servitization is motivated by a market “pull” – customers demanding servitized products {Andrews, 2018, Bikfalvi, 2013; Kinnunen, 2012} needs to be validated. Specifically, the decision-making process in organisations who decide to let their suppliers take over parts of value-creating activities, who decide to give up ownership of valuable assets (i.e. machines) and, potentially, share their proprietary intellectual property deserves

attention. While servitization arguably allows the manufacturer to build a “stronger relationship” with their customer, the customer becomes more dependent on the supplier. Competition is reduced, new entrants (e.g. from developing countries) are kept out of mature markets {Baines, 2017}.

How do organisations decide to servitize? Who are the people inside a manufacturing organisation who make the decision to add more services? Researches point out to “pressures for servitization”, however, the decision-making process, the “tipping point” has not been investigated yet. Is it the availability of IoT, a specific customer request, an initiative from marketing, an individual’s passion for service?

Research from France {Crozet, 2017} shows that smaller firms (around 50 employees) are the biggest beneficiaries and biggest contributors to servitization. Yet, there is no research in small firms on servitization decision-making, strategizing, capabilities or process.

Finally, much of the research points to the advantages of servitization and issues some warnings about the pitfalls {Baines, 2013; Gebauer, 2005; Gurtu, 2019}. Servitization is almost a panacea for the declining manufacturing sector in Western countries. There is a lack of critical research on the impacts of servitization as well as a lack of a sound philosophical theory explaining the servitization at micro and macro levels.

The paper introduces the phenomenon of servitization into IS community intending to provoke thought and discussion around this topic. Hopefully, it will not be the last word.

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ⁱ Informal interviews with Schindler, and Liebherr and other firms were conducted by the author in October 2019 at industry events in Berlin and Cologne