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Battisti, Juliane de Freitas; Cauchick-Miguel, Paulo Augusto; Sousa-Zomer, Thayla Tavares

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From servitization to deservitization: a literature review on the aspects related to a deservitization movement in manufacturing firms

Juliane de Freitas Battisti^a, Paulo Augusto Cauchick-Miguel^a , Thayla Tavares Sousa-Zomer^{a*} 

^aUniversidade Federal de Santa Catarina, Florianópolis, SC, Brasil

*thayla.ts@gmail.com

Abstract

Paper aims: This study identified the main aspects related to deservitization in manufacturing firms, a process involving the dilution of services after their integration into companies' business models.

Originality: The deservitization process has been identified as a movement among manufacturing companies, but so far, there is limited understanding of its characteristics. The paper contributes to the existing literature by identifying the main aspects related to the dilution of once-added services by manufacturing firms.

Research method: A literature review was conducted. A content analysis of the selected papers (89 publications) was carried out to identify the main challenges discussed in the servitization literature as issues leading to deservitization.

Main findings: The explanations for manufacturing firms failing in the transition to servitization and consequently taking the deservitization path discussed in the literature are related to changes in the organizational structure, new capabilities, modification of the business model and strategy, and difficulties in the interaction between supplier and customer.

Implications for theory and practice: Deservitization is a complex phenomenon, and little is known about it, especially when compared to the existing body of knowledge on servitization. The paper thus extends the knowledge on the conditions leading to deservitization in manufacturing firms.

Keywords

Deservitization. Servitization. Diffusion of services. Market strategy. Reverse servitization.

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1. Introduction

Many manufacturing companies have been adding services to their portfolio as a strategy to remain competitive (Baines et al., 2020; Gomes et al., 2021). Manufacturing companies have started offering integrated product-service solutions, a process known as the servitization of manufacturing (Kowalkowski et al., 2017a). When servitizing, manufacturing companies move from selling pure products to selling product-service solutions, often delivering customized offers (Raja et al., 2017; Martinez et al., 2017; Rabetino et al., 2017; Sjödin et al., 2020). This personalization maintains the efficiency of product-service production (Kohtamäki et al., 2020), allowing the exploitation of customer information in a centralized way (Toth et al., 2020). Nevertheless, Martinez et al. (2017) highlight that this process is broad and complex, leading the company to undergo a relevant organizational change, involving its operations and capabilities. If service inclusion strategies are successfully implemented, the addition of services can become a relevant source of revenue and profits, ensuring customer satisfaction and loyalty and supporting the organization's growth (Prester & Peles, 2017). Nevertheless, it also brings



challenges to companies regarding the growth of service offerings, development of a service-oriented culture, and improvement of service processes and capabilities (Baines et al., 2020; Favoretto et al., 2022).

The literature on servitization has grown considerably in the past decade and many manufacturing companies around the world have been following a servitization path. Nevertheless, the servitization movement may also end in the opposite direction and lead to a discontinuity of services motivated by problems related to the package of knowledge components delivered by the manufacturer (Benyoussef Zghidi & Zaiem, 2017; Kowalkowski et al., 2017b; Reim et al., 2019). It has been highlighted in the literature that sometimes the value created is lower than expected (Kowalkowski et al., 2017a; Prester & Peles, 2017; Valtakoski, 2017).

The literature has thus shown that some companies have been unable to achieve the expected revenue, increased profit, or customer satisfaction as expected when deciding to servitize (Reim et al., 2019; Kryvinska et al., 2020). There is consensus among authors that problems that manufacturing companies face after transitioning to services are leading those companies to review their business models and reduce or abandon the once-added services (i.e. services added before). Due to a lack of achievement of the expected outcomes, many companies have gone through a deservitization process (Kowalkowski et al., 2017b; Valtakoski, 2017), a transformation process adopted by companies in which the business model centered on services changes back to a business model and logic centered on the product (Kowalkowski et al., 2017a). Although this movement back towards the original business model has been acknowledged by previous studies, there is still a lack of general understanding and systematization on how it unfolds. Therefore, this paper explores the following question: *What are the characteristics and directions discussed in the existing literature regarding the deservitization process?* A literature review is conducted to identify what has been discussed about deservitization, as it has been identified as a movement among manufacturing companies, but there is limited understanding so far on how it unfolds (Kowalkowski et al., 2017b). The paper identifies the main aspects related to the dilution of once-added services by manufacturing firms, providing a summary of what is known about the deservitization movement and supporting future research on the topic.

The remainder of this paper is structured as follows. Section 2 presents a brief theoretical background on the foundations of servitization and deservitization processes. Afterwards, section 3 describes the methods adopted to conduct the review, followed by an overview of the sample of selected articles and a content analysis of the publications summarizing the main aspects involved in the dilution of services by manufacturing firms. Finally, section 5 draws concluding points as well as contributions of the paper, its limitations, and directions for further research.

2. Theoretical background

2.1. Servitization concepts

The shift from products to product-service solutions emerged in the literature in the 1980s, when the term servitization was first mentioned (Vandermerwe & Rada, 1988). At that time, services were limited to after-sales and were seen as a necessary revenue-generating source (Mathieu, 2001). Over time, servitization has emerged as an innovation of organizational resources and processes to create value through the change from the sale of products to the sale of products and services (Neely, 2008). Structural changes in the business model and new capabilities are needed in a service-centric organization (Kowalkowski et al., 2017b).

Empirical studies have highlighted success factors in the servitization process, including changes in supply (Jovanovic et al., 2016), changes in customer relations (Forkmann et al., 2017), modification in the organizational structure (Bustinza et al., 2015), and the fit between service strategies and the competitive environment (Eggert et al., 2015). Studies have also pointed out the benefits of transitioning to services. However, despite the documented benefits, the literature has also identified issues in the servitization process (Brax, 2005; Gebauer et al., 2005; Neely, 2008; Valtakoski, 2017; Reim et al., 2019; Kohtamäki et al., 2020). Studies have highlighted the barriers to servitization (Kindström et al., 2017; Lütjen et al., 2017), uncertainties in the transition process (Kreye, 2017), failures (Zhu & Zolkiewski, 2015; Valtakoski, 2017), risks (Nenonen et al., 2014; Benedettini et al., 2015; Cui et al., 2019), difficulties (Coreynen et al., 2018), challenges (Martinez et al., 2017; Raja & Frandsen, 2017; Zhang & Banerji, 2017; Reim et al., 2019), organizational change issues (Bustinza et al., 2017), and the shift back to the product-centric business model, also called deservitization (Kowalkowski et al., 2017a, b; Valtakoski, 2017; Iriarte et al., 2019) which involves a discontinuation of once-added services. Although the transition to services may be attractive, some companies have chosen to modify their business strategies through a movement of return to the supply of products, slowing down the growth of services (Kowalkowski et al.,

2017a, b; Valtakoski, 2017). Currently, the literature is addressing this issue forementioned as deservitization, also called reverse servitization, described next.

2.2. Deservitization

Over the years, research on servitization has focused on presenting the changes in the business models of companies as a beneficial process. However, studies indicate that when the services do not meet the expectations of generating revenue or margins to cover additional investment, the best strategy is the dilution of services (Benyoussef Zghidi & Zaiem, 2017; Kowalkowski et al., 2017a; Valtakoski, 2017; Iriarte et al., 2019).

The term deservitization started to be discussed in the literature in 2017, conceptualized as a transformation process adopted by companies where there is a change from the business model centered on services to a business model and logic centered on the product (Kowalkowski et al., 2017a; Valtakoski, 2017). Figure 1 illustrates the directions adopted by organizations for servitization and deservitization.

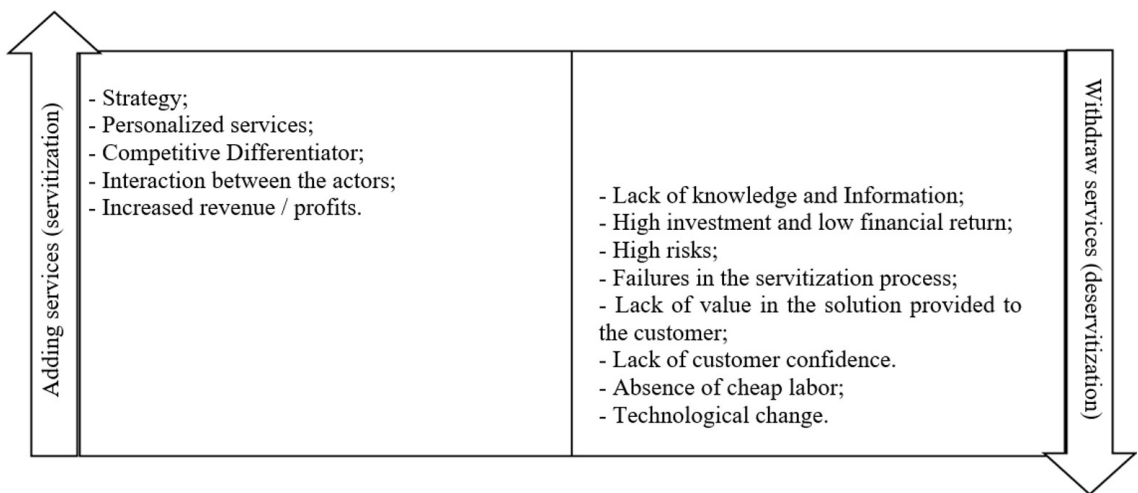


Figure 1. Directions for servitization and deservitization.

Some studies mention that companies have added services as a strategy to remain competitive in the market (Ambroise et al., 2018). Other research describes that companies sought non-financial measures, such as increasing customer satisfaction (Eggert et al., 2014; Prester & Peles, 2017) and the interaction between actors (Ambroise et al., 2018; Aminoff & Hakanen, 2018; Reim et al., 2019). Some organizations sought to increase their sources of revenue and profitability with the addition of services (Eggert et al., 2014; Kowalkowski et al., 2017a).

Successful cases related to the addition of services have been observed over the years. For example, technology and innovation companies, such as IBM and Alstom (Spohrer, 2017; Colm et al., 2020), and also in the aerospace sector, such as BAE Systems and Rolls-Royce (Cusumano et al., 2015; Spohrer, 2017; Bustinza et al., 2017; Kowalkowski et al., 2017a), have been extensively investigated in studies dedicated to exploring the increased revenue of organizations by adding services to their business models. Nevertheless, the literature has signaled the opposite direction as well. The problems faced along the servitization path can be related to the change to a service culture, service innovation processes, organizational structure, mergers, and acquisitions (Kowalkowski et al., 2017a).

Some companies have added and removed services over the years. For example, companies such as Xerox (Finne et al., 2013; Kowalkowski et al., 2017b; Iriarte et al., 2019), Thyssen Krupp (Kowalkowski et al., 2017b), Dürr (Fischer et al., 2010; Benedettini et al., 2015) and Hewlett-Packard (Kowalkowski et al., 2017b), are cases cited in the literature that have gone through this movement of servitization-deservitization. The addition of services to the business model has led managers to change their minds about products. The companies considered that, more than simply selling a product, it was ensuring a support network for the customer, providing a quick response from the supplier (service provider and manufacturer) with the intention of not jeopardizing the availability of services (Finne et al., 2013; Kowalkowski et al., 2017b).

Some previous studies (e.g., Lütjen et al., 2017; Iriarte et al., 2019) have identified the difficulties for organizations in achieving the expected revenue and increase in customer satisfaction. Other studies state

that the financial return obtained with the services sometimes does not cover the high investment made by organizations (Neely, 2008; Alghisi & Saccani, 2015; Benedettini et al., 2017; Benyoussef Zghidi & Zaiem, 2017; Kowalkowski et al., 2017b; Zhang & Banerji, 2017; Reim et al., 2019; Kryvinska et al., 2020). There is also some research highlighting organizations' inability to meet customer needs (e.g. Kowalkowski et al., 2017a; Prester & Peles, 2017). According to Valtakoski (2017), this may be related to the package of knowledge components delivered by the organization, where the value created is less than the value expected by the customer, suggesting that collaboration between the solution provider and the customer was unsuccessful.

As there are few cases mentioned in the literature and those cases are discussed in isolation, the knowledge of this movement of diluting added services remains uncertain and not-systematized, leading to the question of what are the reasons that lead companies to the path of deservitization. Therefore, compared to the robust body of knowledge on servitization, deservitization is a less explored phenomenon, and an overview of what is known about it is provided in this study.

3. Research method

A literature review was performed to identify relevant studies on the deservitization topic and summarize the characteristics of the process. Two databases were used to identify, retrieve, and organize existing publications on the subject: Scopus and ISI Web of Knowledge. Those were chosen as both are recognized as relevant databases (Zhang & Banerji, 2017) and have been adopted by numerous researchers for literature reviews, including on the subject of servitization (e.g., Nudurupati et al., 2016; Baines et al., 2017; Kowalkowski et al., 2017a).

The search was conducted without timeframe restrictions, and papers published until 2022 were included. Only peer-reviewed articles that for which full text was available were selected. Table 1 the keywords related to the term 'servitization' that were used in the search and combined with subjects related to the deservitization process identified in the literature, based on previous publications (e.g., Kowalkowski et al., 2017a, b; Valtakoski, 2017).

Table 1. Keywords used in the search.

Top Keywords	Combinations of keywords	Databases		Total Articles
		Scopus	ISI Web of Knowledge	
"servicising" OR "servitization" OR "servitisation" OR "servicizing"	"Failur*" OR "fault" OR "flaw" OR "shortcoming" OR "rift" OR "Challeng*" OR "barrier*" OR "obstac*" OR "difficulty*" OR "Uncertainty" OR "risk"	383	365	748
"deservitization" OR "deservitisation"	**	8	26	34
Total articles		391	391	782

Note: ** the keyword 'deservitization' was not combined with other keywords.

The initial search resulted in a total of 782 publications. The duplicate articles were then removed, resulting in 471 publications for further consideration, according to the selected filters defined, as shown in Figure 2. The filtering process presented in Figure 2 was then applied, resulting in a final sample of 70 studies addressing the issues faced in servitization and that represent the reasons why companies move back towards the original business model.

Regarding the deservitization process, 34 articles directly addressing the keyword were initially found (Table 1). After eliminating duplicates, papers not available and studies that only used references that addressed deservitization (not being the focus of the study), 19 articles that directly addressed the subject remained in the sample. It is noteworthy that of the 19 selected articles on deservitization, five were published in 2017, one in 2019, four in 2020, five in 2021, and four studies in 2022. Thus, the final portfolio resulted in 89 publications.

The Mendeley and R 3.5.2 software were used to organize and record the papers. An Excel spreadsheet was also used to categorize general aspects of the portfolio of articles (e.g., authors, title, keywords, content description, methodological research approaches, journals, publication distribution over the years, types of research work - empirical and theoretical, etc.). Firstly, a descriptive analysis was performed by using a deductive approach to collect the articles' basic information followed by the themes addressed by the conceptual articles (e.g., Valtakoski, 2017). The thematic analysis was inductive in nature, as the objective was to identify the constructs of servitization challenges found out over the years along with relevant contextual factors. Articles were classified by considering year of publication, main authors, and themes related to servitization and deservitization.

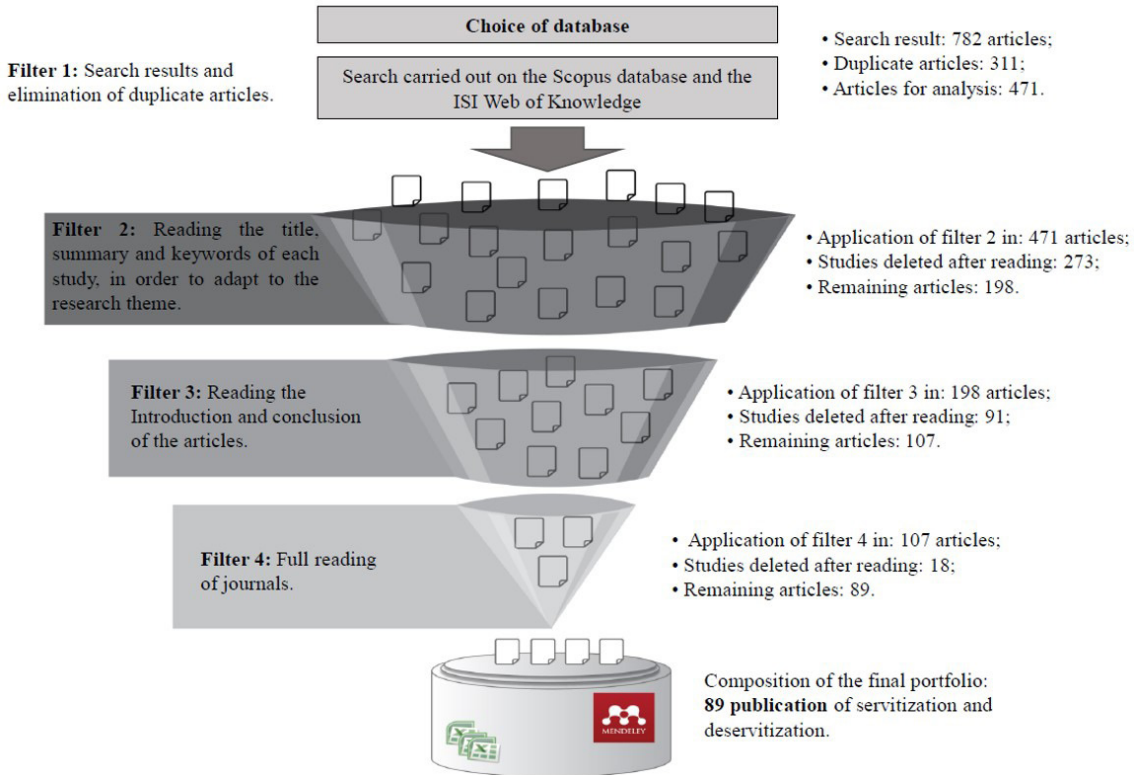


Figure 2. Article filtering process.

The intention was to synthesize the focal articles (Tranfield et al., 2003). In general, the content analysis (see Elo et al., 2014, and Miles & Huberman, 1994) focused on identifying the problems in the servitization process that may have led companies to deservitize.

Three main themes were emerged from the contents analysis of servitization and deservitization papers: (i) challenges, (ii) paradoxes, and (iii) failures and risks. Those themes are the main content findings, raised from the publications. The first theme discusses challenges faced by companies in the organizational transition towards servitization (e.g. Alghisi & Saccani, 2015; Nudurupati et al., 2016; Zhang & Banerji, 2017; Reim et al., 2019). The second theme was the servitization paradox, as an interesting narrative to be faced for servitization research (Dmitrijeva et al., 2020), as companies have encountered paradoxical tensions when implementing the service transition (Kohtamäki et al., 2018). Studies also frequently mentioned failures and risks that come from the servitization process (Benedettini et al., 2015; Valtakoski, 2017). Thus, these three themes were explored in this work.

4. Findings

This section firstly presents a descriptive analysis, followed by the content analysis performed.

4.1. Research methods employed in the publications

Table 2 provides a summary of the research approaches employed, including some details about them. As shown, different research methods were identified among the publications.

As can be seen in Table 2, the majority of the studies are empirical (69%), where case-based research publications correspond to almost three quarters of the empirical studies. More than half of those studies (approximately 61%) adopted single case study. This research approach enables the investigation of the phenomenon by considering the context (Yin, 2003). Other empirical papers applied survey, action research, and secondary data analysis as methodological research approaches. The remaining of the sample consisted of theoretical or conceptual studies.

Table 2. Categories of research methods in the papers (n = 89).

Main category		1 st level types		2 nd level types	
Empirical	61	Case study	44	Single	27
				Multiple	17
Theoretical	28	Survey, action research, and secondary data	17		
		Literature review	19	Systematic review	11
		Conceptual	09	Other reviews	08

4.2. Distribution of the publications over the years, main journals, authors and citations

Figure 3 illustrates the distribution of publications over the years. Interest in servitization arose from the end of 80's with the work of Vandermerwe & Rada (1988). Other publications began to explore the difficulties encountered in servitization years later (Neely, 2008; Hou & Neely, 2013). From 2007 to 2013, the problems started to be discussed gradually, with at least one paper addressing the difficulties involved in the servitization process per year.

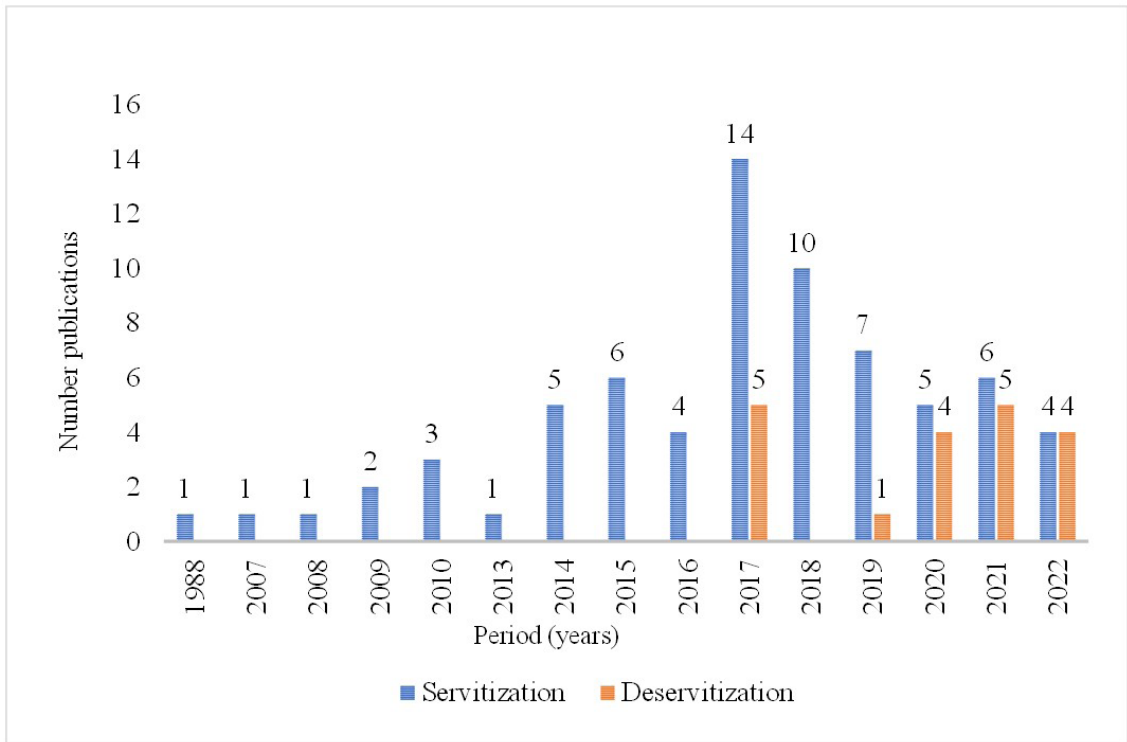


Figure 3. Publications on servitization and deservitization.

A growth of publications can be seen from 2014. The Design Journal, Ekomonski Pregled, Energy Efficiency, and Journal of Manufacturing Technology Management each presented one publication addressing issues related to challenges (Lammi, 2017), barriers (Kindström et al., 2017), economic context and the paradox of services (Szász et al., 2017), as well as trends related to servitization with a focus on deservitization (Prester & Peles, 2017).

The International Journal of Production Economics published seven papers with approaches referring to the strategic map of servitization (Rabetino et al., 2017), challenges related to the transformation of the business model (Burton et al., 2017; Martinez et al., 2017; Raja et al., 2017), organizational change (Baines et al., 2017; Bustinza et al., 2017), deservitization (Lütjen et al., 2017) and co-creation of value (Green et al., 2017; Kreye, 2017), and overall challenges encountered in the process of servitization (Raja & Frandsen, 2017). The journal

Industrial Marketing Management published five articles in 2017, which three papers were related to an initial investigation on deservitization, thus generating a theoretical framework (Kowalkowski et al., 2017a, b; Valtakoski, 2017). One explanation found for the increase in the number of publications was the strong interest in servitization problems and deservitization in the same year (2017). Nevertheless, in the following years, there was a decrease in the number of papers on the subject in 2019.

Another aspect analyzed was the number of publications by journals. Thirty-six different journals were identified. Table 3 shows the main outlets that presented at least six publications over the analyzed period. The journals Industrial Marketing Management, International Journal of Production Economics, Journal of Manufacturing Technology Management, and International Journal of Operations & Production Management are the journals that have published the most on this subject. Thus, the subject of servitization seems to be well consolidated in the literature. In contrast, the reverse process of deservitization is still incipient, with a limited number of papers, as previously discussed.

Table 3. Leading journals with publications on servitization and deservitization.

Academic journal	Frequency of servitization articles	Frequency of deservitization articles	Impact Factor (JCR)	Publishers
Industrial Marketing Management	10	7	8.89	Elsevier
International Journal of Production Economics	9	2	11.25	Elsevier
Journal of Manufacturing Technology Management	6	0	8.14	Emerald Insight
International Journal of Operations & Production Management	6	1	9.36	Emerald Insight

The Industrial Marketing Management Journal has been the most popular outlet on servitization and deservitization research. Of the seven studies found about deservitization, four publications refer to conceptual articles, which gained prominence in the literature due to a new narrative ‘reserve servitization’, mainly in the studies by Valtakoski (2017) and Kowalkowski et al. (2017a, b). These studies were published in one of the volumes of the journal and presented two special sections on the subject. The first section addresses servitization and advanced business services as a way to increase competitiveness. The purpose of this section was to present the current state of the field before looking at future concerns such as smart servitization in the context of corporate and industrial relations (Kowalkowski et al., 2017b). The second section deals with critical perspectives on the growth of the service. This section aimed to promote and integrate critical research that challenges prevailing assumptions and strengthens the theoretical foundations of the field (Kowalkowski et al., 2017a). In 2018, this same journal highlighted investigations related to the types of uncertainties of services concerning manufacturers and their customers (Kreye, 2017), highlighting uncertainties: environmental, technological, organizational, and relational, as well as the change in strategy to servitization. Within these sections are the studies by Kowalkowski et al. (2017a) and Valtakoski (2017), who addressed issues associated with possible problems faced in adding services in organizations. Collectively, these articles began to conceptualize deservitization, discussing the bias regarding the past, present, and future of services. More recently, some studies have contributed to the theme to identify the possible directions discussed in the literature. Ambroise et al. (2018) present directions for servitization to reduce risks due to the lack of strategy obtained. The authors relate these strategies to three categories: additional services, reconfiguration of activities, and reconfiguration of the business model. The research by Dmitrijeva et al. (2022) conceptualize a procedural perspective on the paradoxes inherent to servitization, where they highlight learning, belonging, organization, and the perception of paradoxical tensions that arise over time.

The International Journal of Production Economics, Journal of Manufacturing Technology Management, and International Journal of Operations & Production Management presented studies focusing on practical issues faced by companies when moving to servitization. It is worth noting that, of the four journals with more publications on servitization and deservitization (Table 3), three of them have published papers that fall within the ten most cited articles (to date), which are: Industrial Marketing Management, Journal of Manufacturing Technology Management and International Journal of Operations & Production Management. The authors and the ten most cited papers in the analyzed period were identified and are shown in Table 4.

The European Management Journal published the first article on servitization in 1988 and is one of the most extensively cited papers in the subject. The paper addressing the subject of deservitization was published in the Industrial Marketing Management Journal in 2017. Regarding the authorship of the most cited papers,

Table 4. Top-ten most cited articles on servitization and deservitization.

Authors	Article title	Journal	# of citations
Vandermerwe & Rada (1988)	Servitization of business adding value by adding services	European Management Journal	1395
Baines et al. (2007)	State of the art in product-service systems	Proceedings of The Institution of Mechanical Engineers	1312
Baines et al. (2009a)	The servitization of manufacturing: a review of literature and reflection on future challenges	Journal of Manufacturing Technology Management	903
Neely (2008)	Exploring the financial consequences of the servitization of manufacturing	Operations Management Research	814
Martinez et al. (2010)	Challenges in transforming manufacturing organizations into product-service providers	Journal of Manufacturing Technology Management	359
Baines et al. (2017)	Servitization: revisiting the state-of-the-art and research priorities	International Journal of Operations & Production Management	308
Kowalkowski et al. (2017b)	Servitization and deservitization overview concepts and definitions	Industrial Marketing Management	187
Kowalkowski et al. (2015)	What service transition? rethinking established assumptions about manufacturer's service-led growth strategies	Industrial Marketing Management	174
Kowalkowski et al. (2017a)	Service growth in product firms past, present, and future	Industrial Marketing Management	169
Benedettini et al. (2015)	Why do servitized firms fail a risk-based explanation	International Journal of Operations & Production Management	149

184 authors were identified in the 89 selected articles, of which 34 authors published more than one paper. Table 5 presents the researchers, the affiliated institutions, the country of origin, and the percentage of articles published by each one of the authors.

Table 5. Researchers who published more articles on servitization and deservitization.

Authors	Institution of Origin	Country	Articles
Tim Baines	Aston University	United Kingdom	12
Andy Neely	University of Cambridge	United Kingdom	6
Ali Ziaee Bigdeli	Aston University	United Kingdom	6
Ornella Benedettini	University Politecnico di Bari	Italy	5
Heiko Gebauer	Linköping University	Sweden	5
Howard Lightfoot	Aston University	United Kingdom	5
Oscar F. Bustinza	University of Granada	Spain	4
Veronica Martinez	University of Cambridge	United Kingdom	4
John M. Kay	Cranfield University	United Kingdom	3
Christian Kowalkowski	Linköping University	Sweden	3
Jawwad Z. Raja	Cranfield School of Management	United Kingdom	3
Nicola Saccani	University of Brescia	Italy	3
Judy Zolkiewski	University of Manchester	United Kingdom	3
Stephen Evans	University of Cambridge	United Kingdom	3

The results demonstrate that most studies on the subject were developed in Europe, more specifically in the United Kingdom (UK). The leading universities researching the subject in the UK are Aston University, the University of Cambridge, Cranfield University, Cranfield School of Management, and the University of Manchester. Other European countries also published influential works on subjects such as Finland, Italy, Sweden, and Denmark. Countries in other parts of the world have also been involved in research on the subject, but with fewer publications, such as the USA, China, Japan, and Brazil.

4.3. Aspects of the deservitization process

A content analysis of the papers was carried out, involving the identification of (i) challenges, (ii) paradoxes, and (iii) failures in servitization, in order to identify the main aspects related to the deservitization process.

4.3.1. Challenges in servitization

The challenges faced by companies when migrating to servitization have gained significant attention in academic and professional circles as organizations have opted for the services strategy (Zhang & Banerji, 2017). Manufacturers needed to simultaneously manage different types of uncertainty than the organizational transition process provided (Zhang & Banerji, 2017; Reim et al., 2019). The ability to manage uncertainty from multiple sources and the potential interactions between types of uncertainty is crucial for organizations. The literature highlights that the most influential approach is based on external and internal sources. Table 6 presents the main challenges identified in the papers.

Table 6. Challenges identified in the literature.

Categories	Challenges	Description	References
Business Model	Modification of the business model	The obstacle in creating, developing, and providing value propositions to customers.	Baines et al. (2009b); Kowalkowski et al. (2015); Zhang & Banerji (2017)
	Customized solutions	Difficulty to succeed with customized solutions.	Kowalkowski et al. (2015); Reim et al. (2019)
Organizational Structure	Resource management	Lack of resources needed in the organization.	Alghisi & Saccani (2015)
	Cultural	Resistance to the needed cultural change and changing clients' mentality.	Neely (2008); Dahmani et al. (2016); Zhang & Banerji (2017); Nudurupati et al. (2016); Ambroise et al. (2018); Yan et al. (2019); Dmitrijeva et al. (2020)
	Communicating and training	Lack of adequate communication and training practices to present customers with solutions that meet their needs and expectations.	Baines et al. (2009b); Reim et al. (2019)
	Commitment and leadership	Lack of commitment and awareness of senior management negatively impacts the involvement and attitudes.	Alghisi & Saccani (2015); Kowalkowski et al. (2017b); Dmitrijeva et al. (2020)
	Development of services capacity and methods	Lack of distinction between service design and product design. Service design features are required to implement the service transition strategy.	Alghisi & Saccani (2015); Zhang & Banerji (2017); Dmitrijeva et al. (2020)
	Integration of the actors	Low integration between customers and suppliers: generates deprivation in the exchange of information between actors, making it difficult to solve problems.	Neenen et al. (2014); Nudurupati et al. (2016); Zhang & Banerji (2017); Ambroise et al. (2018); Aminoff & Hakanen (2018); Reim et al. (2019)
Supplier and Customer	Customer portfolio	Low utilization of factors related to the process.	Neely (2008); Alghisi & Saccani (2015); Dmitrijeva et al. (2020)
	Co-production and Co-creation	Lack of the integrated service resources needed to design and deliver product and service offerings.	Alghisi & Saccani (2015); Green et al. (2017)
	Supply network	Difficulty in analyzing needs and defining partnerships.	Alghisi & Saccani (2015); Nudurupati et al. (2016)
Strategy and Market	Strategy vision	Problems related to strategy in the transition of services may involve resources and competencies of the manufacturers linked to the development of the services business.	Ambroise et al. (2018); Reim et al. (2019); Dmitrijeva et al. (2020)
	Competition	Extending service offerings can lead manufacturers to compete with service network partners who already offer services to customers.	Alghisi & Saccani (2015); Dmitrijeva et al. (2020)
	Relationship of product with the company's brand	Successful branding can become an obstacle in introducing extensions in the services business model.	Neenen et al. (2014); Alghisi & Saccani (2015)
	Market	The market behavior can generate uncertainties regarding the new business model and problems related to new services.	Neely (2008); Iriarte et al. (2019); Dmitrijeva et al. (2020)
	Revenue, price, and sale	Difficulty in pricing offers.	Kowalkowski et al. (2015); Nudurupati et al. (2016); Reim et al. (2019)
	Decision making	Lack of knowledge of manufacturers' competence impacts directly decision making.	Neenen et al. (2014); Alghisi & Saccani (2015)
	Knowledge Management	Difficulty in implementing the knowledge management system.	Alghisi & Saccani (2015)

The challenges addressed in the literature can be classified into four categories: (i) business model, (ii) organizational structure, (iii) strategy and market, and (iv) supplier and customer. The first category refers to the business model, which encompasses the essential business logic of how a company elaborates, develops, and provides value propositions to customers (Kindström, 2010; Zhang & Banerji, 2017). In addition, the literature highlights the need to understand the actual value of services and how much this is advantageous to customers and consumers (Neely, 2008; Valtakoski, 2017). However, this task is not easy, especially when internal employees do not have the same perspective as the client and may present a preliminary design of value propositions not aligned with the client's interests (Brax, 2005; Zhang & Banerji, 2017).

In general, the modification of the business model in servitized companies requires attention due to several changes necessary to integrate the service strategy with the production system (Kindström & Kowalkowski, 2014; Kowalkowski et al., 2015), impacting the resources required in the organization (Kindström & Kowalkowski, 2014; Wang et al., 2016). These resources refer to the: financial and human resources available, with skills and capabilities to develop innovative services (Hou & Neely, 2013; Lütjen et al., 2017). Such resources used by companies are linked to the investment part of services and are considered an issue for companies as it limits the profit margin (Confente et al., 2015).

The second category is related to the organizational structure. Some of the challenges found in the literature are related to the change in the internal structure to support the transformation of the business model (Nudurupati et al., 2016; Zhang & Banerji, 2017). This change takes time for those involved in the process to adapt to the new business model.

The change in the organization's culture and the change in the customer's mindset are essential for the servitization process (Yan et al., 2019). It is necessary to improve internal communication and offer training to support the development of solutions that meet customer needs and expectations (Alghisi & Saccani, 2015). Martinez et al. (2017) report that the difficulty faced by the manufacturer is to understand and manage the transformational processes that manufacturing companies must go through to compete through services, not just products. The studies showed that the main difficulty faced in this category is discovering the unspoken needs of customers and designing product-service solutions as expected. The literature has highlighted that servitization is not a one-way shift from products to product and service offerings (Baines et al., 2020). Another aspect found is the lack of commitment and leadership of senior management. Gebauer et al. (2005), Alghisi & Saccani (2015) and Dmitrijeva et al. (2020) describe that the awareness and commitment of top management are essential for the commitment of employees who are involved in providing the service. This absence of support and a positive attitude from management can negatively impact employee commitment and attitudes.

The third category relates to the relationships between suppliers and customers. Zhang and Banerji (2017) report that interaction is essential to understanding the customer's actual needs. Good interaction with the customer facilitates communication and the sale of new services, overcoming cultural or organizational resistance (Alghisi & Saccani, 2015). The literature reported that some manufacturers faced challenges in establishing and maintaining the required partnerships (Martin et al., 2019) due to the high degree of cooperation required between the manufacturers and their suppliers, customers, and intermediaries (Confente et al., 2015).

The fourth category is related to the challenges associated with strategy and market. The strategic challenge is to adjust the strategy regarding the portfolio of services (Benedettini et al., 2017). Products combined with services tend to be exclusive, difficult for competitors to imitate, and with value for customers (Malleret, 2006). Nevertheless, some servitized companies found difficulties in delivering knowledge and information components packages, not meeting expectations or customer demands (Hou & Neely, 2013; Valtakoski, 2017). All this change directly impacts the market, generating uncertainties in the new business model, which can cause: a lack of demand, conflicts with existing service providers, new competitors, and problems related to new service offerings (Iriarte et al., 2019). Gomes et al. (2021) corroborates the idea that the market is uncertain and state that some organizations are rethinking their growth in the services area due to the various challenges found out in this work.

Overall, companies that adopt servitization have faced numerous challenges related to organizational structure, new capabilities required, modification of the business model, strategy, market, and problems related to the interaction between supplier and customer. Although researchers have explored the challenges from various perspectives, existing studies offer a limited understanding of the impacts of the challenges (Zhang & Banerji, 2017; Iriarte et al., 2019; Reim et al., 2019). The identified challenges could be possibly responsible for the withdrawal of services in some organizations, but existing research has not gone further to identify the consequences of such challenges.

4.3.2. The paradox of servitization

The term paradox of servitization has been discussed in the literature. Rakesh & Menon (2022) describe servitization as a transformation process where organizations start to compete based on product services.

However, the transformation process tends to be extensive and complex (Baines et al., 2020), sometimes requiring significant changes by the organization, mainly in operational processes, capabilities, and platforms (Martinez et al., 2017). According to Dmitrijeva et al. (2022), these changes directly impact the delivery of products and services and their quality. The previous authors also add that, organizations take years to reach the level of high quality (products-services), which makes companies balance the two demands of their competitors, which generates paradoxical tensions.

Several studies support these claims (e.g Gebauer et al., 2005; Brax, 2005; Visnjic et al., 2016; Kryvinska et al., 2020), considering that most of these tensions are related to the significant investments needed to expand the business model, increase the offer of services and, consequently, this also generates, increases costs, risks, and uncertainties of return on investment. In fact, as observed in the literature, the increase in profit does not occur simply by adding services to products (Kryvinska et al., 2020). Nevertheless, Kastalli & van Looy (2013) point out that the profitable growth of services tends to be viable only to the extent that investments in training translate into economies of scale, i.e., when the manufacturer provides services to its entire installed base, and thus obtains the maximum use of factors related to the process. A manufacturing organization may even increase its profits at an early (short-term) stage, but it may also experience a drop in profitability later on.

Other paradoxical issues were also observed. Incorrect or poorly performed service delivery generates high operating costs, directly impacting the company's revenue (Visnjic et al., 2016; Kowalkowski et al., 2017b). In the view of Kowalkowski et al. (2015), the paradox may be related to the provision of customized solutions through the effectiveness of customized solutions and efficiency in the manufacture of products.

Kohtamäki et al. (2020) state that the solution provider must effectively customize the product-service solutions to meet the customer's needs, maintaining its efficiency in the production and delivery of customized products. The cited authors also add that the solution is used to generate value for the customer, but personalization ends up becoming an obstacle to the manufacture and delivery of the product and service. Thus, manufacturing and delivery efficiency are critical to profitability. Corroborating this thought, the study by Dmitrijeva et al. (2022), presents a conceptual structure, based on the servitization stages highlighted by Baines et al. (2020). Figure 4 presents the stages of servitization, as well as the paradoxical tensions organizations face as they progress through their servitization journey.

Servitization stage					
STAGE 1		STAGE 2	STAGE 3	STAGE 4	
Initial learning about servitization		Experimentation and co-development of specific outcome-based services	Increasing the scale of innovation and integration of the product-service offerings	Optimisation and delivery of the servitization portfolio	
Paradoxical tension surfaced between competing demands	Tension between exploiting the established knowledge and building up new frame-breaking knowledge			Learning	Organisational paradox category
	Tension between own identity and the identity of the wider group			Belonging	
	Tension between separating and integrating entities within structures and processes			Organising	
	Tension between short-term and long-term targets			Performing	

Figure 4. Stages of servitization and the paradoxical tensions (adapted from Dmitrijeva et al., 2022).

Figure 4 highlights the stages of servitization and paradoxical tensions. Dmitrijeva et al. (2022) addressed four tensions that manufacturers face as they progress and change their business models, namely: (i) tensions related between exploiting established knowledge and building new knowledge, (ii) tension between own identify and the wider group, (iii) tensions between separating and integrating entities within organizational structure and processes; (iv) tensions related short- and long-term objectives/targets. The paradox of servitization may also be a cause for the withdrawal of services, but existing studies have not addressed that.

4.3.3. Risks in servitization

Some studies have also shown failures in the servitization process (Benedettini et al., 2015; Valtakoski, 2017). The failures are related to the poor development of a profitable service business in conjunction with

the existing product business (Valtakoski, 2017). As previously presented, servitization seeks to increase the interaction between actors. Nevertheless, this involvement does not guarantee the customer's intention to acquire and use a service or new service (Valtakoski, 2017), and this may lead some manufacturing companies to declare bankruptcy (Benedettini et al., 2015). According to the authors cited earlier, as the organization changes its business model, the risks increase. Several studies addressed the issue of risks in servitization and recognized the importance of risk management and control (e.g., Benedettini et al., 2015; Kowalkowski et al., 2015; Nudurupati et al., 2016; Luoto et al., 2017; Martinez et al., 2017; Szász et al., 2017; Zhang & Banerji, 2017; Li & Chen, 2019; Yan et al., 2019). Table 7 presents the three main types of risks found in the literature.

Table 7. Risks related to servitization.

Risks	Description	References
Financial	The change in the organizational structure increases financial requirements	Neely (2008); Alghisi & Saccani (2015); Benedettini et al. (2015); Benedettini et al. (2017); Zhang & Banerji (2017); Reim et al. (2019)
Internal	Problems related to the product's operational process	Finne et al. (2013); Alghisi & Saccani (2015); Benedettini et al. (2015); Kowalkowski et al. (2015); Reim et al. (2015); Nudurupati et al. (2016); Durugbo & Erkoyuncu (2016); Zhang & Banerji (2017); Szász et al. (2017); Luoto et al. (2017); Coreynen et al. (2018); Li & Chen (2019); Yan et al. (2019); Dmitrijeva et al. (2020)
External	Environmental factors may reflect across the enterprise	Baines et al. (2009b); Hou & Neely (2013); Finne et al. (2013); Reim et al. (2015); Alghisi & Saccani (2015); Benedettini et al. (2015); Kowalkowski et al. (2015); Nudurupati et al. (2016); Kreye (2017); Zhang & Banerji (2017); Dmitrijeva et al. (2020)

From a financial point of view, the change in the organizational structure increases financial risks, especially in the implementation of the service, with the development of new functional groups and the hiring of skilled labor (Neely, 2008). In this sense, it is necessary to know the impacts that this change provides. Eggert et al. (2015) report that one way to identify these impacts is through financial performance. The previously mentioned authors add that there are three ways to assess this risk: self-assessment of supervisors, secondary financial data, and longitudinal case studies. From this perspective, an organization's financial performance is generally evaluated in terms of growth, profitability, and value (Zhou et al., 2020).

Regarding internal risks are interruptions that occur in the operational process of the product and affect the fulfillment of operational objectives concerning cost, quality, delivery, and flexibility (Li & Chen, 2019). In addition, according to the previous authors, the ability to manage this risk is related to the power of organizations to reduce the occurrence of operational failure and deal with uncertainties and fluctuations associated process. Baines et al. (2020) highlight that internal risks emerge from organizational structure, corporate culture, power and leadership, internal political characteristics, strategic directions, and level of trust.

Concerning external risks, environmental changes can impact the organization, influenced by the market, ecosystem (Benedettini et al., 2015), and technology (Dmitrijeva et al., 2020). These changes refer to foreign policy, economy, social aspects, and competition to technological development, directly impacting the transformation (Baines et al., 2020). The best way to prevent these risks is to draw up contracts that cover how each variable can change and how changes can influence the results (Hou & Neely, 2013). Nevertheless, developing these types of contracts is complex, making it an obstacle for the supplier to fully understand the possible consequences of their decisions and measure the impacts of potential risks. Hou & Neely (2013) also point out that both the customer and the supplier must predict how these variables will be affected by external risks related to commodity prices and general economic situations. An example of this is technological uncertainty. While the literature offers deep insights into the specific nature of these types of uncertainties in servitization, limited insights exist. External sources cause environmental uncertainty, defined as the unpredictability of a company's external environment.

5. Conclusions

The main contribution of this work was to identify and summarize aspects related to the deservitization movement. The complex relationships between servitization and deservitization are investigated, aiming to understand why companies choose to withdraw services after adding them to their business models. The research contributes to the existing literature by identifying and summarizing theoretical arguments and findings on servitization and deservitization, bringing together reasons why service withdrawal may occur in manufacturing companies, and contributing to calls for further exploration of the subject. This study is important to the literature as it synthesizes previous research and categorize the main issues related to the deservitization movement.

5.1. Theoretical implications

The literature highlights that organizations opted for the path of deservitization due to problems related to the lack of value creation for the customer in the services provided. The study found theoretical arguments about servitization and deservitization, which have occasionally been discussed in the literature separately. In this sense, the research offers an overview, bringing together the reasons why there was a dilution of services and the factors (internal and external) that interfered with the transition process. Moreover, this work highlighted that companies that adopt servitization often face numerous challenges related to organizational structure, new capabilities needed, cultural change, new processes that must be implemented, and a new business model and strategy, which can lead to the withdrawal of services when they cannot be managed. According to the objective of this research, the study identified and summarized issues related to the deservitization process.

5.2. Practical implications

Servitization and deservitization may involve a number of challenges for manufacturers, especially for those faced with the task of evaluating whether it is feasible to implement more services into the business model, or even opt out of it. This study corroborates the view from literature by emphasizing that servitization is not a linear process, based on the challenges and contextual factors encountered. While this study draws on most insights into the servitization and deservitization process, the research helps to understand how challenges were viewed in servitization. What was previously a separate study, to only identify the challenges in servitization, today, one can consider and create a strategy for reverse servitization, justifying the abandonment of services. As identified in this study, by knowing the main issues involved in the transition process to servitization, as well as in the deservitization process, organizations could be able to improve their transition process, in order to circumvent or prevent some problems commonly caused in the transition process.

5.3. Limitations and opportunities for future work

This study was limited to an analysis of existing academic literature. Nevertheless, many issues related to the deservitization movement may be available in practitioner-oriented literature, which was not considered in the analysis. In terms of opportunities for further research, studies have highlighted that there are still fundamental aspects of servitization and deservitization that warrant further research. The literature attributes the organizational change to stages, and that these stages are strongly influenced by contextual factors. It would be interesting to understand how these aspects could be a decisive factor for the growth of services or their abandonment. Future research can also explore other reasons for the deservitization movement, as evidence in existing studies is still lacking. Deservitization is still a subject that needs to be better understood, both in a managerial and academic sense. It is a complex phenomenon, and little is known about it, especially when compared to the already evolved body of knowledge on servitization.

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