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The servitization of manufacturing

A review of literature and reflection on future challenges

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Abstract

Purpose – The purpose of this paper is to report the state-of-the-art of servitization by presenting a clinical review of literature currently available on the topic. The paper aims to define the servitization concept, report on its origin, features and drivers and give examples of its adoption along with future research challenges.

Design/methodology/approach – In determining the scope of this study, the focus is on articles that are central and relevant to servitization within a wider manufacturing context. The methodology consists of identifying relevant publication databases, searching these using a wide range of key words and phrases associated with servitization, and then fully reviewing each article in turn. The key findings and their implications for research are all described.

Findings – 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. There are a diverse range of servitization examples in the literature. These tend to emphasize the potential to maintain revenue streams and improve profitability.

Practical implications – Servitization does not represent a panacea for manufactures. However, it is a concept of significant potential value, providing routes for companies to move up the value chain and exploit higher value business activities. There is little work to date that can be used to help practitioners.

Originality/value – This paper provides a useful review of servitization and a platform on which to base more in-depth research into the broader topic of service-led competitive strategy by drawing on the work from other related research communities.

Keywords Services, Product innovation, Manufacturing industries

Paper type Research paper

1. Introduction

Servitization, the term coined by Vandermerwe and Rada (1988), is now widely recognised as the process of creating value by adding services to products. Since the late 1980s, its adoption as a competitive manufacturing strategy has been studied by a range of authors (Wise and Baumgartner, 1999; Oliva and Kallenberg, 2003; Slack, 2005) who have specifically sought to understand the development and implications of this concept. This literature indicates a growing interest in this topic by academia, business and government (Hewitt, 2002), much of which is based on a belief that a move towards servitization is a means to create additional value adding capabilities for traditional manufacturers. These integrated product-service offerings are distinctive, long-lived, and easier to defend from competition based in lower cost economies.

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Since the term servitization was first captured in the work of Vandermerwe and Rada (1988), there has been a steady flow of research papers. For example, our study shows that currently there are approximately 60 papers published directly on this concept, with an additional 90 or more being quite closely related. The collective contribution of these papers has not yet been summarised and so, as a platform for furthering research, a review of the servitization literature is appropriate. Hence, this has been the motivation behind our study described in this paper.

This review of literature is explicitly concerned with servitization. We should note, however, that there are a number of other closely related research communities. The work on product-service systems (PSS) (Baines *et al.*, 2007; Goedkoop *et al.*, 1999; Mont, 2000; Meijkamp, 2000; Manzini and Vezolli, 2003) is particularly closely related. Many of the principles are identical (Tukker and Tischner, 2006). The difference arises in the motivation and geographical origin of the research communities. PSS is a Scandinavian concept which is closely coupled to the debates on sustainability and the reduction of environmental impact. Other research communities deal with similar concepts (e.g. integrated vehicle health management (Fox and Glass, 2000; Baroth *et al.*, 2001) and services sciences (Chesborough and Spohrer, 2006). To date, these communities have largely developed in isolation with few researchers forming links.

The study described in this paper has taken the form of a clinical review of literature that has been published, explicitly, to contribute to the servitization debate. Our methodology has consisted of identifying relevant publication databases, searching these using a wide range of key words and phrases associated with servitization, and then fully reviewing each article in turn. From these reviews, it was possible to compile a set of key findings. These findings and their implications for research are all described. The structure of this paper reflects this approach. First, the research methods are described and the initial results of the search for relevant literature are presented. Key findings are then presented through analysis of the literature. Finally, the results of this analysis are summarised and discussed, and conclusions are drawn.

2. Research programme

2.1 Aim, scope, and questions to guide research

The aim of the research presented in this paper has been to identify, interpret, and summarise the literature currently available on the topic of servitization. In determining the scope of this study, the focus has been on articles that are central and relevant to servitization within a wider manufacturing context. For instance, papers that deal with the application of service concepts to manufacturing, the management of the transition from products to services, the provision of integrated solutions and value creation through service offers, have all been considered relevant. Examples of publications that are clearly within the scope of this review are those such as Vandermerwe and Rada (1988) in which the authors define the concept of servitization and, Wise and Baumgartner (1999) who discuss manufacturers moving downstream into more lucrative product-related services. Outside the scope of our study at this time are articles that deal exclusively with pure services provision.

To guide this review of the literature, a series of questions have been posed. Our intention is that these should help to ensure a thorough and comprehensive review, but that they will not necessarily lead directly to research findings. These questions are:

- What is meant by servitization and how is it commonly defined?
- How does a servitized organisation differ from a conventional manufacturer?
- Where are the leading examples of servitization?
- What guidance is there in the literature for a manufacturer seeking to adopt servitization?
- Overall, what are the characteristics of the current body of literature on servitization?

These questions highlight that this study has focused exclusively, and somewhat pedantically, on the literature that is directly associated with servitization. Outside the scope of our work have been contributions on topics such as PSS. As we have noted, there are many similarities and cross overs between these two communities of researches, however to date there have been few explicit links. This is demonstrated by the lack of cross-referencing between the two communities. This situation will undoubtedly change; indeed this paper itself contributes to this homogenisation through the reworking of definitions in Section 3. Yet, in this paper, we sought to capture how the servitization community has independently evolved to this point in time. Hence, we treat the servitization topic similarly to our review on PSS published in Baines *et al.* (2007).

2.2 Search strategy, results and analysis

The search strategy was developed by first identifying the relevant data sources, time frame, and keywords. Initially, a very broad selection of databases was identified to cover a diverse range of publications (e.g. journal articles, conference proceedings, theses, books and trade journals). These databases included Compendex, Inspect, and Emerald, along with the more traditional library cataloguing systems. For completeness, an internet search was also conducted using a similar process to that used with the library databases. Collectively, these provided access to a wide variety of sources (e.g. *Harvard Business Review*, *Industrial Marketing Management*, *International Journal of Service Industry Management*, and *European Management Journal*). Keywords were identified that were directly associated with servitization (e.g. service-centred, service-oriented, service integration, product support, integrated solutions, post-sales, product-related services and after-sales). Many of these key words were combined with "manufacturing" in order to ensure their relevance to this study. This set was then expanded and refined as appropriate articles were discovered. Initially, this study focused on literature published between 1988 and 2008, with their citations being cross-checked to ensure that any earlier publications were also captured.

By searching the chosen databases, using the keyword over the selected time period, a large number of article titles were uncovered. These lists were then edited to remove any duplicate records, and the titles were checked to ensure relevance to the review. The abstracts of all the remaining articles were then considered and, unless thought inappropriate, the full paper was then read. Initially, the search terms identified about 150 articles, reports, and books. These were then carefully filtered to establish 49 documents that were directly relevant to our research enquiry. Subsequent cross-checking of references increased the list to 58. The analysis itself was aided by

applying mind-mapping techniques to capture and cluster the main themes and contributions. It is the analysis of these articles that forms the basis of the findings in this paper.

3. Analysis of the literature

There has been a steady output of research papers on servitization since 1988 (Figure 1). The papers reviewed originate in the USA (40 per cent), UK (20 per cent),

	Author(s)	YEAR	Origin
1	Levitt T	1976	USA
2	Levitt T	1981	USA
3	Vandermerwe S., Rada J.F.	1988	Switzerland
4	Chase R.B., Garvin D.A.	1989	USA
5	Vandermerwe S., Matthews W.H., Rada J.F.	1989	Switzerland
6	Coyne K.	1989	USA
7	Quinn J.B., Doorley T.L., Paquette P.C.	1990	USA
8	Roscitt R., Parket R.	1990	USA
9	Voss C.	1992	UK
10	Samli A.C., Jacobs L.W., Wills J.	1992	USA
11	Martin Jr C.R., Horne D.A.	1992	USA
12	Anderson J.C., Narus J.A.	1995	USA
13	Kellog D & Winter N	1995	USA
14	Frambach R.T., Wels-lips I., Gündlach A.	1997	Netherlands
15	Cook D et al	1999	USA
16	Verstrepen et al.	1999	Netherlands
17	Wise R., Baumgartner P.	1999	USA
18	Howells J	2000	UK
19	Foote N.W., Galbraith J., Hope Q.	2001	USA
20	Mathieu V.	2001	France
21	Mathieu V.	2001	France
22	Roegner E.V., Seifert T., Swinford D.D.	2001	USA
23	Galbraith J.R.	2002	USA
24	Miller D., Hope Q., Eisenstat R., Foote N., Galbraith J.	2002	USA
25	Robinson T., Clarke-hill C.M., Clarkson R.	2002	USA
26	Oliva R., Kallenberg R.	2003	USA
27	Dennis M., Kambil A.	2003	USA
28	Stille F.	2003	Germany
29	Alonso-Rasgado T., Thompson G., Elfström B.	2004	UK
30	Davies A.	2004	UK
31	Johansson P., Olhager J.	2004	Sweden
32	Windal C., Andersson P., Berggren C., Nehler C.	2004	Sweden
33	Sawhney M., Balasubramanian S., Krishnan V.V.	2004	USA
34	Mathe H., Portioli Staudacher A.	2004	France
35	Lewis M., Portioli Staudacher A., Slack N.	2004	UK
36	Brax S.	2005	Finland
37	Gebauer H., Fleisch E., Friedli T.	2005	Switzerland
38	Gebauer H., Friedli T.	2005	Switzerland
39	Neu W., Brown S.	2005	USA
40	Ward Y., Graves A.	2005	UK
41	Auramo J., Ala-Risku T.	2005	Finland
42	Slack N	2005	UK
43	Davies A., Brady T., Hobday M.	2006	UK
44	Gebauer H., Friedli T., Fleisch E.	2006	Switzerland
45	Cohen et al	2006	USA
46	Malleret V.	2006	France
47	Windahl C & Lakemond N	2006	Sweden
48	Araujo L & Spring M:	2006	UK
49	Byeron A et al:	2006	USA
50	Glueck J., Koudal P., Vaessen W.	2006	Germany
51	Johansson P., Olhager J.	2006	Sweden
52	Block B.	2007	UK
53	Davies A., Brady T., Hobday M.	2007	UK
54	Gebauer H., Fleisch E.	2007	Switzerland
55	Ojasalo K.	2007	Finland
56	Correa H et al	2007	USA
57	Cohen	2007	USA
58	Gebauer H., Bravo-Sanchez C., Fleisch E.	2008	Switzerland

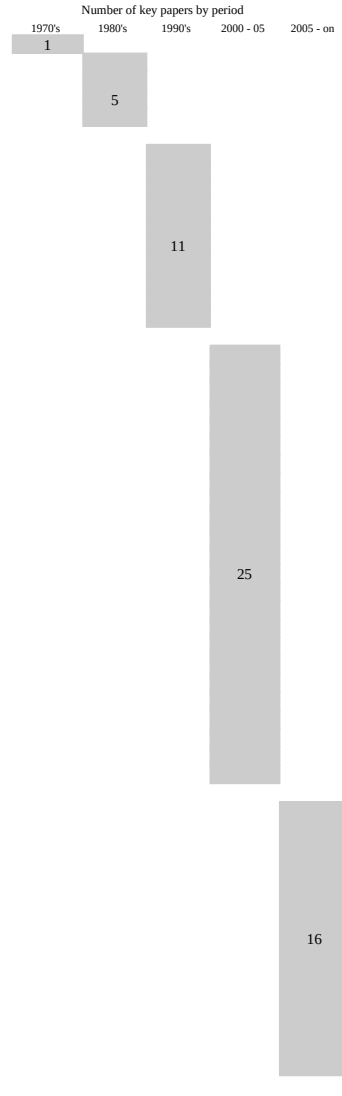


Figure 1.
Time-line for the evolution of relevant papers

Switzerland (15 per cent) and the rest of Western Europe (25 per cent). The literature studied covers a range of topics. These have been grouped into "themes" and the analysis of their coverage by authors is shown in Table I. In Table II, codings ***, ** and * have been used to indicate a "focus on", "detailed discussion of" or "refers to" the particular theme. The majority of authors cover the classification of servitization (Chase and Garvin, 1989; Voss, 1992; Mathieu, 2001a). drivers of servitization (Wise and Baumgartner, 1999; Lewis *et al.*, 2004; Malleret, 2006) and the guidelines and methods for the implementation of servitization strategies (Foote *et al.*, 2001; Oliva and Kallenberg, 2003; Gebauer and Friedli, 2005). Interestingly, few authors directly address the definition servitization (Vandermerwe and Rada, 1988; Howells, 2000) or its evolution in manufacturing (Brax, 2005; Davies *et al.*, 2006a, b). Over 30 per cent of authors cover the topics of the challenges facing manufacturers who are moving into services (Martin and Horne, 1992; Miller *et al.*, 2002; Slack, 2005), the structure of servitized organisations (Quinn *et al.*, 1990; Galbraith, 2002; Gebauer *et al.*, 2006). There is variety of papers based on case studies. These we separate into "inductive" (studies used to develop theory) and "deductive" (studies demonstrating the adoption of theory). Examples of inductive studies are Voss (1992) and Cohen *et al.* (2006) and for deductive studies, Cook *et al.* (1999); Robinson *et al.*, 2002. Other authors have covered a variety of topics including, for instance, service design and industrialisation (Levitt, 1976; Alonso-Rasgado *et al.*, 2004; Johanasson and Olhager, 2004), blueprint development (Vandermerwe and Rada, 1989; Stille, 2003; Shostack, 1982).

Servitization literature – key themes (based on 58 papers reviewed in detail)	Number of papers covering the theme	Percentage of total papers
1 General concept and definition	8	14
2 Evolution of the service orientation in manufacturing	7	12
3 Classification of services	32	55
4 Classification of corporate approaches to sevitization	7	12
5 Drivers of servitization	35	60
6 Factors that undermine the adoption of service strategies and methods for go/no-go decisions	16	28
7 Challenges in moving into services	21	36
8 Guidelines and methods for successful implementation of service strategies	39	67
9 Case studies		
(a) Deductive	27	47
(b) Inductive	23	40
10 Customer value	18	31
11 Service marketing	14	24
12 Service design	13	22
13 Organisational structure	27	47
14 Human factors	11	19
15 Technology support	12	21

Table I.

Table II.
Thematic analysis

	Author(s)	Key themes 1	2	3	4	5	6	7	8	9-a	9-b	10	11	12	13	14	15
1	Alonso-Rasgado T., Thompson G. and Elfström B.			**				*		**					*		*
2	Anderson J.C. and Narus J.A.							*	*							*	
3	Araujo L. and Spring M.	***	**			**	*	*		*							*
4	Auramo J. and Ala-Risku T.			**		*				*							*
5	Block B.							**		*		*			*	*	
6	Brax S.					*	**			*		**				*	
7	Byeron A. *et al.*					*			**	*					**	*	*
8	Chase R.B. and Garvin D.A.			**	**	*			**			*	*		**		*
9	Christensen *et al.*			**		*					**						
10	Cohen			**		*	***		*	*							
11	Cohen *et al.*					*		**	*		*			**		*	
12	Cook D. *et al.*								**	*	*	**	*	*	*		
13	Correa H. *et al.*			**					**	*					*		*
14	Coyne K.			**		**			**	**		**					
15	Davies A.			***													
16	Davies A., Brady T. and Hobday M.	*		*		*			*		**	**					
17	Davies A., Brady T. and Hobday M.			**		**	**	*	**	*		*					
18	Dennis M. and Kambil A.	***		*						*							
19	Foote N.W., Galbraith J. and Hope Q.							**	**	*		*			**		
20	Frambach R.T., Wels-lips I. and Gündlach A.			***	**	***		**	**				**				
21	Galbraith J.R.			**							**						
22	Gebauer H., Bravo-Sanchez C. and Fleisch E.				*				**	*					*		
23	Gebauer H. and Fleisch E.									**			*				
24	Gebauer H., Fleisch E. and Friedli T.			**	**				**	*				*	**		
25	Gebauer H. and Friedli T.			**			*	**	**	*		*		*	**		
26	Gebauer H., Friedli T. and Fleisch E.	*								**	**						
27	Glueck J., Koudal P. and Vaessen W.			**		*	*	*	**		*	*	**		**		
28	Howells J.					*			**	*					*		*
29	Johansson P. and Olhager J.					*					**						*
30	Kellog D. and Winter N.	**							*					***			
31	Levitt T.		*		*	*			**		**	*					

(*continued*)

	Author(s)	Key themes 1	2	3	4	5	6	7	8	9-a	9-b	10	11	12	13	14	15
32	Levitt T.			**					*					*			
33	Lewis M., Portioli Staudacher A. and Slack N.		*				*	**		**			*				*
34	Malleret V.			*				*	**	*		*		**	*		
35	Martin Jr C.R. and Horne D.A.			*				*		**					**		
36	Mathe H. and Portioli Staudacher A.	*				**			*		**						
37	Mathieu V.		**	**		*		**	*		**						
38	Mathieu V.			*		*	**		***				*	*	**	***	
39	Miller D., Hope Q., Eisenstat R., Foote N. and Galbraith J.			*		*	***		*		**				*	***	
40	Neu W. and Brown S.						*		**		**	*		*	**		*
41	Ojasalo K.	*	*	*		**	*	*	*		**	*	*				
42	Oliva R. and Kallenberg R.			*		*		*	*		**				*		*
43	Quinn J.B., Doorley T.L. and Paquette P.C.	**		*		*		**			*						
44	Robinson T., Clarke-hill C.M. and Clarkson R.					*	*	*									
45	Roegner E.V., Seifert T. and Swinford D.D.			*	*	*			**	*		*		*	***	*	
46	Roscitt R. and Parket R.		**	*		*			***		**	*	*	*	**	*	
47	Samli A.C., Jacobs L.W. and Wills J.					*		**	**	*			**	*	*		
48	Sawhney M., Balasubramanian S. and Krishnan V.V.					**	*		*		**		**				
49	Slack N.							*	*		**				**		
50	Vandermerwe S., Matthews W.H. and Rada J.F.					**	**		*	*	*				*		*
51	Vandermerwe S. and Rada J.F.			***					*	**							
52	Vargo S. and Lusch R.			*	***	*	*		*						*	*	
53	Verstrepen *et al.*		***		***						**	*		**	*		
54	Voss C.					**	***		**	**			*		*	***	
55	Ward Y. and Graves A.			*		*		*			*						
56	Windahl C. and Lakemond N.			*		*			*	*							
57	Windal C., Andersson P., Berggren C. and Nehler C.												*				
58	Wise R. and Baumgartner P.			**		*			**		*	*	*		**		

Notes: Coding of key themes: *** = "focus on"; ** = "detailed discussion of"; * = "refers to"

Table II.

4. Generation of key findings

4.1 Defining "servitization"

Clear definitions are the starting point for all research. Here, the terms service and product are intrinsically linked to discussions on servitization. Product terminology is generally well understood by manufacturers. In the world of manufacture, a product is typified by a material artefact (e.g. car, boat and plane). The term "services" is more contentious, often used loosely and defined based on what they are not (i.e. a product)). Here, the word "services" usually refer to an offering (e.g. maintenance, repair and insurance). For the purpose of this paper, we will consider that services are an "economic activity that does not result in ownership of a tangible asset". The first use of the term servitization was by Vandermerwe and Rada (1988). They defined servitization as "the increased offering of fuller market packages or 'bundles' of customer focussed combinations of goods, services, support, self-service and knowledge in order to add value to core product offerings". Here, they took the view that "services are performed and not produced and are essentially intangible".

There are other definitions of servitization in the wider literature (Table III). Throughout these the delivery of product-based services is central, and generally they are all broadly in agreement with the definition provided by Vandermerwe and Rada (1988). One slight deviation is Lewis *et al.* (2004) who refers to the idea of a functional product. In the PSS literature, this is considered as a specific type of product-service offering (Tukker, 2004). This highlights the many similarities between the servitization and PSS research communities. Although these have emerged from differing perspectives on the world, they are converging towards a common conclusion that manufacturing companies should be focusing on selling integrated solutions or PSS (Tukker and Tischner, 2006). A link with servitization is also identified by Baines *et al.* (2007) who define a PSS as an integrated combination of products and services that deliver value in use. Although these two bodies of research have developed separately, it now seems appropriate to refine the servitization definition to encompass the PSS theme. This leads us to provide the following definition for servitization:

Author	Definition of servitization
Vandermerwe and Rada (1988)	"Market packages or 'bundles' of customer-focussed combinations of goods, services, support, self-service and knowledge"
Desmet *et al.* (2003)	"A trend in which manufacturing firms adopt more and more service components in their offerings"
Tellus Institute (1999)	"The emergence of product-based services which blur the distinction between manufacturing and traditional service sector activities"
Verstrepen and van Den Berg (1999)	"Adding extra service components to core products"
Robinson *et al.* (2002)	"An integrated bundle of both goods and services"
Lewis *et al.* (2004)	"Any strategy that seeks to change the way in which a product functionality is delivered to its markets"
Ward and Graves (2005)	"Increasing the range of services offered by a manufacturer"
Ren and Gregory (2007)	"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"

Table III.
Definitions of servitization

Finding 1. Servitization is the innovation of an organisations capabilities and processes to better create mutual value through a shift from selling product to selling PSS.

4.2 The evolution of servitization

There is little literature evidence recording the evolution of servitization within manufacturing industry. Vandermerwe and Rada (1988) describe how companies initially considered themselves to be in goods or services (e.g. product manufacture or insurance), and then moved to offering goods combined with closely related services (e.g. products offered with maintenance, support and finance), and finally to a position where "firms offer 'bundles' consisting of customer focussed combinations of goods, services, support, self-service and knowledge". They termed this movement the servitization of manufacturing. In management-related literature, servitization development is commonly traced back to the early 1990s. However, Davies *et al.* point out that the industrial marketing literature suggests that pioneering applications originated in the 1960s with the introduction of "systems selling" strategies. In the evolution of servitization, many manufacturing companies have moved dramatically into services and so caused the boundaries between products and services to become blurred.

The most highly cited papers have come from the USA followed by contributions from the UK and Western Europe. These papers are general found in managerial and business practitioner literature (e.g. *Harvard Business Review*, *International Journal of Operations & Production Management*, *Industrial Marketing Management*, *International Journal of Service Industry Management* and *European Management Journal*). The authors of these papers tend to be from the operations, production, services, business management and marketing fields. Interestingly, the use of the term servitization only appears in those papers that offer a definition (Table III). The concept of servitization is covered implicitly in a range of topics related to the integration of products and services. These include, for example, service business expansion (Vandermerwe and Rada, 1989; Wise and Baumgartner, 1999; Martin and Horne, 1992; Oliva and Kallenberg, 2003; Brax, 2005; Gebauer *et al.*, 2004; Gebauer and Friedli, 2005), solutions provision (Foote *et al.*, 2001; Galbraith, 2002; Miller *et al.*, 2002; Davies, 2004; Windahl *et al.*, 2004; Davies *et al.*, 2006a, b; Windahl and Lakemond, 2006), after-sale marketing (Cohen *et al.*, 2006; Cohen, 2007), and service profitability (Coyne, 1989; Samli *et al.*, 1992; Anderson and Narus, 1995; Gebauer *et al.*, 2006; Gebauer and Fleisch, 2007):

Finding 2. Since servitization was first coined in 1988, there has been a growing output of papers from the USA and Western Europe that appear mainly in managerial and business practitioner literature, with authors tending to be from operations, services and business fields.

4.3 Features of servitization

Manufacturing companies have been selling services for some time. Traditionally, however, the tendency has been for managers to view services as a necessary evil in the context of marketing strategies (Wise and Baumgartner, 1999; Gebauer and Friedli, 2005; Gebauer *et al.*, 2006). Here, the main part of total value creation was considered to stem from physical goods, and services were assumed purely as an add-on to products

(Gebauer and Friedli, 2005). From this beginning, there has now been a dramatic change in the way services are produced and marketed by manufacturing companies. The provision of services has now turned into a conscious and explicit strategy with services becoming a main differentiating factor in a totally integrated products and service offering. Recently, the value proposition often includes services as fundamental value-added activities (Vandermerwe and Rada, 1988; Quinn *et al.*, 1990; Gebauer *et al.*, 2006) and reduces the product to be just a part of the offering (Oliva and Kallenberg, 2003; Gebauer *et al.*, 2006). Indeed, some companies have found this to be a most effective way to open the door to future business (Wise and Baumgartner, 1999).

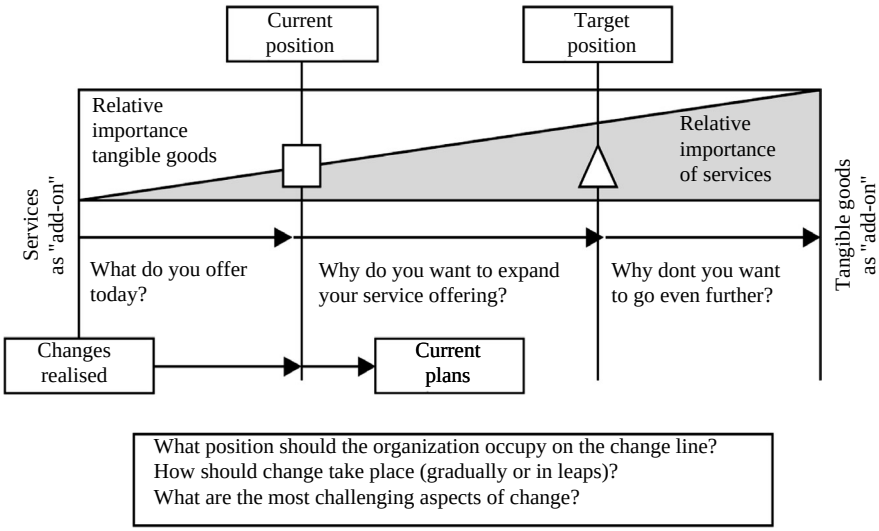
A key feature of servitization strategies is a strong customer centricity. Customers are not just provided with products but broader more tailored "solutions". These deliver desired outcomes for specific customers, or types of customer, even if this requires the incorporation of products from other vendors (Miller *et al.*, 2002; Davies, 2004). This use of "multi-vendor" products to deliver customer centric solutions is exemplified by Alstom's maintenance, upgrade and operation of trains and signalling systems, and similarly Rockwell's on-site asset management for maintenance and repair of automation products. Oliva and Kallenberg (2003) consider this customer orientation to consist of two separate elements. First, a shift of the service offering from product-oriented services to "user's processes oriented services" (i.e. a shift from a focus on ensuring the proper functioning and/or customer's use of the product, to pursuing efficiency and effectiveness of end-user's processes related to the product). Second, a shift of the nature of customer interaction from transaction-based to relationship-based (i.e. a shift from selling products, to establishing and maintaining a relationship with the customer).

There are a variety of forms of servitization with the features differing for each. The literature identifies potential applications along the so-called "product-service continuum" (Oliva and Kallenberg, 2003; Gebauer and Friedli, 2005; Neu and Brown, 2005; Gebauer *et al.*, 2008). This is a continuum from traditional manufacturer where companies merely offer services as add-on to their products, through to service providers where companies have services as the main part of their value creation process (Figure 2). As observed by Gebauer *et al.* (2008), companies have to look at their unique opportunities and challenges at different levels of "service infusion" and deliberately define their position. This is envisioned to be a dynamic process, with companies redefining their position over time and moving towards increasing service dominance:

Finding 3. There are various forms of servitization. They can be positioned on a product-service continuum ranging from products with services as an "add-on", to services with tangible goods as an "add-on" and provided through a customer centric strategy to deliver desired outcomes for the customer.

4.4 Drivers of servitization

Commonly, the literature suggests three sets of factors that drive companies to pursue a setvitization strategy; namely, financial, strategic (competitive advantage) and marketing (Mathe and Shapiro, 1993; Mathieu, 2001b; Oliva and Kallenberg, 2003; Gebauer and Friedli, 2005; Gebauer *et al.*, 2006; Gebauer and Fleisch, 2007).



Source: Oliva & Kallenberg (2003)

Figure 2.
The product-service continuum

The main financial drivers often mentioned in the literature are higher profit margin and stability of income (Wise and Baumgartner, 1999; Gebauer and Friedli, 2005). For manufacturers with high-installed product bases (e.g. aerospace, locomotives and automotives) Wise and Baumgartner (1999) estimate that, in some sectors, service revenues can be one or two orders of magnitude greater that new product sale. Slack (2005) agrees, and points out that in these sectors higher revenue potential often exists. Likewise, Sawhney *et al.* (2004) identifies companies that have enjoyed success with this approach (e.g. GE, IBM and Siemens and Hewlett Packard) and achieved stable revenues from services despite significant drops in sales. Ward and Graves (2005) emphasise that the increased life-cycle of many modern complex products, such as aircrafts, is pushing the most significant revenues downstream towards in-service support. These product-service combinations tend to be less sensitive to price-based competition (Malleret, 2006), and so tends to provide higher levels of profitability in comparison to offering the physical product alone (Frambach *et al.*, 1997). Finally, product-service sales tends to be counter-cyclical or more resistant to the economic cycles that affect investment and goods purchase (Oliva and Kallenberg, 2003; Gebauer and Fleisch, 2007). This can help secure a regular income and balance the effects of mature markets and unfavourable economic cycles (Brax, 2005; Malleret, 2006).

The literature frequently refers to strategic drivers that are largely concerned with gaining competitive advantage. These use service elements to differentiate manufacturing offerings and so provide important competitive opportunities (Frambach *et al.*, 1997; Mathieu, 2001b; Gebauer and Fleisch, 2007). Competitive advantages achieved through services are often more sustainable since, being less visible and more labour dependent, services are more difficult to imitate (Oliva and Kallenberg, 2003; Gebauer and Friedli, 2005; Gebauer *et al.*, 2006). While discussing these aspects, many authors (Coyne, 1989; Frambach *et al.*, 1997; Mathieu, 2001b; Gebauer and Fleisch, 2007) reflect on the increased commoditisation of the markets,

where differentiating strategies based on product innovation, technological superiority or low prices, are becoming incredibly difficult to maintain. Frambach *et al.* (1997) point out that the value-add of services can enhance the customer value to the point, where, homogeneous physical products are perceived as customised. These increase barriers to competitors (Mathieu, 2001b).

Marketing opportunities are generally understood as the use of services for selling more products (Mathe and Shapiro, 1993; Gebauer *et al.*, 2006; Gebauer and Fleisch, 2007). The service component is well known to influence the purchasing decision and assessing its importance has been a lasting tradition in marketing literature (Mathieu, 2001b; Gebauer and Fleisch, 2007). This is especially true in B2B or industrial markets where customers are described as increasingly demanding for services (Vandermerwe and Rada, 1988; Oliva and Kallenberg, 2003; Auramo and Ala-Risku, 2005; Slack, 2005). Reasons for these are pressures to create more flexible firms, narrower definitions of core competences and higher technological complexity, and these often lead to increasing pressures to outsource services (Lewis *et al.*, 2004; Auramo and Ala-Risku, 2005; Slack, 2005). Services are also claimed to create customer loyalty (Vandermerwe and Rada, 1988; Correa *et al.*, 2007) to the point where the customer can become dependent on the supplier. Services tend to induce repeat-sale and, by intensifying contact opportunities with the customer, can put the supplier in the right position to offer other products or services (Mathieu, 2001b; Malleret, 2006). Finally, by offering services, companies gain insight into their customers' needs and are enable to develop more tailored offerings:

Finding 4. Servitization frequently occurs because of financial drivers (e.g. revenue stream and profit margin), strategic drivers (e.g. competitive opportunities and advantage) and by marketing drivers (e.g. customer relationships and product differentiation).

4.5 Challenges in the adoption of servitization

The adoption of a servitization strategy brings with it significant cultural and corporate challenges (Vandermerwe and Rada, 1988; Wise and Baumgartner, 1999; Oliva and Kallenberg, 2003; Brax, 2005; Slack, 2005). These can be broadly categories into integrated product – service design, organisational strategy and organisational transformation.

The design of services is significantly different to the design products since, by their nature, services are fuzzy and difficult to define (Slack, 2005). This may discourage companies from expanding the service dimension, particularly because they need to take account of competition outside the usual domain from unexpected rivals including their own suppliers, distributors, and customers (Vandermerwe and Rada, 1988; Mathieu, 2001b; Oliva and Kallenberg, 2003). Risk also needs to be considered in the design process as undertaking activities previously performed by customers can present new challenges (Slack, 2005). Here, marginal risk incurred might outweigh the benefits of increased profit potential. Finally, a focus on communication strategies that clearly describe the value proposition to the customer need to be considered in the design of service provision (Mathieu, 2001a).

Manufacturing companies that decide on a service-oriented strategy have to adapt the necessary organisational structures and processes (Mathieu, 2001b; Gebauer and Friedli, 2005; Oliva and Kallenberg, 2003; Gebauer and Fleisch, 2007). Here, there are

challenges in defining the organisation strategy necessary to support the customer allegiance required to deliver a combination of product and services (Wise and Baumgartner, 1999). Adopting a downstream position, such as the provision of installed base services, organisations have to be service oriented and value services (Oliva and Kallenberg, 2003). These organisations provide solutions through product-service combinations and tend to be client-centric and providing customised, desirable client outcomes organised around particular capabilities competences and client requirements (Miller *et al.*, 2002). Case studies reported by Windahl *et al.* (2004) support this view, highlighting the importance of client partnering and expanded competences in providing integrated solutions. However, Mathieu (2001b) points out that service management principles are often at odds with traditional manufacturing practices.

Attempting to transform a traditional manufacturer to the required organisational strategy for effective servitization sets-up particular challenges. The service culture is specific and different from the traditional manufacturing culture (Mathieu, 2001a, b) and a shift of corporate mindset is necessary to take on services and prioritise their development with respect to more traditional sources of competitive advantage (Coyne, 1989; Oliva and Kallenberg, 2003; Slack, 2005). This will require significant changes to long-standing practices and attitudes (Vandermerwe and Rada, 1989; Foote *et al.*, 2001). For example, abandoning their product-centric structure in order to become more customer-centric (Foote *et al.*, 2001; Galbraith, 2002; Windahl and Lakemond, 2006). Implementing these changes, companies are likely to meet resistance from areas within the organisation where the service strategy is not understood or because of a fear of infra-structural change (Mathieu, 2001b). Creating a service-oriented environment and finding the right people for the service dimension is key to success. In providing services, managers must be convinced that people are their main asset (the major shift required in moving from a manufacturing to service culture) (Mathieu, 2001b). However, there are many cases in the literature of companies that, despite making the transition into services, did not get the expected correspondingly high returns (Coyne, 1989; Neely, 2007). Gebauer and Friedli (2005) termed this the "service paradox in manufacturing companies" and related it to both organisational and cultural hurdles:

Finding 5. The adoption of servitization by a conventional manufacturer principally presents challenges for service design, organisation strategy and organisation transformation.

4.6 Industrial examples of servitization adoption

A number of authors have studied the adoption of servitization by companies based on case study work (Wise and Baumgartner, 1999; Mont, 2001; Miller *et al.*, 2002; Oliva and Kallenberg, 2003; Mathe and Stuadacher, 2004; Davies, 2004; Davies *et al.*, 2006a, b). Key examples of this work are presented in Table IV. All these are cases of companies moving to exploit downstream opportunities from services. Typically, they fall into four categories (Wise and Baumgartner, 1999): embedded services which allow traditional downstream services to be built into the product (e.g. Honeywell's AIMS for in-flight monitoring of engine systems); comprehensive services such as those offered by GE around its product markets (e.g. GE capital's financing activities); integrated solutions where companies look beyond their traditional product base to asses the overall needs of customers (e.g. Nokia's move to network-infrastructure solutions);

Organisation	Description	Source
Alstom	Maintenance, upgrade and operation of trains and signalling systems	Davies (2004)
ABB	Turnkey solutions in power generation	Miller *et al.* (2002)
Ericsson	Turnkey solutions to design, build and operate mobile phone networks	Davies (2004)
Nokia	Nokia's network-infrastructure solutions, providing network equipment and service to carriers	Wise and Baumgartner (1999) Davies *et al.* (2006a, b)
Thales	Pilot training and simulator-building management	Davies (2004)
Rolls-Royce	"Power by the Hour" guaranteed flying hours for aero engines	Howells (2000)
Xerox International	Document management services. Guaranteed fixed price per copy	Mont (2001)
WS Atkins	System integration services and outsourcing solutions	Davies (2004)

Table IV.
Industrial examples of servitization

and finally distribution control as used by Coca-Cola to grab shelf space in its high-volume low-margin supermarket segment. The adoption of servitization to provide customers with functional results is discussed by Howells (2000) in the case of Rolls-Royce's offering of guaranteed flight hours from their aero engines (Power by the Hour) and by Mont (2001), who describes Xerox's move from the provision of photocopiers to offering "document management". Miller *et al.* (2002) and Davies (2004) describe examples of the provision of integrated solutions and view these as "integrated combinations of product and/or services that are tailored to create desired outcomes for the customer". Davies (2004) concludes that suppliers of capital goods are moving into integrated solutions provision form different position up and down the value stream; he notes Alstom's transport solutions, Ericsson's mobile networks and Thales's training solutions as exemplifying this move. In addition, companies such as W. S. Atkins and Cable & Wireless with strong systems integration capabilities, exemplify the move into providing services previously carried out by their customers.

While the examples in Table IV typify cases of leading practice, they also indicate the limited nature of exemplars in this field. The majority of these are large multinationals supporting high-value capital equipment. This leads the authors to summarise:

Finding 6. Examples of leading practice in the adoption of servitization are focused on larger companies supplying high-value capital equipment such as Alston, ABB, Tales and Rolls-Royce. These demonstrate how traditionally based manufacturing companies have moved their position in the value-chain from product manufacturers to providing customers with integrated solutions that can include multi-vendor products.

4.7 Previous research aiding in the adoption of servitization

Section 4.5 has highlighted that the principal challenges in the adoption of servitization are in the areas of the design of the service, organisational design and organisational transformation. This section summarises the work done to date, in the existing literature, to overcome each of these challenges. This work takes such forms as case studies, guidelines, methodologies and techniques.

There is little previous work offering guidelines, tools or techniques, for the design of integrated products and services. The existing work is typified by Coyne (1989) who advocates that services design should be approached using a set of hard business decisions that employ the same rigorous attitude used to develop products rather than simply consider this as a variation of the marketing mix. Effective customised and flexible service offerings can be achieved by combining a base package of standard services with particular service options that are valued by individual customers (Anderson and Narus, 1995; Neu and Brown, 2005). Similarly, other authors (Miller *et al.*, 2002; Davies, 2004; Davies *et al.*, 2006a, b) observe that in providing integrated solutions, there is a need to design services as modular units that can be "mixed and matched" in different combinations to meet specific customer and market requirements. Such product-service combinations are considered by Alonso-Rasgado *et al.* (2004) as functional products and therefore suggest that general service design processes are inappropriate.

Guidance in the literature on how to approach organisational strategy is largely limited to anecdotal evidence from case studies that suggest good practices and processes for implementation. For example, Davies *et al.* (2006a, b) draws lessons from five cases to surmise that, for success, companies need a clear understanding of what they do well and what new capabilities they need to develop. Likewise, Davies (2004), Oliva and Kallenberg (2003) and Gebauer and Friedli (2005) identify the value of a phased introduction of added services in order to achieve successful implementation of service strategy in manufacturing companies. This is seen to provide a safer journey for companies along the road to servitization. However, Brax (2005) observes a paradox here, in that services introduced in this way can be perceived as secondary to the tangible product and hence may lack cross-functional support, leading to failures in service operations. Davies (2004), Oliva and Kallenberg (2003), Gebauer and Friedli (2005) and Brax (2005) all identify the establishment of de-centralised customer facing service units with profit and loss responsibility within the organisation as a key factor in a successful service strategy. These should be run as a separate business units and operated with the metrics, control systems, and incentives of a professional service organisation (Oliva and Kallenberg, 2003; Gebauer and Friedli, 2005; Gebauer *et al.*, 2006). According to Sawhney *et al.* (2004), running the product-service business separately mitigates the risk of moving outside existing organisational capabilities. Other approaches to servitization described in the literature include collaborative arrangements with partnership and/or outsourcing agreements with third parties (Mathieu, 2001b; Sawhney *et al.*, 2004; Windahl and Lakemond, 2006). In this type of approach, Gebauer *et al.* (2008) observes the involvement of customers as development partners.

The state of previous research on organisational transformation is similar to that of organisational design. There are a small set of case studies which draw lessons from the practices of successful companies (Davies, 2004; Miller *et al.*, 2002). Examples include Gebauer and Fleisch (2007) who investigate typical behavioural processes in these companies which, in some respect, can discourage executives from service investments. Gebauer and Friedli (2005) also note the importance of training and empowering people delivering service so that they can be effective and efficient. They observe that empowerment of this kind is only possible if employees have the mindset to establish a service culture. A number of authors (Oliva and Kallenberg, 2003;

Gebauer *et al.*, 2006; Gebauer and Fleisch, 2007) identify the separate service organisation as the way to create a service culture, with the associated underlying norms and values, without replacing the manufacturing value set. This can help to avoid a clash between a dominant manufacturing culture and the service-related counterculture. Similarly (Windahl and Lakemond, 2006) consider that isolating the service organisation from product development and manufacturing operations may be a critical success factor for managing the transition.

Overall, we have found that the existing guidance in the literature on how to servitize an organisation is limited and this leads to our finding of:

Finding 7. There is a paucity of previous work that provides guidance, tools or techniques, that can be used by companies to servitize.

4.8 Future research challenges for servitization

The principal challenges in the adoption of servitization are in the areas of categories into service design, organisational strategy and organisational transformation (Section 4.5). Within the literature, there are only a few guidelines on how to overcome these challenges, with almost no tools or techniques available (Section 4.6). This leads us to identify that the major gaps in the existing literature are in these areas, and that the following research questions can be posed:

RQ1. How can/should competitive integrated product-service offerings be designed within the context of an industrial organisation?

RQ2. What is/should be the organisational strategy to deliver competitive integrated product-service offerings?

RQ3. How can/should traditional manufacturing firms make the transition to a servitized organizational strategy that delivers competitive integrated product-service offerings?

In terms of research methods, most papers in this field are based on case study research. They are largely descriptive, focusing and giving an illustration of the adoption of servitization by traditional manufacturing companies. There are no examples of more prescriptive approaches using techniques such as action research. We believe that this highlights that the research community is principally taking a reporting role. While valuable in itself, there is clearly an opportunity for researchers to be more active in forming actions rather than simply providing a commentary on the successes or failures of others. We suggest therefore that a third, and significant challenge for future work, is for the research community to engage in more prescriptively in the change process by more actively engineering the tools and techniques that are needed by practitioners:

Finding 8. The principal research need is to engineer tools or techniques that practitioners can apply to help in service design, organisational design and organisational transformation.

5. Concluding remarks

Our review has identified 58 papers that are directly related to the topic of servitization. These have been analysed, interpreted and summarised. From this, eight key findings

have been established. In summary, servitization is the innovation of an organisations capabilities and processes to shift from selling products to selling integrated products and services that deliver value in use. This concept originated the USA in the late 1980s and, to date, most contributors have been academics and practitioners from the operations, production, services, business management and marketing fields. There is also a striking overlap between servitization and product-service system concepts. Servitization is being driven by ever more complex customer needs and demands and a need to defend against product competition particularly from lower cost economies. There are a diverse range of servitization examples in the literature from aerospace, transportation, automation, machine tools, printing machinery and other capital equipment. These tend to emphasize the potential to maintain revenue streams and improve profitability particularly in industry sectors where there is a high-installed base of products. Companies recognise that delivering services is more complex than manufacturing products and requires different approaches to product – service design, organisational strategy and organisational transformation. There is little work however that can be used to help practitioners, and so this forms the basis of research challenges in this field.

Servitization does not however represent a panacea for UK manufactures. It is a concept of significant potential value, providing routes for companies to move up the value chain and exploit higher value business activities. This message is reinforced through the successes of companies such as Rolls-Royce with "TotalCare". These concepts must not be considered as universally applicable. While it is difficult to imagine that any manufacturer can succeed without offering some services (e.g. after-sales support, training and finance), these need not form the basis of a competitive strategy. Success is also possible through excelling at either product leadership or operational excellence. For those manufacturers that do see the provision of services as key to their future, there are still significant challenges to be faced. To be both effective and efficient, manufacturers need, for example, to be able to understand how their customers will value their services. Similarly, they will need to be able to configure their products, technologies, operations, and supply chain to support this value offering.

The findings presented in this paper provide a useful review of servitization and a platform on which to base more in-depth research. As we mentioned earlier though, this is only one community of researchers contributing to the broader topic of service-led competitive strategy. Others exist, particularly in the area of PSS (Baines *et al.*, 2007). To complete the formation of a truly inclusive literature review, the contributions in these themes need to be drawn together. This therefore will be the topic of our future research.

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