



Review

Servitization implementation in the manufacturing organisations: Classification of strategies, definitions, benefits and challenges



Muhammad Mustafa Kamal^{a,*}, Uthayasankar Sivarajah^b, Ali Ziaee Bigdeli^c, Farouk Missi^d, Yannis Koliouisis^e

^a Associate Professor in Supply Chain Management, Subject Lead – Operations Management, School of Strategy & Leadership, Coventry University, William Morris Building, Coventry, CV1 5DL, UK

^b Head of the School of Management Head of Research Centre, Business Analytics, Circular Economy and Supply Chain Chair in Technology Management and Circular Economy Faculty of Management, Social Sciences & Law University of Bradford, Richmond Road, Bradford West Yorkshire, BD7 1DP, UK

^c Centre for Servitization Research and Practice at Aston Business School, Aston University, Aston Triangle, Birmingham, B4 7ET, UK

^d Centre for Servitization Research and Practice, Brunel Business School, College of Business, Arts and Social Sciences, Brunel University London, UB8 3PH, UK

^e Associate Head of School for Enterprise and Commercial, School of Strategy & Leadership, Coventry University, William Morris Building, Coventry, CV1 5DL, UK

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ABSTRACT

The integration of products and services into a bundled product/service offering by manufacturing organisations is seen as a global trend in today's competitive business environment. The shift of product-based manufacturers towards offering business solutions and value-added services to consumers is termed as 'Servitization'. Contrary to the potential benefits expected by adding service activities to the offerings, advocates voice their concerns towards experiential problems and challenges in employing the servitization strategy – termed as 'Servitization Paradox'. Nevertheless, the shift from product-based delivery to a service-based provision has the potential to significantly impact on developing sustainable and eco-friendly environment. To provide greater insights to the servitization phenomenon, this paper presents a comprehensive analysis of the servitization implementation in manufacturing organisations. In order to respond to the latter, we propose the following three research questions "Q1 – what are the different types of servitization strategies?", "Q2 – what are the different servitization definitions?", "Q3 – what are the potential benefits in selecting a servitization strategy?", "Q4 – what are the challenges in transitioning towards servitization?". A systematic literature review is carried out to understand the past trends and extant patterns/themes in the servitization strategy research area, evaluate contributions, summarise knowledge, thereby identifying limitations, implications and potential further research avenues. The key findings confirm servitization studies have contributed both conceptually and empirically to the development and accumulation of intellectual wealth to the manufacturing operations and supply chain discipline. Moreover, the findings clearly indicate the potential of servitization in transitioning manufacturing organisations (e.g. benefits) and utilising innovative technologies to generate business value. Nevertheless, some voices are backing further research/development in the area of servitization due to the several existing challenges.

Article Type: Systematic literature review

1. Introduction

In realising the global transformations in digitising businesses, the industry emphasizing in smart initiatives, in automation and robotisation and the competitive business environment, manufacturing organisations are shifting from traditional product-based business models towards developing and implementing service-oriented business models (Baines, Lightfoot, & Kay, 2009; Baines, Lightfoot, Benedettini,

Whitney, & Kay, 2010; Ferreira, Cova, Spencer, & Proença, 2016; Lightfoot, Baines, & Smart, 2013; Martin, Javalgi, & Ciravegnac, 2018). For instance, several leading multinational titans, such as GE, IBM, Rolls Royce, Fujitsu, and Siemens remained competitive through the basis of value delivered by shifting their market share from manufacturing to more product-service-oriented systems. Over the years, providing services embedded within products' offerings has gradually become a fundamental business constituent for the manufacturing sector (Bigdeli, Bustanza, Vendrell-Herrero, & Baines, 2017; Parida, Sjödin, Wincent, & Kohtamäki, 2014; Vaitinen, Martinsuo, & Ortt,

* Corresponding author.

E-mail address: muhammad.kamal@coventry.ac.uk (M.M. Kamal).

2018). Advocates support that traditional manufacturers can acquire more revenue from their service provisions (as a promising approach) compared to product-based offerings, with added value primarily secured from the service units (Wise & Baumgartner, 1999). This gradual shift towards offering value-added services (i.e. “going downstream”) is influenced by several change factors e.g. changing consumer demands and behaviour, information sharing and management, globalisation of the manufacturing sector, sustainable competitive advantage, market saturation, triadic nature of service supply chains, and diffusion of innovation products and services (Dimache & Roche, 2013; Opresnik & Taisch, 2015; Aminoff and Hakanen, 2018).

The transformation towards services-led business model is collectively referred to as “*Servitization*”, which was initially discussed by Theodore Levitt (e.g. Levitt, 1976), but later captured by Vandermerwe and Rada (1988) and has led to a developing stream of research, including influential works by the likes of Wise and Baumgartner (1999). In essence, servitization, as a process of value-creation through bundling service provision with manufacturing products, has been broadly recognised as a competitive manufacturing strategy. As a research domain, it has been developed considerably in recent years, pushing manufacturing organisations to change their perspective from merely delivering products to creating value added services (Lightfoot et al., 2013).

Contrary to the potential benefits expected by adding service activities to the product offerings, contenders voice their concerns towards experiential problems and challenges in employing the servitization strategy¹ (Gebauer, Fleisch, & Friedli, 2005). Large investments in developing the manufacturing service business may lead to increasing service offerings and greater costs; nevertheless, it may also not always produce the anticipated higher returns (Guo, Li, Zuo, & Chen, 2015). Neely (2008) further suggests that, even if they increase their income returns, servitized manufacturing organisations often make reduced profits compared to non-servitized manufacturing organisations who do not extend their activities into services – traditional product-centric. Matschewsky, Kambanou, and Sakao (2017)) and Lim, Kim, Heo, and Kim (2018)) also identified challenges that manufacturing organisations encounter while implementing servitization e.g. related to strategic alignment and to ensuring customer trust. Despite the significance of the servitization phenomenon, these theorised conceptions clearly question the extent to which manufacturing organisations are able to effectively and efficiently master the transition from product manufacturing to service-centric manufacturing. This transition calls for deeper insights related to the types of servitization strategies e.g. product-service systems and to the types of customers e.g. identifying their service needs (Haber, Fargnoli, & Sakao, 2018).

To provide detailed insights to the phenomenon of servitization and establish a fundamental cognitive reference point, the authors respond through a comprehensive Systematic Literature Review (SLR) of the servitization research literature. To analyse and synthesize the extant literature on servitization strategy research area, we followed the SLR approach proposed by Tranfield, Denyer, and Smart (2003)). The scope and applicability of servitization phenomenon clearly indicates that this area has the potential to support the manufacturing organisations to transition effectively into services (Baines, Lightfoot, Benedettini, & Kay, 2009; Dimache & Roche, 2013). This SLR compliments existing literature through an enhanced descriptive and thematic awareness of the resulting body of knowledge, structuring the servitization research area so as to further develop in a more cognizant and multidisciplinary

approach. This type of profiling research is essential in order to establish an understanding of the servitization area and the growth in the theory and application of servitization strategy within the manufacturing organisations. This paper is predominantly descriptive and inductive in nature; the interest is on understanding the concepts of servitization and its distinctiveness as practiced by manufacturing organisations. The remainder of this paper is structured as follows. Section 2 provides a normative perspective on the servitization area. Thereafter, Section 3 presents the research methodology highlighting the overall research conducted in this paper. Then, in Section 4, we present, analyse and discuss the overall SLR findings. Finally, conclusions, implications for theory and practice, limitations and potential future research avenues are offered in Section 5. This should provide some fresh insights and contribute further understanding about servitization research. Finally, this work contributes with the intention of providing a robust SLR and synthesis of the previous literature on servitization.

2. Servitization in manufacturing: a normative perspective

Following the earlier normative studies conducted by Baines, Lightfoot, Benedettini et al. (2009); Schmenner (2009); Finne, Brax, and Holmström (2013)); Lightfoot et al. (2013) and Benedetti, Cesarotti, Holgado, Introna, and Macchi (2015) and Baines, Bigdeli et al. (2017) on servitization (in relation to operations management, reversed servitization paths, change management, interdependent trends in servitization), this paper attempts to broaden the scope of their reviews by further investigating and assessing the different servitization strategies in the manufacturing organisations. Although these research studies provide greater understanding on some aspects of servitization area, there seems to be a lack of a comprehensive and methodical approach to understand the phenomenon of servitization. Table 1 presents a summary of the SLRs and general literature review articles published on servitization. This summary further differentiates the work presented in this paper with the extant literature. The themes/focus generating from this analysis highlights that each paper published on different aspects on servitization.

3. Research Methodology

3.1. Introduction

This study adopts a SLR methodology to review the extant conceptual and empirical research on servitization (Tranfield et al., 2003). According to Tranfield et al. (2003) undertaking a literature review to provide the best possible manifestation for enlightening policy and practice in any discipline, is a key research objective for the academic and practitioner communities. This further adds to the significance of such literature review papers that may further result in aiding evidence-based decision-making in the future research endeavours. Thus, the authors follow a three-phase approach as outlined by Tranfield et al. (2003) and diagrammatically illustrated in Fig. 1:

- Phase I – Planning the Review Process – Defining the research aim and objectives (I.1); preparing the proposal (I.2) and developing the review protocol (I.3);
- Phase II – Conducting the Review Process – Identifying, selecting, evaluating and synthesising the pertinent research studies; and
- Phase III – Reporting and Dissemination of the Overall Research Results – Descriptive reporting of results and thematic reporting of journal articles.

Following this three-phase approach, the next subsection 3.1 summarises the research protocol (Phase I.3) as the defining of the aim and objectives including the proposal (I.1 and I.2) have already been presented in the introduction section. Sub-section 3.2 describes the Scopus

¹ By strategy(ies) we mean “a plan of action(s) designed to achieve a long term goal of a business. In the context of servitization, we refer to servitization strategy where an organisation chooses to strategically shift from a product-oriented to services-oriented business formation – as a long term plan/goal. Examples include, product-centric servitization strategy, integration oriented product-service system, product oriented product-service system, product-centric services, etc.

Table 1
Differentiating this SLR from Extant Literature Reviews.

Reference	Summary	Main Focus	Research Gap
Nordin and Kowalkowski (2010)	This article offers a critical analysis of the literature of solutions and offerings and presents a conceptual framework comprising of dimensions that distinguish between the different kinds of solutions and connect their different characteristics. The review highlights that there is no unanimous and rigorous definition of solutions, but rather a number of often broad and generic descriptions that could be applied to a wide array of different offerings.	Developing a conceptual framework.	Gap exists in the extant literature in terms of a horizontal analysis of the servitization strategies and what the benefits are specifically upstream for the manufacturing organisations. There is increasing infusion of theory into servitization research, for instance, in relation to Resource-based View (RBV) and Transaction Cost Theory (TCS) appearing recurrently. This mirrors mounting pressures on researchers in servitization area, to offer robust theoretical foundations.
Lightfoot et al. (2013)	Using an evidenced-based approach, this SLR is associated with the servitization of manufacturing. This incorporated a descriptive and thematic analysis of 148 academic and scholarly papers from 103 different lead authors in 68 international peer-reviewed journals. The results indicate varying degrees of interdependency among research communities, which are associated with the concepts of product-service differentiation, competitive strategy, customer value, customer relationships and product-service configuration.	Identifying the main concepts of Product Service Systems (PSS).	Though this is significant, there is also a need for extended empirical research that explicate business logic, combining theory, evidence, and examples to create bold propositions for business. In this specific context, the paper by Wise and Baumgartner (1999) , is a prime case, and its contributions are highly valued.
Boehm and Thomas (2013)	This article conducted a review to integrate the results of the fields of information systems, business management, and engineering & design and hence to investigate the state-of-the-art in Product Service Systems research. The review analyses a total of 265 papers and provides a meta-analysis of previous literature highlighting varying interpretation of PSS in the three disciplines. Therefore, a research agenda for future research is developed which includes for example the need for clarifying the terminology, changing perspectives, and conducting more evaluations.	A meta-analysis of PSS by combining three different disciplines; information systems, business management, and engineering & design.	Nearly every journal article proposes future research recommendations, nevertheless, it has been more than a decade since Oliva and Kallenberg's (2003) and Davies, Brady, and Hobday (2006) influential research was published focusing on different ways of developing integrated goods-services solutions following in-depth studies of industry norms and practices. Thus far, the application of the concepts and language of servitization is still not prevalent among majority of practitioners. Thus, new methods and procedure are required to fulfil this literature void, resulting in minimising the theory-practice disparities at large.
Beuren, Ferreira, and Cauchick (2013)	This article reviews the literature on PSS, including 149 papers published from 2006 to 2010. The review discussed specific features of the PSS as well as the benefits and drawbacks. This article reports that the concept and empirical applications of the PSS have remained immovable. The authors suggested that researchers in PSS should investigate into the environmental and social aspects of this topic – this latter aspect acts as the main barriers to achieving a wholly successful PSS. They continue to say that other important barrier for all parties involved with the implementation of PSS, is the cultural change. Hence, there is a need for the development of PSS models.	Environmental, social and cultural aspects related to PSS implementation.	
Reim, Parida, and Ortqvist (2015)	This article presents a comprehensive review on PSS business models and tactics. They identified five tactical sets that explain the competitive choices associated with each business model category. This article presents a novel relationship between PSS business models and tactics, more precisely contracts, marketing, networks, product/service design, and sustainability. The authors further highlight that PSS business model implementation remains an important yet understudied area of research in the PSS literature.	PSS business models and tactics.	
Kowalkowski et al. (2015)	This article argues that the established assumptions underlying the service transition concept is problematic. The researchers challenge the service transition assumption and propose how product firms should pursue service-led growth. Using 'problematization methodology', and drawing on findings from thirteen suppliers of systems, the authors present three service-led growth trajectories i.e. becoming an availability provider, which is the focus of most transition literature; becoming a performance provider, which resembles project-based sales and implies an even greater differentiation of what customers are offered; and, becoming an 'industrializer', which is about standardizing previously customized solutions to promote repeatability and scalability.	The transition to servitization	
Tukker (2015)	This article presents a review of 140 papers focusing on PSS. The review highlights how firms have implemented PSS in their organisation and what the key success factors and issues that require attention are such as a focus on product availability for clients; an emphasis on diversity in terms of services provided rather than the range of products; and the need for staff to possess both knowledge of the product and relationship management skills. The paper also reports on the reasons why PSS have not been widely implemented in the B2C context.	Implementation of PSS.	

(continued on next page)

Table 1 (continued)

Reference	Summary	Main Focus	Research Gap
Brax and Visintin (2017)	This article presents a systematic profiling framework thereby comparing different value constellations of industrial, service-based business models. The study analyses 154 research articles on servitization in order to produce an integrative meta-model of servitization. The review presents three different approaches to represent servitization which are classified as end-state models, gradual transition models, and stepwise progression models. The meta-model ties different perspectives, models and terminology into a base line theory of servitization as a process and enables a systematic comparison of the different empirical studies.	Developing an integrative meta-model of servitization.	
Annarelli, Battistella, and Nonino (2016))	This article presents a conceptual structure depicting the current situation of literature dealing with the analysis of economic impact and environmental/social impact of PSS. Their work sets out to contribute to a critical theory debate through the presentation and use of a framework for the categorisation of literature linked to PSS. They concluded that PSS literature has been and still is, mostly focused on the description and analysis, through case studies, of real implementation cases.	Categorisation of PSS against three streams; economic, environmental and social impact.	
Gebauer, Joncourt, and Saul (2016))	In this business review, the authors reflected on the past, present, and future of the service research in product-oriented companies. The authors explored the way in which the literature on services in product-oriented firms has been evolving and taking shape. This article presents examples that show why the transition from a product manufacturer to a service provider across sectors has a high practical relevance for companies. The latter supported the researchers in highlighting the underlying key concepts, and describe future research directions.	The importance of transitioning from a product manufacturer to a service provider.	
Kowalkowski, Gebauer, and Oliva (2017))	This article provides a critical inquiry into the past, present, and future of the service growth in product firms. The researchers report that research in this area is still largely in a nascent phase. Highlighting the contributions of papers already published in and emphasizing their challenges to prevailing assumptions in this research domain. The researchers conclude by identifying suggested themes for further research on service growth: the assessment of empirical evidence of the impact of service growth on firm performance, the role of merger and acquisitions in the service growth strategy, the exploration of single/multiple positions along the transition line, the process of adding or removing services, and expanding the context of service growth beyond product manufacturing firms.	Generalist approach on the importance of service growth in product firms.	
Kowalkowski, Gebauer, Kamp, and Parry (2017))	This article examines the challenges related to service growth strategies, as well as strategies involving de-servitization, in other words a retreat from service offerings. They sought to bring greater clarity to the core concepts of servitization, de-servitization, service infusion, and service dilution.	Focus on de-servitization or a retreat from service offerings.	
Vendrell-Herrero, Bustinza, Parry, and Georgantzis (2017))	This article explores how digital disruption affects Business-to-Business (B2B) interdependencies. The authors proposed that the new market conditions can empower downstream firms, which can still capture additional value through digital service if their servitized offer includes difficult to imitate elements.	Digital servitization.	
Kamp and Parry (2017)	This research proposed a framework to analyse how PSS offerings create value as perceived by the customer, and described how this framework can contribute to developing effective PSS that create sustainable value for manufacturers considering servitization. The study seeks to help companies overcome the servitization paradox, and to provide a further operationalization of the concept of value-in-use from a customer's perspective.	Focus on how PSS offerings create value.	
Baines, Bigdeli et al. (2017)	This systematic review article consolidates the servitization research discipline and knowledge from the organisational change management perspective, thereby presenting a theoretical framework. The researchers adapt to the Pettigrew Model and extend these to develop their own theoretical framework to study the phenomenon of servitization, such as the context of transformation, process of transformation, content of transformation, and descriptive and prescriptive orientation – all resulting in the development of a theoretical framework.	Focus on organisational change management.	

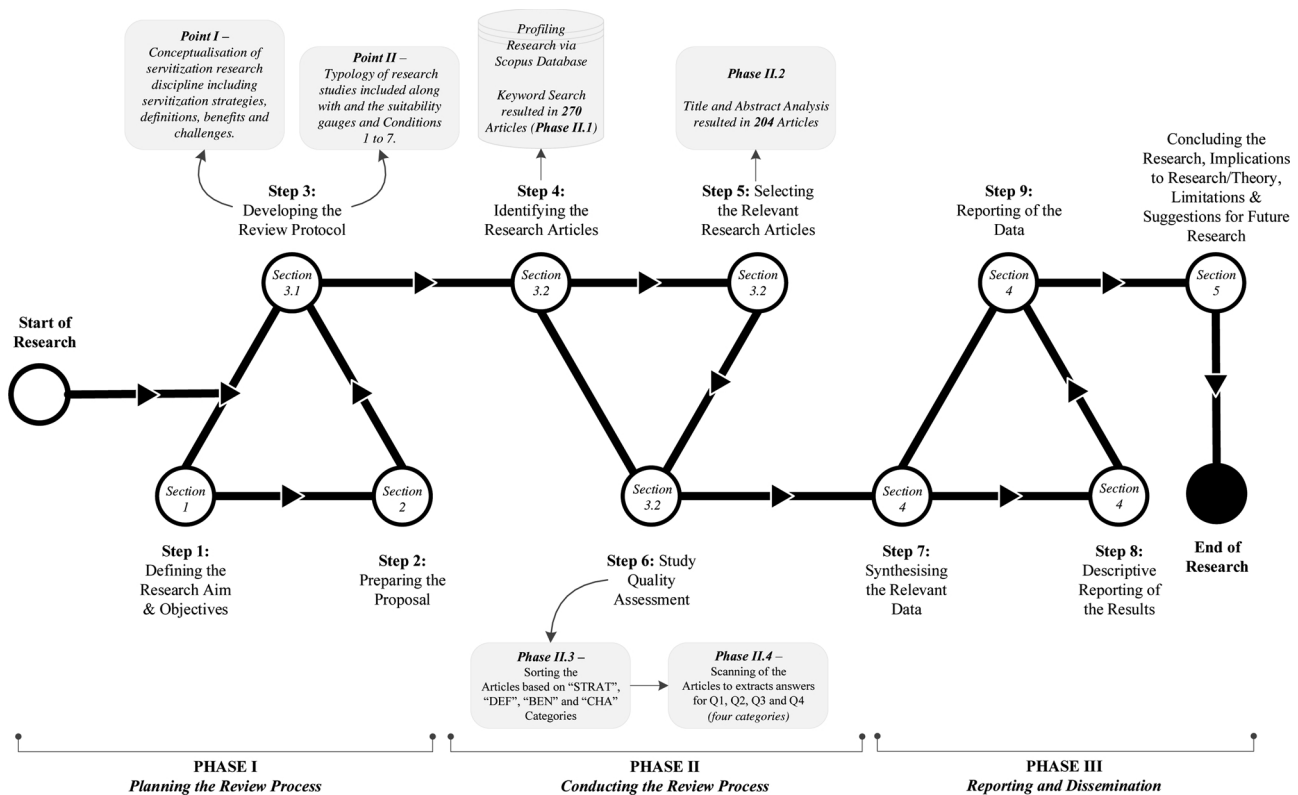


Fig. 1. Research Design – Systematic Literature Review Process.
(Note: Section 1 to Section 5 refers to the Section headings of this paper).

database searching process of the relevant articles (Phase II). Finally, the reporting and dissemination the overall results (Phase III) are discussed in Section 4.

3.2. Research questions

Based on the literature review, we identified a certain gap in the analysis in terms of a horizontal analysis of the servitization strategies and what the benefits are specifically upstream for the manufacturing organisations. To provide greater insights to the servitization phenomenon, this paper presents a comprehensive analysis of the servitization implementation in manufacturing organisations. In order to respond to the latter, we propose the following three research questions:

- Q1–what are the different types of servitization strategies?
- Q2–what are the different servitization definitions?
- Q3–what are the potential benefits in selecting a servitization strategy?
- Q4–what are the challenges in transitioning towards servitization?

3.3. The research protocol (phase I.3)

The research review protocol was developed around Q1, Q2, Q3 and Q4 as outlined above by following a prescriptive three-phased approach. As this SLR focuses on analysing, synthesising and presenting a comprehensive structured analysis of the normative literature on servitization, it was necessary to consider both conceptual and empirical (including qualitative, quantitative and mixed method) papers for research synthesis. The research protocol for this SLR provides details on the following two points, as also followed by Delbufalo (2012):

- **Point I** – Conceptualising servitization research discipline and its related servitization strategy in the manufacturing organisations, including benefits and challenges of transitioning towards servitization.

- **Point II** – Typology of research studies to be considered in this review and the appropriate measures.

In view of the above, several selections in relation to the typology of research studies to be counted in and the suitability conditions (i.e. the inclusion and exclusion measures) have been made (Point II).

- **Condition 1**– The review was conducted by only using the Scopus database. This database asserts to be the largest abstract and citation database of research literature and quality of web sources. Though, this claim is challenged by other databases (e.g. Web of Science, EBSCO), yet Scopus is easy to navigate and due to its multi-disciplinary nature, it facilitates the researchers to explore beyond their research discipline. Nevertheless, it is difficult to endorse that one is better than the other. These databases complement each other as neither database, despite big claims, is all inclusive. Additionally, choosing Scopus was also attributed on it covering nearly 36,000 titles from over 11,000 international publishers, including covering over 34,000 peer-reviewed journals.
- **Condition 2** – in order to enhance quality (David & Han, 2004) only articles published peer-reviewed journals (including articles in press) and conference articles were considered by selecting ‘Article’ option from the Document Type option. Other document types such as trade publications, books series, book or book chapter, reviews, and editorials were omitted.
- **Condition 3** – Following David and Han’s (2004) enhancing quality control policy, only those articles were selected that were published between 1988 and 2018.
- **Condition 4** – Articles published in English language were only selected, excluding the articles published in other languages.
- **Condition 5** – It was ensured that the selected articles were not only empirical based (i.e. case-study, survey, results, analytical, etc.) but also those paper that were essentially conceptual so as to identify conceptual research developments in servitization area, including

the types of servitization strategies, servitization definitions, benefits and challenges in transitioning to servitization.

- **Condition 6** – Articles' applicability was confirmed by requiring that selected articles contained a number of key phrases throughout the paper including, title, abstract, keywords and the paper content.
- **Condition 7** – Finally, substantive applicability was confirmed by reading the remaining whole article for essential research perspectives and satisfactory empirical data. The latter process forced the alignment between the selected articles and the research review objectives.

The abovementioned conditions itemised in seven points were all firmly followed so as to conduct an effective and reproducible database examining process as pronounced in the following subsection.

3.4. Scopus database searching process and results – phase II

According to Delbufalo (2012), there are four stages of database searching process. This section reports on these steps and activities of the process and demonstrates the outcomes both descriptively and synthetically by searching for relevant articles through the Scopus database.

- **Phase II.1**– In order to identify the relevant articles through the Scopus Database, the following keywords search criteria were used following the conditions 2, 3 and 4 in subsection 3.1. This process resulted in 270 relevant publications, 204 of which were qualified as relevant after filtering according to the restrictions.
 - o “*Servitisation*” OR “*Servitization*” OR “*Servitisation Processes*” OR “*Servitization Processes*” OR “*Servitisation Process*” OR “*Servitization Process*” OR “*Servitisation Supply Chains*” OR “*Servitization Supply Chains*” OR “*Servitisation Supply Chain*” OR “*Servitization Supply Chain*” OR “*Service Strategy Implementation*” OR “*Service Business Models*” OR “*Service Business Model*” OR “*Advanced Service Implementation*” OR “*Product-Service Formulation*” OR “*Product-Service Implementation*” OR “*Product-Service System*” OR “*Product-Service Systems*” AND “*Manufacturing Site*” OR “*Manufacturing Sites*” OR “*Manufacturing Firm*” OR “*Manufacturing Firms*” OR “*Manufacturing Organisation*” OR “*Manufacturing Organisations*” OR “*Manufacturing Organization*” OR “*Manufacturing Organizations*” OR “*Manufacturing Company*” OR “*Manufacturing Companies*” OR “*Manufacturing Enterprise*” OR “*Manufacturing Enterprises*” OR “*Manufacturing Sector*” OR “*Manufacturing Industry*”.
- **Phase II.2**– A title and abstract analysis was thereafter conducted on the extracted articles based on the conditions 5 and 6. No further articles needed elimination; at the end of this process, the same numbers of articles (i.e. 204 – from 1988 to 2018) were considered.
- **Phase II.3** – For this step, the authors followed the quality criteria matrix as adopted by Ping and Jia (2010). In this step, the selected 204 articles were further scanned through in order to search both conceptual as well as empirical studies against the criteria highlighted in conditions 6 and 7. All selected articles were grouped into four categories, more precisely STRAT, which stands for Servitization Strategy, DEF, which stands for servitization definitions, BEN, which stands for benefits of transitioning towards servitization manufacturing including the reasons for transitioning towards servitization manufacturing and CHA, which stands for challenges in transitioning towards servitization). We will define those Categories as:
 - o “**STRAT**” was defined to incorporate all the studies as certainly pertinent because each article either reported or discussed or evaluated the servitization implementation strategy. Therefore, for this category all the 204 papers resulted as productive.
 - o “**DEF**” was defined to understand how different researchers have defined servitization in the context of their research. We reviewed all the 204 articles to extract definitions and resulted in presenting

35 definitions (presented in Table 2).

- o “**BEN**” was defined for those studies that were relevant for extracting information on servitization benefits i.e. these benefits justified the rationale for manufacturing organisations to transition towards servitization. After thoroughly analysing the 204 articles, almost every article presented or discussed on the benefits of transitioning towards servitization.
- o “**CHA**” was defined for those studies that reported on challenges in transitioning towards implementing servitization strategy. For this category, the articles were again further analysed to identify the challenges. This exercise also finally resulted in selecting all 204 articles for further investigation.

The applicability assessment was considered as relative, to the degree that the authors' decrees were focused on facets defined within the scope of the review process.

- **Phase II.4**– Herein, beginning within the STRAT category and followed by DEF, BEN and CHA categories, the full-text version of 204 articles were both read by two researchers thoroughly, so as to confirm substantive relevance both conceptually and empirically as mentioned in conditions 6 and 7.

This analysis was conducted descriptively and inductively using a standard template adapted from the works of Delbufalo (2012) to make it relevant to the context of this paper. For instance, the descriptive analysis produced the following information – yearly publications, type of servitization strategies and associate approaches, classification of servitization definitions and resulting core themes, and servitization benefits and challenges (see complete section 4).

4. Empirical Findings Analysis and discussions

Each of the following subsections discuss on the findings in relation to a particular variable set earlier in the paper (objectives).

4.1. Yearly Publications from 1988 (January) to 2018 (December)

As presented in Fig. 2, the largest number of publications were recorded for year 2018 (with C = 63), followed by year 2015 (with C = 29), 2014 and 2017 (with C = 27) and year 2014 (with C = 18). With fewer publications (i.e. below the 5 mark) were recorded from 1988 until 2010. There may be more papers on servitization and product-service systems, however, this count of papers are based on the keywords set earlier in the paper. Fig. 2 clearly illustrates the trend of a constantly increasing number of journal and conference articles in the servitization research area specifically from 2011 onwards until 2015 but then declined in 2016 and then there was a sharp increase from 2017 onward.

The gradual upward trend in the number of articles clearly highlights the awareness and the importance of this area among the practitioners (specifically within the manufacturing sector), academic community and even governments worldwide (e.g. Johnson & Mena, 2008; Baines, Lightfoot, Kay et al., 2009; Opresnik & Taisch, 2015; Haber et al., 2018). Despite the increase in the number of papers on servitization, when looking specifically at the context of manufacturing organisations the articles published clearly indicates that this research domain is still emerging and requires further in-depth conceptual as well as empirical research studies a notion also supported by Parida et al., 2014. We compare this to papers from similar disciplines such as Supply Chain Management, which according to Scopus database presents around 31,744 articles from 1982 until 2018.

On the contrary, there are researchers who assert the concept of servitization may have already existed 150 years ago (Schmenner, 2009) or as in the words of Levitt (1972), p. 42) “*everybody is in service*”. Predominantly the manufacturing sector has mainly offered services

Table 2
A Classification of Servitization Definitions/Description.

Source	Servitization Definition/Description	Core Theme of the Definition/Description
Vandermerwe and Rada (1988), p. 314)	Servitization “is the increased offering of fuller market packages or ‘bundles’ of customer focused combinations of goods, services, support, self-service and knowledge in order to add value to core product offerings”.	Integrated Product-Service Offering
Tellus Institute (1999)	Servitization is “the emergence of product-based services which blur the distinction between manufacturing and traditional service sector activities”	Product-Based Services Offering
Verstrepen and van Den Berg (1999)	Servitization is about “Adding extra service components to core products”.	Product-Based Services Offering
Wise and Baumgartner (1999)	Servitization is defined as “a transition from the business model toward a customer relationship orientation, results-driven solutions and customised value offerings” and or it is about “going downstream into more lucrative product related services.”	Going Downstream
Stremersch et al., (2001)	Servitization is described “as a step-by-step pathway on a products-to-services continuum in which manufacturers provide extended service portfolios for their installed bases throughout their operative lives”.	Product-Service System
Robinson, Clarke-Hill, and Clarkson (2002))	Servitization “is a concept which goes beyond providing additional services but considers the total offer to the customer as an integrated bundle consisting of both the goods and the services”.	Integrated Product-Service Offering
Galbraith (2002), p. 194)	Servitization is to “create an organisation that can package and deliver the solutions”.	Product-Service System
Oliva and Kallenberg (2003)	Servitization is about “transitioning from products to services”.	Product-Service System
Slack et al. (2004)	Effective servitization requires “the co-ordination of manufacturing systems, maintenance systems, spare parts supply systems, logistics systems, and so on”.	Seamless Communication and Service Offering
Davies (2004)	Servitization is conceived of “as an extensive strategic change in which customised life-cycle solutions are offered”.	Strategic Approach and Customisable Services
Davies (2004)	Servitization is defined as a “trend in manufacturing firms to offer for integrated bundles, or both solutions and operational services”.	Integrated Product-Service Offering
Slack (2005)	Servitization is a “strategy that seeks to change the way in which product functionality is delivered to its markets (by marketing the capability rather than the product)”.	Product Functionality and Capability
Lusch and Vargo (2006)	Servitization is the “the application of specialised competences (knowledge and skills), through deeds, processes, and performances for the benefit of another entity, or the entity itself.”	Application of Knowledge and Skills
Brax (2005)	Servitization is a “process in which companies are adding more and more value to their core offering through services”.	Value through Services
Ward and Graves (2005)	Servitization is about “increasing the range of services offered by a manufacturer”.	Service-Centric Offering
Ahlström and Nordin (2006)	Servitization is a “strategy that seeks to establish service supply relationships to deliver product services in order to augment a physical product”.	Strategic Approach and Service Relationship Management
Nordin (2006)	In servitization strategy, business solutions, full maintenance contracts, and managing customers’ operations are valued over repair, product support, product-oriented training, installation, systems integration.	Service Management
Ren and Gregory (2007)	Servitization is “a change process wherein manufacturing companies embrace service orientation and/or develop more and better services, with the aim to satisfy customer’s needs, achieve competitive advantages and enhance firm performance”.	Service-Centric Offering
Johnson and Mena (2008)	Servitization is a “competitive strategy that involves the bundling of products and services. Servitization involves a customer proposition that includes a product and a range of associated services”.	Competitive Strategy and Product-Centric Approach
Johnstone, Dainty, and Wilkingson (2008))	Servitization is the “general trend away from a ‘pure product’ orientation towards a combined product-service offering”.	Integrated Product-Service Offering
Lewis, Howard, and Stone (2008))	Servitization is a “strategy in which manufacturers place a greater emphasis on a whole range of novel product-service combinations”.	Product-Service System
Lewis et al. (2008)	Servitization may be either ‘value creating’ (additive in customer perceived value) or ‘efficiency maximising’.	Value through Services
Lindberg and Nordin (2008)	Servitization is the “trend where firms move from manufacturing goods to providing services or integrating products and services into solutions or functions”.	Integrated Product-Service Offering
Johnstone, Dainty, and Wilkinson (2009))	Servitization is a “trend towards integrated solutions, P-Ss or PSSs”.	Integrated Product-Service Offering
Baines, Lightfoot, Kay et al. (2009)	Servitization is “the innovation of an organisation’s capabilities and processes to shift from selling products to selling integrated products and services that deliver value in use”.	Innovation and Capabilities
Baines, Lightfoot, Benedettini et al. (2009)	Servitization i.e. product-centric servitization – a service portfolio is directly coupled with the product offering”.	Product-Centric Approach
Baines, Lightfoot, Peppard et al. (2009)	Servitization is widely recognised as “the process of creating value by adding services to products”.	Value through Services
Baines et al. (2010)	Servitization is the offering of goods combined with closely related services.	Integrated Product-Service Offering
Neely (2008)	Servitization is “the movement in which manufacturing firms move beyond manufacturing and offer services and solutions, often delivered through their products, or at least in association with them”.	Product-Centric Approach
Neely (2008); Baines, Lightfoot, Kay et al. (2009)	Servitization is the innovation of an organisation’s capabilities and processes so that it can better create mutual value through a shift from selling products to selling product-service systems.	Innovation and Capabilities
Pawar et al. (2009), p.469)	Servitization refers to “a transition ... from an emphasis on the manufacture of products to the provision of service”.	Product-Service Systems
Schmenner (2009)	Servitization is a term coined “to capture the innovative services that have been bundled (integrated) with goods by firms that had previously been known strictly as manufacturers”.	Innovation and Integrated Product-Service Offering
Desmet, Van Dierdonck, Van Looy, and Gemmel (2013))	Servitization is a “a trend in which manufacturing firms adopt more and more service components in their offerings”.	Service Adoption
Chen (2015)	The manufacturing servitization “is a migration process wherein product companies embrace a service orientation and/or develop more and better services, with the aim to offer total client solutions”.	Service-Centric Approach
Li et al., (2015)	Servitization is among the strategies that firms employ when they abandon the tradition to focus only on tangible products and turn to service offerings for vitality.	Product-Centric Approach

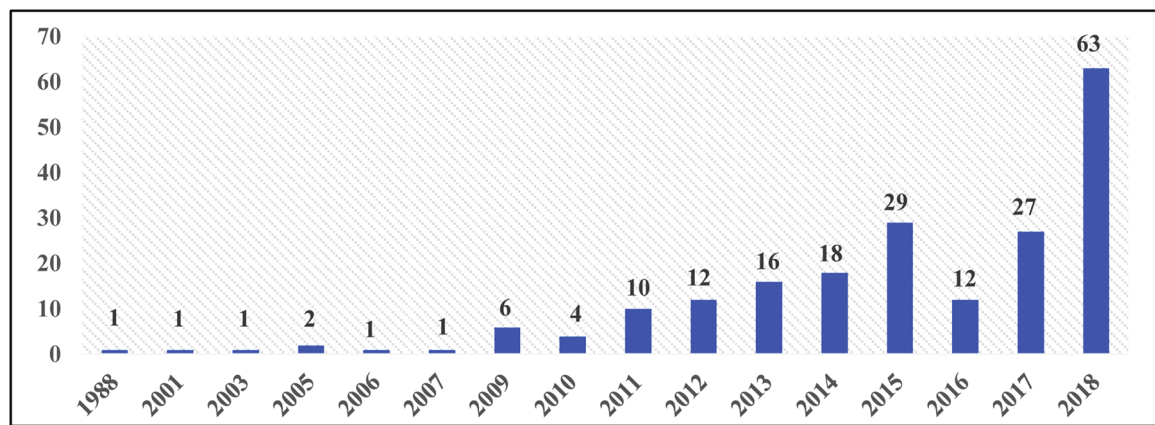


Fig. 2. Number of Papers Selected.

with their products in one form or the other (such as warranty, repairing, maintenance, etc.), nevertheless, such services appeared to be supplementary services – a well manufacturing practice to increase market share. Since coining the phrase “servitization” and more recently, this concept of “service provision” in different forms of servitization has enforced manufacturers to view services more strategically – to strive more on the basis of value rather than lowering the product costs. Regardless of these differing conceptions on servitization or service provision, there is limited agreement as to how to capture the real essence of servitization at a broader scale.

Given the increasing significance as well as the differing nature of the servitization research area, it is anticipated that extensive research is still required to develop possible reference frameworks on which future research could be based for further consolidation of the area itself and knowledge in servitization – mainly focusing on financial performance and impact (Ambroise, Prim-Allaz, & Teyssier, 2018), analysis of the degree of novelty of service innovations (Goduscheit & Faullant, 2018), industry 4.0, big data analytics and inclusion of other innovative technologies (Grant & Yeo, 2018), lack of focus on emerging economies (Marjanovic et al., 2018), and lack of leadership styles supporting transition to servitization (Kim & Toya, 2018).

4.2. Types of Servitization Strategies & Associated Approaches (Q1)

Manufacturing organisations have been selling services for some time (Baines et al., 2010). There has been a dramatic change in the way services are produced and marketed by manufacturing organisations leading to different forms of servitization strategies (Finne et al., 2013). Ahamed, Inohara, and Kamoshida (2013) highlights that the rationale for developing service operations, extending the services business and integrating products and services can be classed into viewpoints that drive companies to pursue a servitization strategy; such as, strategic, financial, economic, marketing and environments. There are various other categorisations of servitization (or product-service systems) types. For instance, Vandermerwe and Rada (1988) and Lin et al., 2010 mainly define two types of servitization strategies:

- *product-centric strategy* or *product-oriented servitization strategy* with the aim of providing products and related services (normally after-sale services) on time to the customers, and
- *service-centric* or *service-oriented servitization strategy* with the aim of providing related services or servitized products in a timely manner.

On the other hand, Tukker (2004) defines, based on the literature, three main types:

- *product-oriented services*, where the business model focus is mainly on sales of products with but some minor services included.

- *use-oriented services*, where the focus is still essentially on the product, however, the business model does not focus on selling the product.
- *result-oriented services*, where the client and provider agree on a result with no pre-determined product involved.

In Fig. 3, we present the overall theoretical illustration of servitization process including different types of servitization strategies.

4.3. (Adapted from Vandermerwe and Rada [1988], Lin et al., [2010], Tukker [2004])

As reflected on Table 2 (Appendix 2), servitization has been studied from different perspectives i.e. different terminologies are used by the articles reviewed to represent servitization as a strategy (please refer to Appendix 2, Table 2). These different terminologies signify the diversity of the servitization phenomenon as well as of the discipline. In essence, literature highlights the positioning along a ‘product-service continuum’ that extends from conventional manufacturers simply offering services as supplements to their core products, through to service provision where services are the core fragment of their value creation process.

To address Q1, we analysed each paper in depth and extracted the types of approaches/practices associated with each type of servitization strategy implemented in the manufacturing organisations (Fig. 4).

Regardless of any servitization strategy adopted, a common theme in this service provision is the drive for demonstrating how the inclusion of intangible services can supplement the sale or lease of tangible products, and their significance for the development and competitive success of manufacturing organisations. Through this SLR exercise, we recognised the significance of the product-service based servitization strategy and the way in which this strategy supports traditional manufacturing in transitioning to service-based manufacturing. Almost all the papers reviewed in this SLR exercise clearly highlight the reasons manufacturing organisations aspire to include more services in the offerings e.g. expedite their products sales, prolong relationships with existing customers and expand on market share, support in developing more growth opportunities in global markets and respond to demands from different stakeholders. From the SLR analysis, it is also evident that services and manufacturing organisations may have several distinct differences that derive from the consumable, intricate and multi-functional character and type of services and service operations. With the scale of the types of manufacturing operations (e.g. production, design and development, distribution), it can be alleged that production and delivery system of products are two separate operations in the manufacturing organisations, nevertheless, they are inseparable in services.

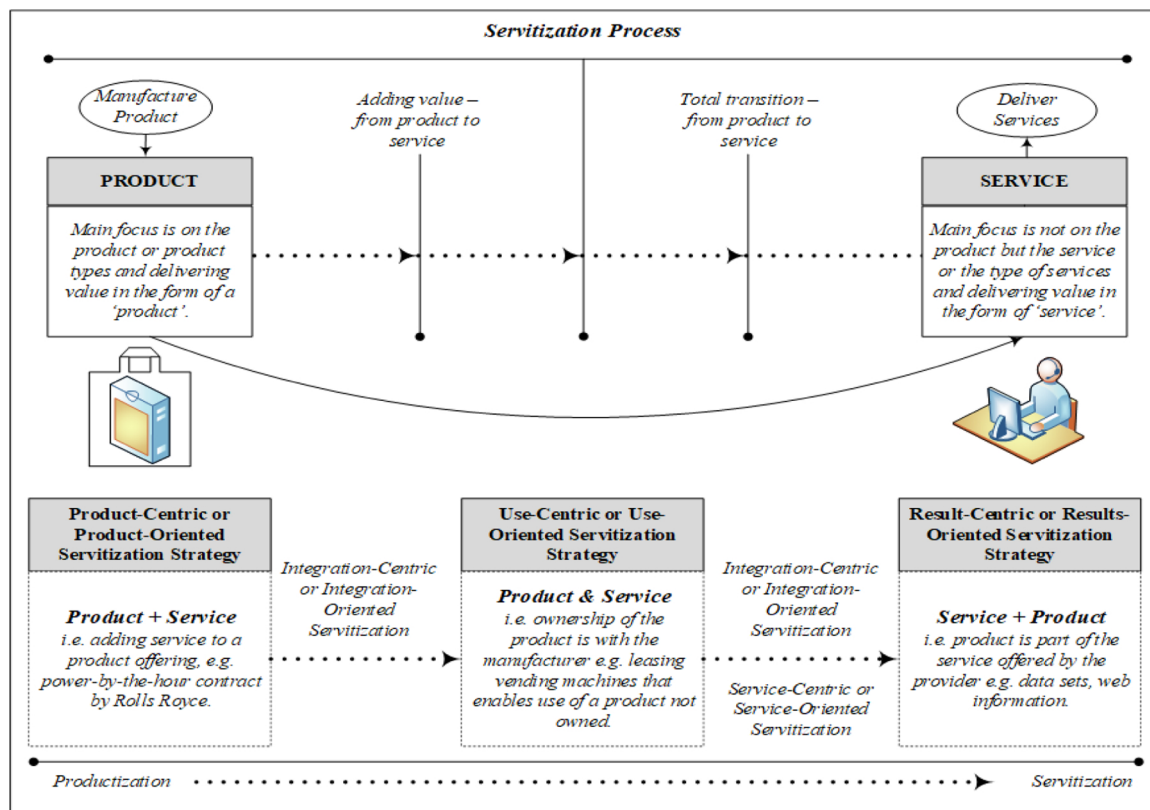


Fig. 3. Types of Servitization Strategies and Process.

4.4. A classification of servitization definitions and themes extracted (Q2)

There is no uniform definition of the term servitization (Baines, Lightfoot, Benedettini et al., 2009). Nevertheless, what servitization may bring to manufacturing organisations appears to be substantial as evidenced from the viewpoints presented in servitization literature. For example, it can set entry barriers for potential competitors, and similarly, can offer distinguished market offerings and new innovations. Having reviewed the literature, both the findings from the earlier (i.e. Vandermerwe & Rada, 1988) and also the findings from the contemporary (e.g. including among others Slack, Lewis, & Bates, 2004; Johnson & Mena, 2008; Pawar, Beltagui, & Riedel, 2009; Baines, Lightfoot, Kay et al., 2009, 2009b) with particular consideration to the sections of the articles that made explicit references to servitization, a series of contributions extracted from these references were reviewed. Our research addresses Q2 by providing in Table 2 (please refer to the Appendix) a classification of servitization definitions² including presenting the core theme arising from each definition/description.

All these definitions/descriptions emphasize the strategic significance of servitization for a traditional manufacturer. Within these definitions/descriptions of servitization, the essential focus is transitioning from product only manufacturing to product and service manufacturing. The essence of servitization is on adding value to customers (i.e. demand pull) and to solve traditional manufacturing problems, nevertheless, the degree of innovative nature of making use of technology is still largely missing i.e. service innovation (Roos, 2015). In today's global competitive business environment and omni-channel supply chain landscape, the use of advanced innovative technologies has necessitated a paradigm shift to provide integrated service

provision i.e. integrated solutions traversing from manufacturing the product through last mile delivery to customer, entrenched with services (Goduscheit & Faullant, 2018). In developing a sustainable end-to-end integrated product-service system that delivers customised products with embedded services, the synergy between servitization and innovative technologies (e.g. industry 4.0, big data analytics, digital manufacturing, artificial intelligence) has the required capability to optimise internal manufacturing processes and achieving optimal decision-making (Cavalcante, Frazzon, Forcellini, & Ivanov, 2019). The latter is also referred to as the foundation of the digital transformation, which in essence is more about developing digital solutions to facilitate inherently new forms of modernisation, integration (both horizontal and vertical) and creativeness, rather than merely augmenting and supporting conventional approaches.

Thus, based on our in-depth review and understanding of the servitization area, we define that

"Servitization is the strategic shift of an organisation's capabilities, human and financial resources and processes in order to offer end-to-end integrated services utilising innovative technologies that deliver added value to products".

In line with the above proposed servitization definition, Xiong, Liu, Liu, Zhu, and Shen (2012) assert that innovation of service with core product offerings is vital to the servitization strategy. In summarising the classification of servitization definitions/descriptions above, it is evident that servitization is considered significant from both the strategic (i.e. innovation) and the operational (i.e. process) perspectives – an innovative approach to acquire more competitive advantage and offering added value.

4.5. Servitization – benefits and challenges

Herein we present a classification of servitization related benefits and challenges using 6 dimensions, namely Strategy, Organisation,

² In order to compile and present a comprehensive list of servitisation definitions/description, some of these definitions are also extracted from the research works of Alix and Zacharewicz, 2012; Alvizos, 2012.

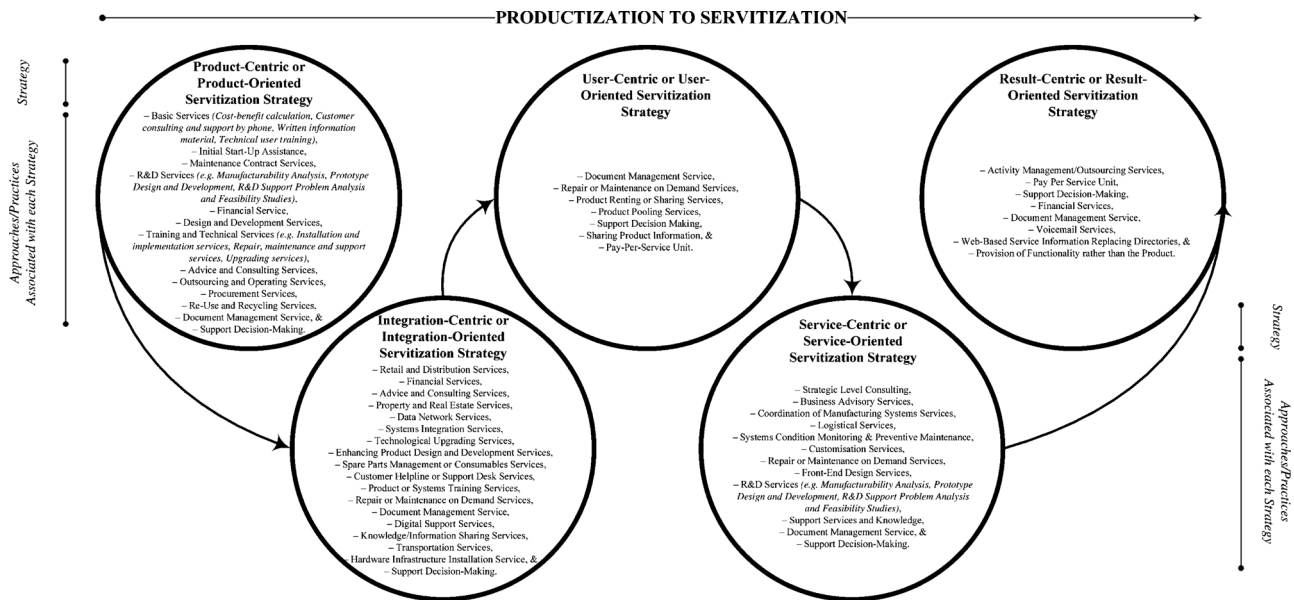


Fig. 4. Classifying the Types of Servitization Strategies and Associated Approaches/Practices.

Operational, Financial, Technological and Environmental (SOOFTE). Irani, Sharif, Kamal, and Love (2014)) and Irani, Kamal, Sharif, and Love (2017)) used similar dimensions for visualising knowledge mapping for information systems evaluation and classifying factors influencing green supply chain collaboration, respectively.

- **Benefits of Transforming through Servitization (Q3):** There is a growing understanding and acceptance of the benefits of servitization among manufacturers. The benefits of servitization are many and varied and have been widely discussed in the extant literature. As highlighted by Baines and Shi (2015), some of the benefits of servitization are not universally agreed in the extant literature. For instance, some researchers suggest significant improvements have been made in terms of increased profit margins whereas others argue that, despite significant investment, returns do not match managers' expectations (Gebauer and Fleisch, 2007). Nevertheless, manufacturers have several reasons to include more services in their total offering as by using the servitization approach to get closer to customers, drive up customer loyalty levels, develop more valuable supplier-customer relationships and ultimately generate recurring and incremental revenue streams (Brax, 2005). Advocates e.g. Gebauer and Friedli (2005); Opresnik and Taisch (2015) and Neuhüttler, Woyke, and Ganz (2018)) report that service addition can help an organisation differentiate itself from its competitors and support the consolidation and protection of the core product business and allow for better customer relationship. As services are more labour dependent and provide less visible rendering, it makes it more difficult to imitate, and therefore leads to sustainable competitive advantage for organisations (Guo et al., 2015).

In order to successfully address 'Q3', we reviewed all 204 articles in detail to extract relevant data on the benefits acquired from transitioning towards servitized manufacturing. To do so, we focused on conceptual as well on empirical based research studies conducted in different manufacturing organisations e.g. semi-conductors; organisations that design and manufacture high value capital equipment for the power; defence and aerospace markets; heating, ventilation air conditioning (HVAC), automotive, personal computers, etc. The empirical findings in the form of a classification of servitization benefits are illustrated in Fig. 5. On analysing the benefits, it is evident that where other benefits are vital and clarify the significance of servitization – one of the most cited benefits is “a sustainable source of competitive

advantage”. Competitive advantages acquired through supplementary service provision are often more sustainable since, being less visible and more labour dependent, services are more challenging to replicate (Gebauer et al., 2005). According to Ren and Gregory (2007), “manufacturing servitization” or “servitization within manufacturing” as a process i.e. choose a service-oriented strategy and develop better services to meet customer needs, supports achieving competitive advantages and improving manufacturing performance. Thus, supplementary service provision is a key construct influencing customer satisfaction and vital source for improving competitiveness (Norman, 1984).

- **Challenges Faced in Transitioning to Servitization (Q4):** As evidenced above, offering servitized systems arguably results in several benefits but also involves significant challenges. For instance, Coreynen, Matthyssens, De Rijck, and Dewitd (2017)) reports that the reasoning behind many manufacturing organisations that are still averse in using supplementary service provision for growth purposes is that servitization is still considered ‘a black box’. Similar, Klein, Biehl, and Friedli (2018)) report that poor service culture and lack of support from decision-makers are among the central challenges when moving to a service-centric approach. Baines et al. (2009), being main advocates of servitization, confer that the adoption of servitization by a conventional manufacturer principally presents challenges for the service design, the organisational strategy and the organisational transformation. Implementing servitization requires fundamental top to bottom changes, for example aligning servitization strategy with corporate culture, marketing, production, and high investment resources, thus making it highly challenging for organisations to shift to a servitization business model (e.g. Baines et al., 2008; Brax, 2005; Peillon, Dubruc, & Mansour, 2018). In line with the latter argument, Martinez, Bastl, Kingston, and Evans (2010)) also argue that relationship-based value creation increases the human resources needed (i.e. number of staff members) to interact with the customer and meeting their demands, which is often not an easy task for organisations.
- To address Q4, we reviewed all 204 papers in detail to extract relevant data on the types of challenges faced by manufacturing organisations in transitioning to servitization. The empirical findings in the form of a classification of servitization challenges is illustrated in Fig. 6. On analysing the challenges in transition towards servitization, issues that are commonly referred to in the extant literature include challenges such as failure in deploying successful service

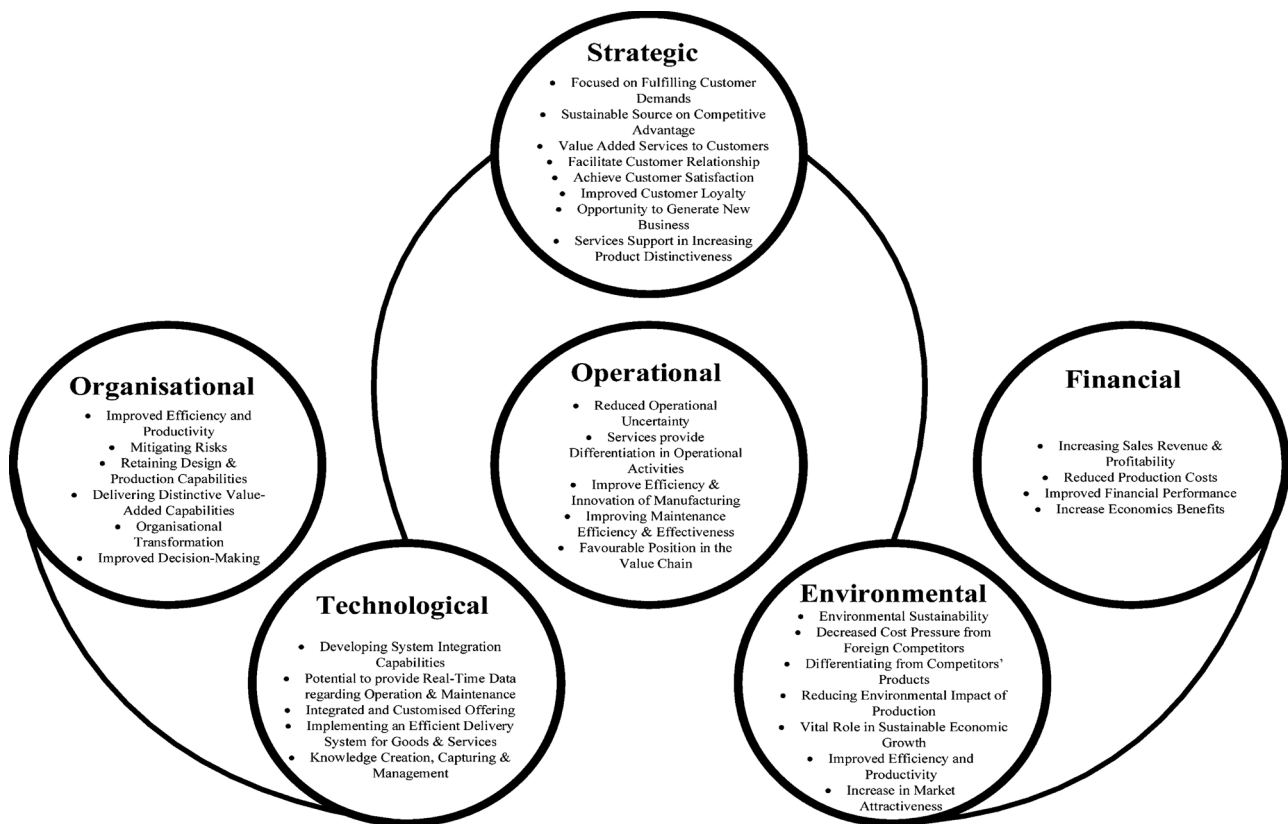


Fig. 5. Classifying Benefits of Transforming through of Servitization.

strategy (e.g. Olivia et al., 2003), lack of strategic relationships with suppliers/customers (e.g. Martinez et al., 2010) and slow and cautious transition towards servitization (e.g. Alix & Zacharewicz, 2012). It is certain that servitization within manufacturing is evidently a diverse and complex field with contributions arising across a range of research communities that are interdependent. Improved awareness and cohesion across these communities will help to improve the quality and rate of knowledge production, and establish important future research challenges. Increasing awareness of these challenges linked to servitization in research and the modest application of servitized business models in industrial practice indicate that a critical examination of the servitization phenomenon is necessary (Lay, 2014).

To achieve the desired servitization outcomes, manufacturing organisations need to evaluate the stream of challenges in line with their performance objectives and the challenges addressed, both in the short-term as well as in the long-term. More importantly, manufacturing organisations should align their servitization strategy with their organisational culture (Peillon et al., 2018) and enhancing ability and enabling space for service innovation (Lindhult, Chirumalla, Oghazi, & Parida, 2018).

5. Conclusions

In this section, we summarise the theoretical contributions of this study, paying specific attention to its relevance for practitioners. Finally, we discuss the limits of our work and offer recommendations for future research. Since its inception in 1988, scholars from operations management, supply chain management, and service operations disciplines have studied servitization and applied in different context, though mainly in manufacturing. It is predominantly regarded as a means for an integrated delivery of both products and services along a

seamless flow of information, enhancing the knowledge sharing between and among the manufacturing supply chain partners and providing a win-win basis for both organisations and customers (Guo et al., 2015). This paper presents the past and current state of servitization research published in a number of key operations and production management journals and conferences. Following Tranfield's et al., (2003) 'Systematic Review Approach', the authors extracted and reviewed 204 journal and conference articles from 1988 to 2018. Figs. 1 to 6 and Tables 1 to 2 clearly indicate the past trends and current patterns in the papers published on servitization. Moreover, the continuing interest and the use of servitization strategies specifies that in future research studies academics, researchers and practitioners may focus on the factors driving or inhibiting implementing servitization to further propose robust solutions to the service related problems. The intention in conducting this detailed investigation was to provide a useful, yet usable, source of information for future researchers.

5.1. Implications and contributions

Over the past few decades, research in the manufacturing sector has gradually increased and shifted from product-only manufacturing sector to thorough service provision integrated with products (Coreynen, Matthyssens, & Bockhaven, 2017). However, Lenka, Parida, Sjödin, and Wincent (2018) argue that most of these servitization studies have primarily focused on the journey of servitizing organisations along a unidirectional, advanced product-to-service continuum. Today there is a growing need for intangible (no more only tangible) goods and services (along a bi-directional continuum) such as specialised skills, knowledge and processes – the focal point of almost every leading manufacturing organisation. While valuable knowledge has been developed, recent studies have begun to highlight servitizing organisations' persistent inclination to focus on their product-oriented businesses in parallel with their rising service-oriented business (e.g.

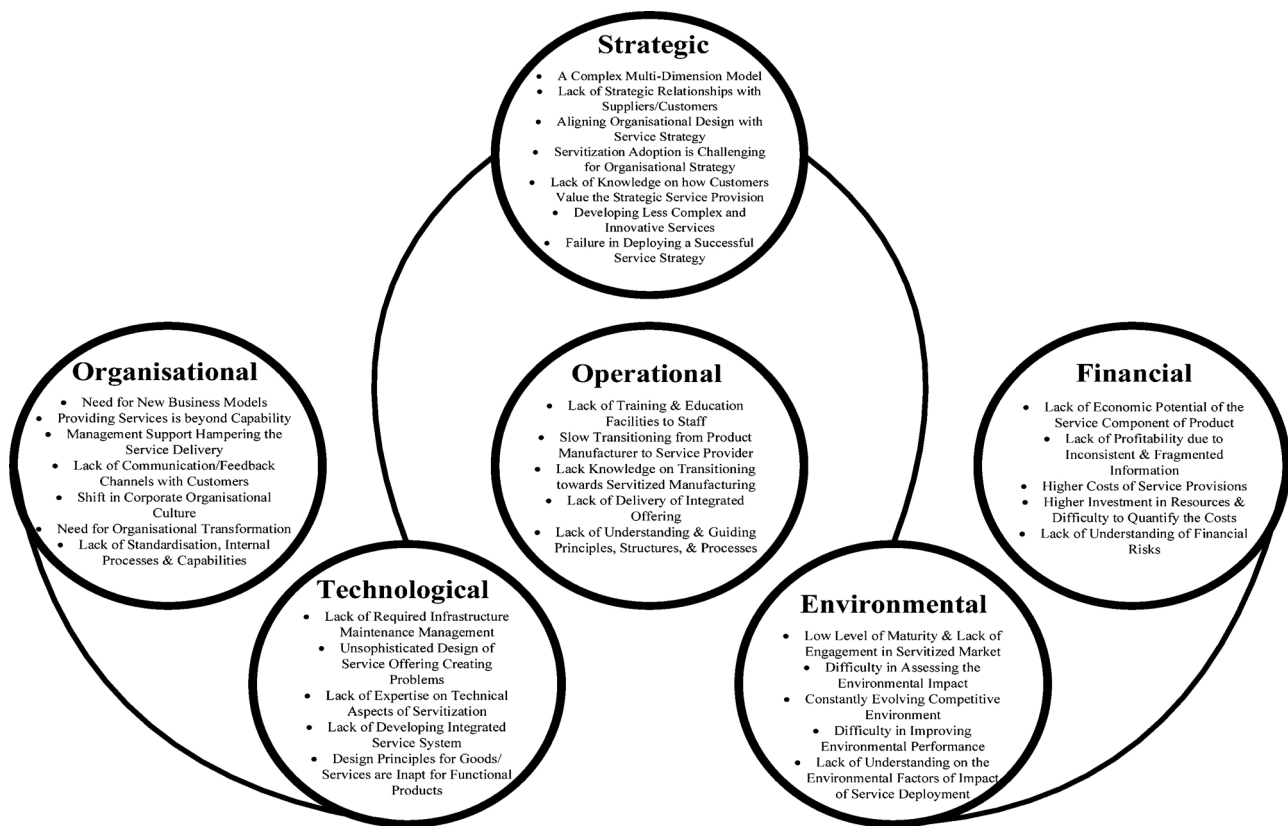


Fig. 6. Classifying the Types of Challenges in Transitioning towards Servitization.

Kowalkowski, Windahl, Kindström, & Gebauer, 2015). This paper provided a number of insights into the extant status of research into servitization phenomenon, how it is defined and conceptualised. In reviewing the articles, it was evident that the prime emphasis was on qualitative (case study based) research studies, followed by very limited studies using quantitative approach, including some articles focusing on design research, analytical, action and experimental research.

The authors assert that more practical insights into servitization can be attained by utilising the findings of this SLR to enlighten and direct research towards a more comprehensive analysis of the servitization i.e. including the key conceptual as well as empirical developments (specifically also utilising survey-based research). More detailed research is required to understand the existence of product and service business orientations. This is because product-based businesses focus on productivity and standardisation, which largely opposes the heterogeneity and flexibility required to run a service centric business. In this paper, we have not dwelt on identifying specific lines of enquiry on servitization, but rather focused on synthesising and presenting a comprehensive analysis of the systematic literature on servitization. This paper extends the research stream on servitization by demonstrating and analysing the key trends related to the servitization strategies, classifying servitization definitions, benefit and challenges and identifying the gaps that require further investigation.

While business models are regularly seen as planned strategies, servitization may occur incrementally in response to requests from customers (Kowalkowski et al., 2012; Raja, Chakkol, Johnson, & Beltagui, 2018). This SLR research highlights the importance of actively developing capabilities to ensure that they are aligned with the business model, which may evolve to match customer demand. More specifically, the challenges presented in Fig. 6 clearly offer opportunities for researchers and practitioners to further the research on servitization from strategic (e.g. need for successful alignment between organisation and service strategy), organisational (e.g. focus on transforming

organisational culture and developing simple business models to facilitate servitization implementation process), operational (e.g. provide relevant training to staff to enable smooth transition towards servitized manufacturing), financial (e.g. reducing the cost of service provision), technological (e.g. developing sophisticated designs of service offerings) and environmental (e.g. supporting the improved environmental performance) viewpoint. An organisation's design capabilities should be clearly identified, because these define what types of products and services can be designed and, hence, whether customer demand can be met. As well as enabling offerings to customers, design capabilities may restrict the nature of services that can be offered. Therefore, managers must ensure that these capabilities are updated.

5.2. Limitations

Beyond our contributions to the extant research, we recognise that our study has limitations, and readers and future academics and researchers should be aware of these and indeed interpret the material presented in this paper within the context of the limitations. By definition, a meta-analysis rests on the existing as well as on the accessible research studies (both conceptual and empirical). While the authors conducted an extensive and thorough literature search through the Scopus database to identify all available and relevant articles, it is possible that some research articles may have been overlooked in this review from some other leading databases (i.e. Web of Science, EBSCO and Google Scholar). In order to avoid duplication, every effort was exhausted to acquire and analyse all relevant information essential, regarding the four questions from the articles reviewed from the Scopus database. Additionally, the analysis and synthesis are based on the research team interpretation of the selected articles. The authors attempted to avoid these issues by cross-checking papers independently and thus dealt with embedded bias; however errors might have occurred. Notwithstanding, the authors took all precautions so as to

consider this research robust and to mitigate errors.

5.3. Suggestions for future research

Building upon the rich underpinning of the research findings described and overall understanding acquired in this paper, the authors presents the concerns that merit further research and anticipate that these gaps may hold the potential in contributing towards the future research studies. Despite a considerable body of literature examining many aspects of servitization, there are still several areas that remain under-explored.

- *Firstly*, the analysis of the selected articles reveals that the opportunity clearly exists, specifically to strengthen empirical research on predictive tools and quantitative approach. Most of the papers analysed follow an inductive qualitative case-study based approach. As [Martinez et al., \(2010, pp. 449\)](#) stated “given the nature of research design, the identified patterns cannot be used as a predictive tool”. It would be crucial to conduct transversal studies with a quantitative approach, which is particularly important in the context of analysing servitization implementation effects – with specific focus on users (customers).
- *Secondly*, as a result of product commoditisation and the ever-increasing competition among manufacturing organisations, managers sought to offer supplementary services to their customers to secure their competitive positioning in the market. Nevertheless, many organisations (mainly from emerging economies) are often not able to offer services embedded with products. To remain competitive, they link with service providers in a “service network” collaboration to provide services for their customers. [Weigel and Hadwich \(2018\)](#) argue that despite the significance of this area, research on managing these service networks in the context of servitization is still limited and needs further investigation and we would also add that the organisational development of such networks including the partnering premises should be further substantiated in terms of approaches, methods, impact and resilience.
- *Thirdly*, innovative technological developments in manufacturing (such as cloud manufacturing, industry 4.0 manufacturing linked with servitization or digital servitization) are challenging the traditional manufacturing business models, and adapting these is key to a sustainable competitive advantage. The potential of cloud manufacturing and servitization is a growing field of interest that still requires further research for developing new servitization based business models to capture value ([Charro & Schaefer, 2018](#); [Heinis, Loy, & Meboldt, 2018](#)). There is also a need to consider the use of automation and robotics, and artificial intelligence in playing a significant role in delivering services for manufactures. [Baines, Bigdeli, Sousa, and Schroeder \(2020\)](#) reiterate the latter argument that the influence of disruptive innovation and dynamics of technology shift on servitization is still underdeveloped.
- *Lastly*, there is a growing need for additional focus and research on how servitization adopts and works with circular economy business models and avoid any fragmented research ([Kühl, Bourlakis, Aktas, & Skipworth, 2019](#)). Businesses and organisations can shift from a linear servitization strategy to a more sustainable service-oriented business models that provides resource efficiency-related services for customers which will be the most resilient and profitable in the future. There is much more need for creating commercial opportunities that focuses on the economic construct (e.g. increased revenues, extended product lifecycles, economic recoverability) by bringing new and more resource efficient services to the market ([Doni, Corvino, & Martini, 2019](#); [Parida et al., 2014](#)). In this context, a growing relevant topic comes from developing co-creation mechanisms that enable capabilities, reduce the adverse effects of servitization and improve the product development.

Overall, there is a need for stronger infusion of general strategy theory into the servitization debate. Servitization is a cross-cutting theme, and many linkages exist with established topics across engineering, management, technology and sustainability. Moving forward, we advocate in favour of the substantial need to understand the value of servitization for manufacturing companies in terms of resource consumption, impact on the competitiveness of the firm in order to evaluate the boundaries of flexibility and improve the corporate agility and resilience. Furthermore, based on our research we would propose to further study how new production concepts like Internet of Things (IoT), Circular Economy, Artificial Intelligence (AI) and machine learning enable servitization strategies. Especially considering the current fluid economic environment, the collaborative strategies should be further investigated in terms of best-fitness with the servitization strategies. Last but not least, we would also propose addressing the potential of servitization to other, less mainstream industries, for example processing, smart manufacturing and recycling. Many papers that our method selected discussed conceptual studies and the empirical elements have been rather limited. This asks for more work on this aspect with real cases and the development of new, empirically backed theories. Similarly, we propose an additional focus on the behavioural side of servitization and the implications to the current business models.

Appendix A

1 Different Servitization Terminologies

Based on our review, we identified the following typology of definitions:

“Product-Service System”, “Product-Centric Servitization Strategy”, “Integration Oriented Product-Service System”, “Product Service Supply Chain System”, “Tertiariation Strategy”, “Product Oriented Product-Service System”, “Product-Centric Services”, “Customer-Centric Orientation”, “Service-Oriented Strategy”, “Service Management Strategy”, “Sustainable Service-Oriented Strategy”, “Service Supply Chain”, “Service-based Innovation Strategy”, “High-Value Industrial Product-Services”, “Integrated Product-Service System”, “Service-oriented Virtual Manufacturing System Strategy”, “Lifecycle Service Offering”, and “Industrial Product Service Systems”

2 Classification of Servitisation Typologies

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