Journal of Business Research 98 (2019) 328–338

Contents lists available at ScienceDirect

Journal of Business Research

journal homepage: www.elsevier.com/locate/jbusres

The role of customer knowledge development for incremental and radical service innovation in servitized manufacturers

A. Elisabeth Johansson[a,*], Chris Raddats[b], Lars Witell[a,c]

[a] Department of Management and Engineering, Linköping University, SE-581 83 Linköping, Sweden
[b] Management School University of Liverpool, Liverpool L69 3BX, United Kingdom
[c] CTF- Service Research Centre, Karlstad University, SE-651 88 Karlstad, Sweden

ARTICLE INFO

Keywords:
Customer knowledge development
Service infusion
Servitization
Service innovation
New service development
Incremental innovation
Radical innovation

ABSTRACT

Service innovation is a key driver of service infusion for manufacturers. Although service innovation is widely researched for service firms, it is less explored for service infusion in manufacturers. Existing research about service infusion considers developing customer knowledge in sales and service delivery, but there is scarce research about how manufacturers develop customer knowledge during new service development (NSD). This study investigates customer knowledge development within manufacturers and considers how it differs between the development of incremental and radical service innovations. A study was undertaken with 239 European manufacturers which revealed multiple drivers of customer knowledge development, service innovation performance, and firm performance. Developing incremental service innovations are more successful when customers participate in NSD teams while developing radical service innovations leads manufacturers to higher firm performance.

1. Introduction

Manufacturers, operating in business-to-business (B2B) markets, are increasingly focusing on the development of new services to go alongside or even replace their traditional product-based offerings; a process described as service infusion (Forkmann, Henneberg, Witell, & Kindström, 2017; Kowalkowski, Kindström, Alejandro, Brege, & Biggemann, 2012). In this study, service infusion is seen "as the process whereby the relative importance of service offerings to a company or business unit increases, so augmenting its service business orientation" (Kowalkowski, Gebauer, Kamp, & Parry, 2017, p. 7). However, manufacturers are struggling to develop new services since "the rules of the game" (i.e., the development process) learned from developing new products, do not always work for new services (Storey, Cankurtaran, Papastathopoulou, & Hultink, 2016). This situation is exacerbated by the range of services that manufacturers now develop to infuse into their businesses, including both incremental and radical service innovations.

Even though service innovation and new service development (NSD) are increasingly important research areas, studies addressing them in relation to service infusion in manufacturers are relatively scarce. Research to date focuses on exploring and understanding manufacturers' NSD processes and challenges (Burton, Story, Raddats, & Zolkiewski, 2017; Ettlie & Rosenthal, 2011) and changes to organizational design and strategic behavior (Oliva & Kallenberg, 2003; Raddats & Burton, 2011). However, there is scarce research on how manufacturers undertake NSD by developing knowledge about and involving, their customers. This is surprising since the importance of working closely with customers in the development of new services within manufacturers is starting to be recognized (Santamaría, Jesús Nieto, & Miles, 2012; Schaarschmidt, Walsh, & Evanschitzky, 2018). Thus, we see a need for further investigation of how working with customers can improve manufacturers' service innovation performance and indeed overall firm performance.

Customer knowledge development is the process of developing an understanding of customers' new service preferences (Joshi & Sharma, 2004). Despite recognition of its importance for manufacturers, how it can be achieved has almost exclusively been investigated by conceptual research (Valtakoski, 2017) and case studies (e.g., Turunen & Toivonen, 2011). Service infusion literature suggests that manufacturers can use sales teams as conduits for information between their organization and customers (Hakanen, Kansola, & Valkokari, 2014; Rabetino, Kohtamäki, & Gebauer, 2017). Maintenance personnel might also be able to facilitate this role (Turunen & Toivonen, 2011) or knowledge transfer could take place during service delivery (Valtakoski, 2017). Regular meetings between manufacturers and customers are required to

* Corresponding author.
E-mail addresses: elisabeth.johansson@liu.se (A.E. Johansson), c.raddats@liverpool.ac.uk (C. Raddats), lars.witell@liu.se (L. Witell).

https://doi.org/10.1016/j.jbusres.2019.02.019
Received 6 September 2017; Received in revised form 6 February 2019; Accepted 8 February 2019

share information (Kohtamäki & Partanen, 2016). This work does not, however, provide guidance on how customer knowledge development takes place in manufacturers' NSD processes. This is despite the likelihood that developing extensive knowledge about customers during these processes could be key to success for service infusion in manufacturers (Gremyr, Löfberg, & Witell, 2010). So, there is a research gap concerning what the drivers of customer knowledge development in manufacturers' NSD processes are and to what extent customer knowledge development in NSD is beneficial for service infusion.

Service infusion can be based on adding either incremental or radical service innovations to the existing range of services (Gremyr, Witell, Löfberg, Edvardsson, & Fundin, 2014). Dependent on the type of service innovation, how to develop knowledge about customers may differ (Garcia & Calantone, 2002). Incremental service innovation occurs when relatively minor changes are made to an existing service, while radical service innovation implies a significant shift in the value proposition (Gallouj & Weinstein, 1997; Skålén, Gummerus, von Koskull, & Magnusson, 2014). Radical service innovation is often proposed to lead to larger performance improvements for manufacturers (Baines & Lightfoot, 2014); although the empirical evidence is far from conclusive on this matter (Eggert, Thiesbrummel, & Deutscher, 2015).

Given these research gaps concerning customer knowledge development and service infusion in manufacturers, the objectives of the paper are: (1) to identify what drives customer knowledge development in manufacturers' NSD processes, and how these drivers in turn influence service innovation performance and overall performance and (2) to investigate differences in the effects of these relationships for incremental and radical service innovation. This study builds on theoretical concepts developed in service infusion (e.g. Schaarschmidt et al., 2018), NSD (Witell, Gustafsson, & Johnson, 2014) and marketing (e.g., Fang, Palmatier, & Steenkamp, 2008; Joshi & Sharma, 2004) literature. These concepts include: 'Customer participation' (customer involvement in the manufacturer's NSD process); 'Customer research methods' (approaches to enable customers to contribute information about their service needs) and 'Integrated development teams' (the internal cooperation between different functional units in the firm). Based on a solid theoretical foundation, this has enabled the study to contribute new theoretical insights about how customer knowledge development takes place in manufacturers infusing their businesses with services.

2. Theoretical framework

2.1. NSD and service innovation within manufacturers

We align to the perspective that the process of developing new service offerings is NSD and the outcome of the process is service innovation (Witell, Snyder, Gustafsson, Fombelle, & Kristensson, 2016). Service innovation is often divided into different categories (Snyder, Witell, Gustafsson, Fombelle, & Kristensson, 2016), with innovation level (radical and incremental) as the most common categorization (Ordanini & Parasuraman, 2011). A value proposition with minor changes to existing characteristics (e.g., the knowledge and competencies of the manufacturer's service employees; its operational routines) is categorized as incremental service innovation, while one with a totally new set of characteristics is categorized as radical service innovation (Gallouj & Weinstein, 1997). It should be noted that innovation level is a relative concept and whether a service innovation is incremental or radical can only be determined by the manufacturer or customer concerned. In this study, it is the manufacturer that has determined if the service innovation is incremental or radical.

Despite the key role of service innovation for service infusion, manufacturers have found it difficult to implement service innovations in hybrid offerings. These are described as innovative combinations of services and products; for example, collecting and analyzing operational data to develop maintenance services for customers' fleets of forklift trucks (Ulaga & Reinartz, 2011). These difficulties are in part due to product and service development potentially competing for limited resources (Eggert et al., 2015). However, Eggert et al. (2015) find that manufacturers directing their innovation efforts to both products and services outperform other companies, whereas Gebauer, Gustafsson, and Witell (2011) find that manufacturers should focus on either product or service innovation to improve firm performance. While we do not seek to resolve this debate, it is fruitful for research to consider product and service innovation separately (Eggert et al., 2015), and in this study, we focus solely on service innovation.

2.2. Manufacturers' customer knowledge development and service infusion

Manufacturers' interactions with their customers often span a long period of time, allowing them to develop significant knowledge about their customers (Schaarschmidt et al., 2018). Thus, service infusion, which can be seen as a longitudinal process, is associated with both increased emphasis on services and the number of services offered (Homburg, Hoyer, & Fassnacht, 2002). Service infusion is strongly influenced by knowledge of, and interactions with customers, which result in a reconfiguration of the manufacturer's business model (Forkmann, Ramos, Henneberg, & Naudé, 2017). Kindström and Kowalkowski (2014) set out a number of processes within the service infusion business model for which developing customer knowledge appears particularly important: namely, sales processes, service delivery, and NSD. In terms of sales processes, developing knowledge about customers' needs is an important part of a consultative sales engagement to enable new offerings to be developed to address these needs (Sheth & Sharma, 2008). Service delivery can help manufacturers create strong ties with customers and facilitate customer knowledge development (Ulaga & Reinartz, 2011). Indeed, the opportunity to develop customer knowledge is probably greatest during this process, given the long duration over which many services, such as technical support and maintenance, are provided (Matthyssens & Vandenbempt, 2010; Turunen & Toivonen, 2011), and the intensity of the relational dimension, compared to product provision (Tuli, Kohli, & Bharadwaj, 2007).

As for NSD, manufacturers' new service offerings are increasingly developed with, rather than for, customers (Fliess & Lexutt, 2017). Thus, manufacturers need to learn about customers' existing operational processes in order to develop appropriate offerings (Storbacka, Windahl, Nenonen, & Salonen, 2013; Tuli et al., 2007). The revenue model associated with these new services also requires a sophisticated understanding of how customers wish to pay for them, since the offerings may be provided on a 'risk/reward' basis, where payment is only made when the manufacturer achieves agreed performance targets (Baines & Lightfoot, 2014). As a consequence, developing customer knowledge is particularly important for NSD (Lightfoot & Gebauer, 2011; Santamaría et al., 2012).

Since there have been no previous studies on customer knowledge development in NSD for manufacturers, we build on research from inside and outside the domain of service infusion. Customer knowledge development is considered the process of developing an understanding of customers' new service preferences that unfold through the iteration of probing and learning activities (Joshi & Sharma, 2004). This corresponds to studies within service infusion which stress the importance of increased customer participation in order to enhance knowledge of customers and develop solutions adapted for their existing processes (Kohtamäki & Partanen, 2016; Storbacka, 2011). Customer knowledge development has three characteristics: it takes place in the NSD process; the novelty of customer knowledge in each phase arises from interaction with customers; and it entails action-based learning about customer needs (Joshi & Sharma, 2004). Thus, the customer is seen as an important source of information (Mahr, Lievens, & Blazevic, 2014) and as a potential partner in development work (Witell, Kristensson, Gustafsson, & Löfgren, 2011).

2.3. Hypotheses development

The study tests the importance of customer knowledge development in NSD within a manufacturing context. To develop our conceptual model and hypotheses, including the key concepts, we build on research about service infusion, NSD and service innovation. The study, thus, focuses on the drivers of customer knowledge development; service innovation and firm performance; and the moderating role of service innovation level (incremental and radical).

2.3.1. Drivers of customer knowledge development

The first driver of customer knowledge development is customer participation which concerns the degree of continual, informal and in-depth contact with customers (Witell et al., 2014). In line with Fang et al. (2008) we define customer participation as the extent to which the customer is involved in the manufacturer's NSD process. The direct involvement of customers provides an arena for continuous interaction between employees and customers, enabling action-based learning (Storbacka, 2011). Customer participation in the NSD process gives firms a more complete assessment of customers' needs (Hakanen et al., 2014; Mahr et al., 2014) and supports the probing and learning activities needed for customer knowledge development. Based on this, we argue that customer participation in manufacturers' NSD process increases knowledge of customers.

H1. Customer participation is positively related to customer knowledge development.

Customer knowledge development can take place using customer research methods (Schirr, 2012). Such methods enable customers to contribute information about their needs and/or suggest ideas for new services (Schaarschmidt et al., 2018). Customer information has traditionally been identified through surveys, interviews and focus groups (Witell et al., 2011). Researchers now argue for using customers as co-creators during the early phases of the NSD process to help reveal latent customer needs, that otherwise would not be identified (Witell et al., 2011).

Using multiple customer research methods provides a vast amount of information and as a consequence manufacturers develop richer knowledge about their customers (Storbacka, 2011; Witell et al., 2011), which can help to quantify and visualize customer value (Rabetino et al., 2017). Storey and Larbig (2018) further argue that the use of a diverse set of customer research methods increases both the amount and accuracy of a firm's customer knowledge which reduces the ambiguity of customer information and aids its interpretation. Consequently, using multiple customer research methods beyond sales teams (Hakanen et al., 2014) and maintenance personnel (Turunen & Toivonen, 2011) in the NSD process should help manufacturers to learn new things about their customers (Storey & Larbig, 2018). Accordingly, we propose the following:

H2. The use of multiple customer research methods is positively related to customer knowledge development.

Using an integrated development team means that the responsibility for NSD is given to a formalized group of personnel from multiple functional areas (Joshi & Sharma, 2004). Integrated development teams foster sharing customer information across functional areas which improve the strategic flexibility needed for customer knowledge development (Joshi & Sharma, 2004). Nissen, Evald, and Clarke (2014) suggest that when a team has members with different knowledge and skills it creates momentum and progress in the NSD process. The different interpretations and combinations of customer information help team members to create new customer knowledge. Moreover, involving team members with specific competencies such as sales and maintenance has been shown to increase knowledge of customer needs (Menguc, Auh, & Uslu, 2013). Thus, we argue for the use of integrated development teams to increase customer knowledge development for manufacturers.

H3. The use of integrated development teams is positively related to customer knowledge development.

2.3.2. Drivers of service innovation performance

In this section, we investigate the effects of customer participation, customer knowledge development and integrated development teams on service innovation performance. Customer participation should have a positive effect on service innovation performance (Carbonell, Rodríguez-Escudero, & Pujari, 2009; Cheng & Krumwiede, 2012). Hakanen et al. (2014) further suggest that customer participation increases the adaptability of solutions to existing customer processes. Building on Witell et al. (2014), we argue that the direct participation of customers in the development team can provide additional interpretations of customer needs, over and above what the manufacturer could do alone. When customers actively participate in the NSD process they are more likely to provide contextual knowledge that is important for understanding how the customer will actually use an offering (Mahr et al., 2014). Customers are not just limited to considering existing products but can also think outside the context of current solutions and offerings, and may bring new ideas (Witell et al., 2014). The direct contribution of customer participation is different throughout the phases of the NSD process for manufacturers, with input on ideas in the early phases, interpretation of ideas, and later testing of specific service concepts (Storbacka, 2011; Valtakoski, 2017). So, in addition to an indirect effect through customer knowledge development, we suggest a positive relationship between customer participation and service innovation performance.

H4. Customer participation in NSD projects is positively related to service innovation performance.

Co-created knowledge has a significant positive impact on service innovation performance (Mahr et al., 2014). It enables a better understanding of customers' needs (Carbonell & Rodriguez-Escudero, 2014) and can help manufacturers to accurately develop the right services for the right customers (Brady, Davies, & Gann, 2005). Sharing knowledge and improved relationships enable suppliers and customers to discover unique competencies and value creating opportunities (Fang et al., 2008; Kohtamäki & Partanen, 2016). In the later phases of the NSD process, it can lead to the identification of additional uses and benefits as well as enable co-shaping of customer experiences (Storey & Larbig, 2018; Valtakoski, 2017). Thus, firms that have knowledge of customer needs will be able to improve service innovation performance (Joshi & Sharma, 2004).

H5. Customer knowledge development is positively related to service innovation performance.

Involving employees with different competencies in development teams has been shown to have an impact on how well a firm's NSD activities meet customer needs (de Brentani, 1989). Joshi and Sharma (2004) found a positive relationship between the use of integrated development teams and innovation performance in NPD and this effect has been replicated for service firms (Edvardsson, Meiren, Schäfer, & Witell, 2013). Integrated development teams can be beneficial through improved creativity and breadth of ideas associated with the diversity and use of various resources (Froehle, Roth, Chase, & Voss, 2000), which can lead to successful service innovations. Windahl and

Lakemond (2006) support this in their study of manufacturers by stressing the importance of intra-firm relationships during solution development. However, Schaarschmidt et al. (2018) suggest that integrated development teams are less beneficial in a manufacturing context. We suggest that integrated development teams have a positive direct effect on service innovation performance within manufacturers.

H6. The use of integrated development teams is positively related to service innovation performance.

2.3.3. Service innovation performance and firm performance

The relationship between service provision and manufacturers' overall performance is fairly well established (Fang et al., 2008; Wang, Lai, & Shou, 2018). This is particularly the case when manufacturers are seen as leaders in service innovation (Gebauer et al., 2011). Measures of firm performance often include profitability (Eggert et al., 2015), market share (Gebauer et al., 2011) and services revenue (Antioco, Moenaert, Lindgreen, & Wetzels, 2008). However, questions have been raised as to how appropriate services revenue is as a performance measure. For example, firms may not separately record sales of products and services (Wang et al., 2018); an increase in the proportion of services sales in the corporate total may be as a result of failing product businesses (Raddats, Burton, & Ashman, 2015); increasing services revenue does not necessarily improve profitability (Eggert, Hogreve, Ulaga, & Muenkhoff, 2011; Suarez, Cusumano, & Kahl, 2013). To qualify this point, Fang et al. (2008) found services may need to reach a significant proportion (20–30%) of a manufacturer's sales to have a positive impact on firm performance. To reach this threshold, new services must be developed by the manufacturer. Thus, we argue that service innovation performance positively affects manufacturers' firm performance.

H7. Service innovation performance is positively related to firm performance.

2.3.4. The moderating effect of innovation level: radical versus incremental service innovation

Given that customers' knowledge is generally based on day-to-day experiences with products or services (Gustafsson, Kristensson, & Witell, 2012), the use of existing methods and approaches for NSD in manufacturers might not help them accurately capture information about heterogeneous customer needs (von Hippel & Katz, 2002). One reason is that these methods and approaches concentrate on capturing customers' experiences with existing services; that is, they have been designed for customers to respond to stimuli from the firm (Witell et al., 2011). These methods and approaches are less effective for radical service innovation and could weaken the effects of the antecedents on customer knowledge development; that is, these antecedents do not, to the same extent, contribute to customer knowledge development needed for radical service innovation in manufacturers. It should be noted that we do not expect that innovation level influences the effect of integrated development teams on customer knowledge development. Thus, we argue that:

H8. For radical innovation (in comparison to incremental innovation), (a) the weaker the positive relationship between customer participation and customer knowledge development; (b) the weaker the relationship between customer research methods and customer knowledge development.

Previous research offers mixed findings concerning the effect of innovation level on the relationship between customer knowledge development and service innovation performance. Eggers, Kraus, and Covin (2014) find that responsiveness to customer needs can lead to higher performance from radical innovations. By comparison, customer involvement was found to be more important for incremental rather than radical innovation (Cheng & Krumwiede, 2012; Gustafsson et al., 2012). While supporting this finding, Carbonell and Rodriguez-Escudero (2014) note that firms could seek the involvement of certain 'lead user' customers for technologically advanced services. This is particularly relevant for manufacturers where radical service innovations are often technology-based and might focus on the application of 'Big Data' (Opresnik & Taisch, 2015). Gustafsson et al. (2012) suggest that for radical service innovations manufacturers should frequently interact with their customers, but that customers should not be too involved in developing the content of the service. We can, therefore, expect that customer participation and customer knowledge development have a weaker effect on service innovation performance for radical service innovation than incremental service innovation. It should be noted that we do not expect that innovation level influences the effect of integrated development teams on service innovation performance. Thus, we argue:

H9. For radical innovation (in comparison to incremental innovation), a) the weaker the positive relationship between customer participation and service innovation performance, (b) the weaker the positive relationship between customer knowledge development and service innovation performance.

de Brentani (1989) argues that service innovation needs to be unique and truly radical to achieve a competitive advantage, whereas Story, Daniels, Zolkiewski, and Dainty (2014) find that radical service innovation often results in unprecedented improvements in performance. Manufacturers are generally urged to develop radical, over incremental, service innovations to have a major impact on firm performance (Barnett, Parry, Saad, Newnes, & Goh, 2013; Witell and Löfgren 2013). Thus, for manufacturers, radical service innovation positively affects firm performance. We, therefore, argue:

H10. There is a stronger positive relationship between service innovation performance and firm performance for radical innovation (in comparison to incremental innovation).

These relationships are presented in our conceptual model (Fig. 1).

3. Methodology

3.1. Data collection and sampling

The target population was manufacturers with 20 or more employees, based in Germany, Sweden, and Switzerland. Firm details were sourced from databases for each individual country and included a wide range of sectors such as the manufacturer of machinery, plastics, paper, and electrical components. After deletion of firms with multiple sites, the initial list comprised 1839 manufacturers. The unit of analysis for the study was the manufacturer or strategic business unit (SBU) for larger firms. A SBU is a relatively autonomous unit controlling a number of its own functions (Homburg, Workman Jr., & Krohmer, 1999). Focusing on SBUs is more appropriate in larger firms since different SBUs may have diverse approaches to NSD.

The self-administered questionnaire was distributed by post to managers responsible for services. As an incentive to complete and return the questionnaire the respondents were promised an executive summary of the major findings from the study. Two follow-up contacts were made to maximize the response and minimize non-response bias (Iacobucci & Churchill, 2005). Reminders were sent to non-respondents, one and two weeks after the initial mailing. This yielded a

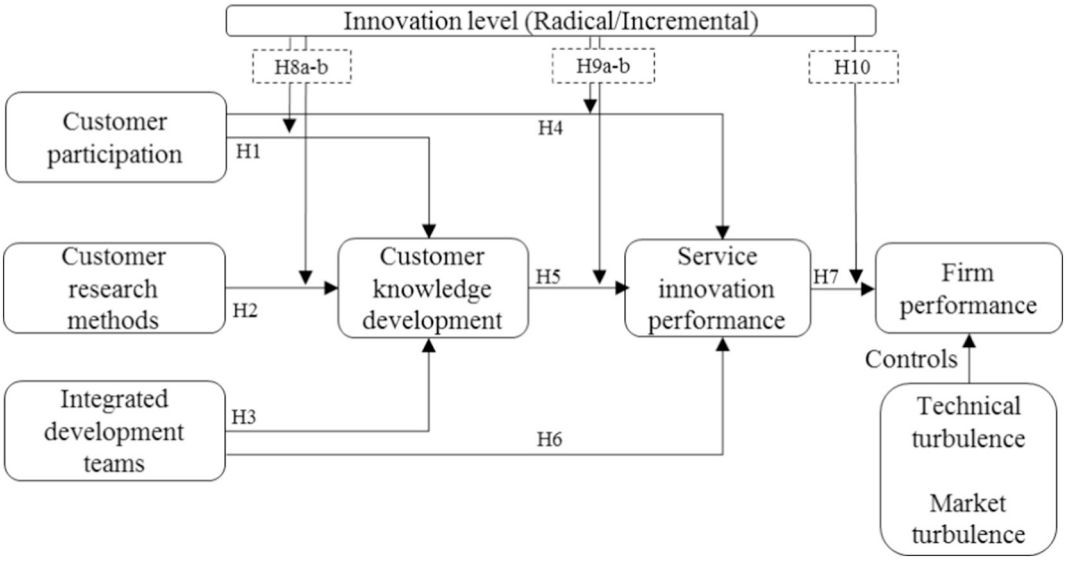

Fig. 1. Customer knowledge development in service innovation.

response rate of 13% (n = 239), which is in line with other cross-sectional studies of NSD (Melton & Hartline, 2010). Within the sample, 50% of the manufacturers had < 100 employees while the average turnover coming from services was 16.3%. This shows that services are important for their businesses and that service infusion is a relevant concept for the surveyed manufacturers. Most respondents had more than fifteen years' experience with their current firms and were viewed as capable of commenting on their firms' NSD activities. In order to detect possible non-response bias, an independent samples *t*-test was applied to early and late responses (Armstrong & Overton, 1977). No statistical differences were found, so non-response error was not considered an issue.

3.2. Questionnaire and measures

The questionnaire was designed to capture respondents' service infusion and NSD experiences. The constructs and items were primarily based on existing scales that were used or adapted whenever needed (Churchill Jr., 1979). Since existing scales from NSD and NPD were used, these were adapted to fit the context of NSD in manufacturing firms. The adaption process mainly concerned (1) rewording of items to fit the context; and (2) elimination of items that did not fit the manufacturing context. We used interviews and pre-tests of the scales with managers to ensure face validity. The constructs were reflective, with the majority of scales taken from previous research: 'Customer participation', 'Customer research methods', 'Integrated development teams', 'Customer knowledge development', 'Service innovation performance' and 'Firm performance'. We used 'Technological turbulence' and 'Market turbulence' as controls.

The construct 'Customer participation' builds on customer information usage and was adapted from Witell et al. (2014) and concerns the degree of customer participation in the different phases of the NSD process. The construct 'Customer research methods' has previously been used in Witell et al. (2014) and Cui and Wu (2016). The items in the construct capture the methods used to seize customer information. The two constructs 'Integrated development teams' and 'Customer knowledge development' were adopted from Joshi and Sharma (2004). These constructs capture the internal co-operation between different functional units in the firm and how knowledge about customers evolves throughout the development process. The construct 'Service innovation performance' was adapted from Moorman and Rust (1999) and captures how new services are performing in relation to the service development objectives. In a similar vein, 'Firm performance' was adapted from Moorman and Rust (1999). The performance construct builds on a comparison of the achieved results with the industry average and competitors. In line with previous research, innovation level (Garcia & Calantone, 2002) (used to split the sample for the moderation analyses) was measured through an evaluation by the respondent as to what extent the services addressed new customer needs and were new to the firm and industry. 'Technology turbulence' and 'Market turbulence' (Gebauer et al., 2011) were included to control for how fast technology and markets are changing. The appendix contains details of the constructs, items and their sources.

The questionnaire was designed by the research team paying particular attention to ensuring consistency in different languages, as the questionnaire was to be used in Germany, Sweden, and Switzerland. The questionnaire was initially written in English and then, once agreement about the wording had been reached, translated to German and Swedish. A comparison was then made to ensure that the translated versions all had the same meaning. Two members of the research team spoke the three languages (English, German and Swedish) which enabled this process to take place. A pilot test was performed with a number of manufacturers in each country. Based on the pilot study minor changes were made to improve the questionnaire's layout and readability. In line with previous studies within service infusion (Oliva, Gebauer, & Brann, 2012), cognitive measures were used to assess managerial perceptions of the key constructs under investigation. Items were measured using a ten-point Likert-type scale (1 = strongly disagree to 10 = strongly agree).

In a cognitive-based survey, it is important to control for common method variance. We tested this issue using Harman's single-factor test which showed that the shared common variance accounted for only 20%. Since this test suffers some limitations, in addition, we used a marker variable approach (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003) adapted for partial least squares structural equation modeling (PLS-SEM). More precisely, we used the latent variable scores as single items connected to each construct in the estimated path model. Thereafter, we made a comparison between the relationships in the estimated path model with and without a marker variable (Sattler, Völckner, Riediger, & Ringle, 2010). This comparison showed no

Table 1
HTMT matrix, discriminant validity, reliability and descriptive statistics.

		1	2	3	4	5	6	7	8
1	Customer participation								
2	Customer knowledge development	0.462							
3	Customer research methods	0.448	0.595						
4	Integrated development teams	0.243	0.527	0.505					
5	Market turbulence	0.290	0.236	0.462	0.242				
6	Service innovation performance	0.386	0.449	0.407	0.401	0.263			
7	Firm performance	0.119	0.223	0.243	0.224	0.233	0.522		
8	Technological turbulence	0.183	0.276	0.501	0.370	0.545	0.448	0.427	
	Composite reliability	0.811	0.804	0.777	0.813	0.788	0.891	0.895	0.892
	Number of items	3	4	3	3	3	5	4	3
	Mean	6.10	5.24	2.84	6.09	6.40	6.32	6.39	6.12
	Standard deviation	2.38	2.47	2.19	2.87	2.4	1.81	1.94	2.26

noteworthy differences, and all paths maintained their significance. Other techniques used in this study for avoiding common method variance included: respondents were aware that data was collected anonymously; respondents were unaware of the relationships under investigation; the survey was designed to separate predictor and criterion variables (Podsakoff et al., 2003).

3.3. Structural model

Data analysis was undertaken by means of PLS-SEM, using SmartPLS 3 (Ringle, Wende, & Becker, 2015). The statistical model was evaluated and tested in two phases; firstly, assessing the conceptual model presented in Fig. 1; secondly, testing how innovation level moderates the relationships in the conceptual model.

In the first phase, all manufacturers were included, whereas in the second phase manufacturers were divided into two groups, based on innovation level (incremental and radical) (Sarstedt, Henseler, & Ringle, 2011). Whereas manufacturers may develop a range of services with different novelty levels, in line with prior research (Eggert et al., 2015) our intention was to analyze firm-specific data based on their primary service innovations. Previous research, such as Gustafsson et al. (2012) has often relied on firm self-evaluation using a single-item of incremental and radical service innovation. In contrast, this study used self-evaluation of multiple items on how innovative firms' service offerings were based on newness for the customer, firm, and industry (Danneels & Kleinschmidt, 2001). This firm-level approach was appropriate since the study aimed to assess the impact of service innovation at a firm-level. To operationalize this grouping we used six items to measure whether the firm undertook incremental or radical innovations (see Appendix). Two groups were formed based on creating an index out of item scores; an incremental service innovation group based on lower scores (n = 139); a radical service innovation group based on higher scores (n = 100).

Descriptive statistics such as discriminant validity, composite reliability, mean and standard deviation are shown in Table 1. In order to assess the discriminant validity, we use the HTMT criterion (Henseler, Ringle, & Sarstedt, 2014). For the measurement models, all results are below the threshold of 0.85. Thereafter, we ran the bootstrapping procedure with 5000 samples and used the no sign changes option, bootstrap confidence intervals, and two-tailed testing at the 0.05 significance level. The results show that none of the HTMT values include the value one, suggesting that all the HTMT values are significantly different from one. Next, we checked the composite reliability of all constructs. They exceeded the stated threshold value of 0.7 (Hair, Sarstedt, Ringle, & Mena, 2012). Each item used to operationalize the constructs should be highly correlated to, and load onto, their latent constructs preferably above 0.7 and necessarily above the threshold of 0.4 to indicate convergent validity (Hair et al., 2012). In the first phase of testing of our conceptual model each item had the highest loading on its specified construct, which ranged from 0.62 to 0.87. With these reliability and validity tests, we can see that the quality of the measurement model is sound.

4. Results

4.1. Customer knowledge development in manufacturers' service innovation

The outer model evaluation provided evidence for reliability and validity; subsequently, the inner model estimates are presented. R^2 values are used to evaluate the inner model's quality. The variance explained by the three endogenous constructs is: 'Customer knowledge development' (0.25), 'Service innovation performance' (0.19) and 'Firm performance' (0.24). The control variable 'Technical turbulence' has a significant effect on 'Firm performance' whereas 'Market turbulence' has no significant effect. The standardized path estimates provide further evidence of the inner model's quality. These estimates provide support for the hypotheses within the main model, see Table 2.

To assess the path coefficients' significance, we ran bootstrapping, using the no sign changes option and 5000 subsamples. There are significant positive relationships between the drivers: 'Customer participation' (H1), 'Customer research methods' (H2), 'Integrated development teams' (H3), and 'Customer knowledge development'. Furthermore, there are significant positive relationships between 'Customer participation' (H4), 'Customer knowledge development' (H5) and 'Integrated development teams' (H6) and 'Service innovation performance'. The strongest positive relationship is between 'Service innovation performance' and 'Firm performance' (H7).

4.2. Comparison between incremental and radical service innovation

In the second phase, we used parametric tests, which use standard errors derived from bootstrapping (no sign changes and 5000 subsamples [Hair et al., 2012]) to test group differences. This approach was used to analyze the moderation effects between groups (incremental vs. radical service innovation), making it possible to compare the path coefficients which allows us to interpret group differences (Sarstedt et al., 2011). In line with Henseler, Ringle, and Sarstedt (2016), before performing multiple group analysis we made a measurement invariance analysis. This showed that the data groups had partial measurement invariance, and a comparison between the groups is suitable. All measurement models meet the common standard and explained variances of the endogenous constructs in the model are satisfactory (Hair

Table 2
Hypothesis testing: All manufacturers.

Hypothesis	Path	Standardized path estimates	Results
H1	Customer participation - > Customer knowledge development	0.20***	Supported
H2	Customer research methods - > Customer knowledge development	0.28***	Supported
H3	Integrated development teams - > Customer knowledge development	0.24***	Supported
H4	Customer participation - > Service innovation performance	0.21***	Supported
H5	Customer knowledge development - > Service innovation performance	0.21**	Supported
H6	Integrated development teams - > Service innovation performance	0.20***	Supported
H7	Service innovation performance - > Firm performance	0.37***	Supported
Control	Technological turbulence - > Firm performance	0.20***	
Control	Market turbulence - > Firm performance	0.06	

** $p < 0.05$.
*** $p < 0.01$.

et al., 2012); namely 'Customer knowledge development' (incremental = 0.24; radical = 0.27), 'Service innovation performance' (incremental = 0.24; radical = 0.11), and 'Firm performance' (incremental = 0.12; radical = 0.48). This suggests that customer knowledge development is less important in NSD for radical service innovations but radical service innovations are more important for firm performance.

We assessed the relationships between the constructs, see results in Table 3. Both 'Customer participation' and 'Integrated development teams' significantly influenced 'Customer knowledge development' in both groups of manufacturers ($p < 0.05$). 'Customer research methods' also significantly influenced 'Customer knowledge development' in both groups ($p < 0.1$).

We found a significant positive influence of 'Integrated development teams' on 'Service innovation performance' for both groups ($p < 0.05$). However, for 'Customer participation' and 'Customer knowledge development' the incremental group had a significant positive influence on 'Service innovation performance' ($p < 0.1$), but not the radical group. This implies that for incremental service innovation, a strong performance can be achieved by ensuring that customers are highly involved in the NSD process. Finally, both groups had a significant positive relationship between 'Service innovation performance' and 'Firm performance' ($p < 0.05$).

In order to formally test hypotheses H8–H10, we compared the model for possible group differences (incremental vs. radical service innovation) using a modified independent samples *t*-test (Sarstedt et al., 2011). The results show that only two of the hypotheses are supported; H9a and H10 (see Table 4). The relationship between the constructs 'Customer participation' and 'Service innovation performance' (H9a) shows a significant difference between the two groups, suggesting that customer participation is more important for incremental service innovation performance. The relationship between the constructs 'Service innovation performance' and 'Firm performance' (H10) also differs significantly between the groups, in this case indicating that radical service innovation is more important for firm performance.

5. Discussion and implications

5.1. Theoretical implications

This study builds on previous research about NSD and service innovation (Carbonell et al., 2009), as well as conceptual (Valtakoski, 2017) and case study (Turunen & Toivonen, 2011) research about service infusion. It extends existing research by addressing one of the key challenges for manufacturers; that is, how to develop knowledge about customers. The study has three specific theoretical implications.

First, in contrast to previous research that notes that manufacturers *should* develop knowledge about customers for NSD (Santamaría et al., 2012), this study demonstrates *how* customer knowledge development takes place in the NSD process and the positive effect it has on service innovation performance. Our study shows that customer knowledge development needs to be multifaceted: seeking customer participation in NSD activities (Hakanen et al., 2014); using multiple research methods (Storbacka, 2011); and setting up integrated development teams, which involve both employees and customers (Carbonell et al., 2009). Previously, these drivers of customer knowledge development have been studied separately (Hakanen et al., 2014; Storbacka, 2011). The present study, however, shows that the drivers are additive, contributing to developing customer knowledge and enabling manufacturers to complement their products with services to provide hybrid

Table 3
Structural model estimates for Incremental and Radical service innovations and *t*-test for group differences.

Path	Innovation level	Path coefficient	Standard Error	t-Value	p-Value	|Diff| means	t-Value	p-Value
Customer participation - > Customer knowledge development	Incremental	0.180	0.084	2.118	0.035	0.071	0.565	0.573
	Radical	0.250	0.091	2.734	0.006			
Customer research methods - > Customer knowledge development	Incremental	0.264	0.088	3.009	0.003	0.034	0.236	0.8113
	Radical	0.230	0.118	1.941	0.052			
Integrated development teams - > Customer knowledge development	Incremental	0.267	0.085	3.133	0.002	0.037	0.273	0.785
	Radical	0.230	0.110	2.083	0.038			
Customer participation - > Service innovation performance	Incremental	0.329	0.066	4.990	0.000	0.286	2.439	0.015
	Radical	0.043	0.104	0.413	0.679			
Customer knowledge development - > Service innovation performance	Incremental	0.164	0.095	1.724	0.085	0.016	0.100	0.921
	Radical	0.180	0.138	1.309	0.191			
Integrated development teams - > Service innovation performance	Incremental	0.194	0.085	2.274	0.023	0.002	0.014	0.989
	Radical	0.196	0.096	2.029	0.043			
Service innovation performance - > Firm performance	Incremental	0.192	0.102	1.885	0.060	0.418	3.183	0.002
	Radical	0.610	0.064	9.515	0.000			

Table 4
Hypotheses testing innovation level as moderating effect.

Hypothesis	Path	Group path difference	Results
H8a	Customer participation - > Customer knowledge development	0.07	Not supported
H8b	Customer research methods - > Customer knowledge development	0.03	Not supported
H9a	Customer participation - > Service innovation performance	0.29**	Supported
H9b	Customer knowledge development - > Service innovation performance	0.03	Not supported
H10	Service innovation performance - > Firm performance	0.42***	Supported

** $p < 0.05$.
*** $p < 0.01$.

offerings. We highlight the key role of integrated development teams. Schaarschmidt et al. (2018) suggest that such teams only have an effect on product innovation but not on service innovation. Our results contradict previous research on service infusion (e.g., Schaarschmidt et al., 2018) suggesting that integrated development teams influence service innovation performance both for incremental and radical service innovation. This is an important contribution since it shows that manufacturers innovating hybrid offerings could use integrated development teams to enable service innovations.

Second, the extant literature provides no clear view of how the drivers of customer knowledge development and service innovation performance in manufacturers' NSD differ between incremental and radical service innovations. Our findings provide different routes for developing services in manufacturers dependent on the level of service innovation. This study clarifies the ambiguity in previous research on service infusion by showing that manufacturers undertaking incremental rather than radical service innovations have most to gain when customers participate in the NSD process, supporting results from studies outside the service infusion domain (Cheng & Krumwiede, 2012; Gustafsson et al., 2012). When involving customers in the development of new services, manufacturers can encourage them to participate in different phases of the NSD process. This in contrast to research on service firms, where customer participation has the highest effect in the early or later phases of the NSD process (Witell et al., 2014). Within the service infusion literature, the importance of customer participation in sales processes (Sheth & Sharma, 2008) and service delivery (Ulaga & Reinartz, 2011) is already clear. This study extends prior work to demonstrate the importance of customer participation during NSD for incremental service innovations.

Third, the study shows the importance of service innovations for firm performance (Fang et al., 2008; Gebauer et al., 2011). Previous research has disagreed about how manufacturers should balance product and service innovation (Eggert et al., 2015; Gebauer et al., 2011). The present research moves beyond this debate and focuses on how service innovation contributes to firm performance. More specifically, this study supports prior qualitative research on service infusion that stresses the importance of radical over incremental service innovation (Baines & Lightfoot, 2014; Barnett et al., 2013; Witell & Löfgren, 2013). Our results resolve the debate on the role of service innovation for manufacturers in terms of its effect on firm performance (Eggert et al., 2015) showing that a focus on radical service innovation drives manufacturers' performance, whereas a focus on incremental service innovation defends the present market position.

5.2. Managerial implications

The study has a number of implications for managers. Customers should be highly involved throughout the different phases of the NSD process to ensure that service innovations address genuine market needs. In particular, a multi-faceted approach to customer knowledge development is important, including active customer participation in the NSD process; employing different research methods to obtain customer information, and building cross-functional NSD teams to ensure different perspectives. Involving customers in the NSD process also has the potential to improve service innovation performance, and ultimately firm performance.

Managers need to consider the type of service innovation required in their markets. It might be that new services developed for existing problems are appropriate. Our study emphasized, in particular, the importance of customer participation for incremental service innovations. For more radical service innovation, the role of the customer is more ambiguous. There is a danger that simply asking customers what they want or just considering their day-to-day experiences with products will not elicit the right information to fully capture new possibilities through advances in ICT, such as 'Big Data'. Radical service innovation, therefore, requires a more holistic process; capturing ideas from both product innovations and developments outside the manufacturer's own sector and might require the involvement of 'lead user' customers to assess the viability of these innovations.

Finally, while incremental innovation is generally the norm, our study suggests it is radical innovation that will make the largest impact on overall firm performance. This finding challenges managers to seek opportunities which might result in paradigm shifts for both themselves and their customers. Sensing and seizing opportunities for radical service innovation will perhaps be the greatest challenge of service infusion that managers will face.

5.3. Limitations and further research

As with all research, this study has some limitations. First, the results are based on an investigation in Germany, Sweden, and Switzerland. While great lengths were taken to ensure consistency of meaning of each construct and item in German and Swedish, there will inevitably be more risk that this is not the case than for studies conducted in one country. Second, common method variance is inherent when a study uses a single informant per company for data collection, although our research approach was designed to minimize this.

Future research should further explore how manufacturers can develop customer knowledge for radical service innovations since the current practices mainly support the development of incremental service innovation. In addition, there are several contingencies that could be of interest. One issue concerns the timing of incremental and radical service innovation, so as services represent an increasing share of corporate turnover there could potentially be a shift from radical towards incremental service innovation to drive firm performance. In addition, further constructs such as learning orientation and service capabilities could be added to our conceptual model to enhance an understanding of customer knowledge development for service infusion.

Appendix A

Theoretical constructs and their operationalization
Customer participation (Witell et al., 2014) (**composite reliability = 0.81**)
To what degree is the customer integrated into a certain phase of the service development process?
-Idea generation and evaluation phase
-Business analysis phase
-Concept development phase
Customer research methods (Cui & Wu, 2016; Witell et al., 2014) (**composite reliability = 0.78**)
To what degree is the following methods used to involve the customer in service development projects?
-Focus Groups
-Open Source Methods
-Panels on the Internet
Integrated development teams (Joshi & Sharma, 2004) (**composite reliability = 0.81**)
Our projects are comprised of individuals drawn from a number of different functional areas.
In our organization, functional areas are viewed as resource pools from which to draw personnel for cross-functional teams.
Our project teams are given a budget and have specific responsibilities in terms of service development.
Customer knowledge development (Joshi & Sharma, 2004) (**composite reliability = 0.81**)
We went through lots of iterations based on customer feedback prior to launching the service in the market.
We developed and tested lots of new ideas over the course of this new service development process.
The development project involved numerous failed experiments.
We learned about customer needs as we worked with customers through new versions of the service.
Service innovation performance (Moorman & Rust, 1999) (**composite reliability = 0.88**)
Relative to your service development objectives, how are your new services (launched in the last three years in the market) performing on …
-Sales
-Customer satisfaction
-Profitability
-Market share
-Innovativeness
Firm performance (Gebauer et al., 2011; Moorman & Rust, 1999) (**composite reliability = 0.88**)
Relative to your company's stated objectives (during the last three years), how is your company performing on…
-Sales
-Profitability
-Market share
Innovation level (Garcia & Calantone, 2002)
We have developed services that are new to the industry.
We have mainly done improvements of existing services.
We have developed services that are new to the world.
The new services covered customer needs that were new to the company.
The new services focused on attracting customers that were new to the company.
The new services focused on existing customers but meeting new needs.
Technological turbulence (Jaworski & Kohli, 1993) (**composite reliability = 0.89**)
To what extent do you agree with the following statements regarding the role of technology in your industry?
The technology in our industry is changing rapidly.
Technological changes provide big opportunities in our industry.
A large number of new service ideas have been made possible through technological breakthroughs in our industry.
Market turbulence (Jaworski & Kohli, 1993) (**composite reliability = 0.79**)
To what extent do you agree with the following statements regarding the market in your industry?
In our kind of business, customers' service preferences change quite a bit over time.
Our customers tend to look for new services all the time.
New customers tend to have service-related needs that are different from those of our existing customers.

References

Antioco, M., Moenaert, R. K., Lindgreen, A., & Wetzels, H. G. (2008). Organizational antecedents to and consequences of service business orientations in manufacturing companies. *Journal of the Academy of Marketing Science, 36*(3), 337–358.

Armstrong, J. S., & Overton, T. S. (1977). Estimating nonresponse bias in mail surveys. *Journal of Marketing Research (JMR), 14*(3), 396–402.

Baines, T., & Lightfoot, H. W. (2014). Servitization of the manufacturing firm: Exploring the operations practices and technologies that deliver advanced services. *International Journal of Operations & Production Management, 34*(1), 2–35.

Barnett, N. J., Parry, G., Saad, M., Newnes, L. B., & Goh, Y. M. (2013). Servitization: Is a paradigm shift in the business model and service enterprise required? *Strategic Change, 22*(3–4), 145–156.

Brady, T., Davies, A., & Gann, D. M. (2005). Creating value by delivering integrated solutions. *International Journal of Project Management, 23*(5), 360–365.

Burton, J., Story, V. M., Raddats, C., & Zolkiewski, J. (2017). Overcoming the challenges that hinder new service development by manufacturers with diverse services strategies. *International Journal of Production Economics, 192*, 29–39.

Carbonell, P., & Rodriguez-Escudero, A.-I. (2014). Antecedents and consequences of using information from customers involved in new service development. *Journal of Business & Industrial Marketing, 29*(2), 112–122.

Carbonell, P., Rodríguez-Escudero, A. I., & Pujari, D. (2009). Customer involvement in new service development: An examination of antecedents and outcomes. *Journal of Product Innovation Management, 26*(5), 536–550.

Cheng, C. C., & Krumwiede, D. (2012). The role of service innovation in the market orientation - new service performance linkage. *Technovation, 32*(7–8), 487–497.

Churchill, G. A., Jr. (1979). A paradigm for developing better measures of marketing constructs. *Journal of Marketing Research, 16*(1), 64–73.

Cui, A. S., & Wu, F. (2016). Utilizing customer knowledge in innovation: Antecedents and impact of customer involvement on new product performance. *Journal of the Academy of Marketing Science, 44*(4), 516–538.

Danneels, E., & Kleinschmidt, E. J. (2001). Product innovativeness from the firm's perspective: Its dimensions and their relation with project selection and performance. *Journal of Product Innovation Management, 18*(6), 357–373.

de Brentani, U. (1989). Success and failure in new industrial services. *Journal of Product Innovation Management, 6*(4), 239–258.

Edvardsson, B., Meiren, T., Schäfer, A., & Witell, L. (2013). Having a strategy for new service development – Does it really matter? *Journal of Service Management, 24*(1), 25–44.

Eggers, F., Kraus, S., & Covin, J. G. (2014). Traveling into unexplored territory: Radical innovativeness and the role of networking, customers, and technologically turbulent

environments. *Industrial Marketing Management, 43*(8), 1385–1393.
Eggert, A., Hogreve, J., Ulaga, W., & Muenkhoff, E. (2011). Industrial services, product innovations, and firm profitability: A multiple-group latent growth curve analysis. *Industrial Marketing Management, 40*(5), 661–670.
Eggert, A., Thiesbrummel, C., & Deutscher, C. (2015). Heading for new shores: Do service and hybrid innovations outperform product innovations in industrial companies? *Industrial Marketing Management, 45*, 173–183.
Ettlie, J. E., & Rosenthal, S. R. (2011). Service versus manufacturing innovation. *Journal of Product Innovation Management, 28*(2), 285–299.
Fang, E., Palmatier, R. W., & Steenkamp, J.-B. E. M. (2008). Effect of service transition strategies on firm value. *Journal of Marketing, 72*(5), 1–14.
Fliess, S., & Lexutt, E. (2017). How to be successful with servitization – Guidelines for research and management. *Industrial Marketing Management.* https://doi.org/10.1016/j.indmarman.2017.11.012 (accessed 5th February 2019).
Forkmann, S., Henneberg, S. C., Witell, L., & Kindström, D. (2017). Driver configurations for successful service infusion. *Journal of Service Research, 20*(3), 275–291.
Forkmann, S., Ramos, C., Henneberg, S. C., & Naudé, P. (2017). Understanding the service infusion process as a business model reconfiguration. *Industrial Marketing Management, 60*, 151–166.
Froehle, C. M., Roth, A. V., Chase, R. B., & Voss, C. A. (2000). Antecedents of new service development effectiveness: An exploratory examination of strategic operations choices. *Journal of Service Research, 3*(1), 3–17.
Gallouj, F., & Weinstein, O. (1997). Innovation in services. *Research Policy, 26*(4–5), 537–556.
Garcia, R., & Calantone, R. (2002). A critical look at technological innovation typology and innovativeness terminology: A literature review. *Journal of Product Innovation Management, 19*(2), 110–132.
Gebauer, H., Gustafsson, A., & Witell, L. (2011). Competitive advantage through service differentiation by manufacturing companies. *Journal of Business Research, 64*(12), 1270–1280.
Gremyr, I., Löfberg, N., & Witell, L. (2010). Service innovations in manufacturing firms. *Managing Service Quality: An International Journal, 20*(2), 161–175.
Gremyr, I., Witell, L., Löfberg, N., Edvardsson, B., & Fundin, A. (2014). Understanding new service development and service innovation through innovation modes. *Journal of Business & Industrial Marketing, 29*(2), 123–131.
Gustafsson, A., Kristensson, P., & Witell, L. (2012). Customer co-creation in service innovation: A matter of communication? *Journal of Service Management, 23*(3), 311–327.
Hair, J. F., Sarstedt, M., Ringle, C. M., & Mena, J. A. (2012). An assessment of the use of partial least squares structural equation modeling in marketing research. *Journal of the Academy of Marketing Science, 40*(3), 414–433.
Hakanen, T., Kansola, M., & Valkokari, K. (2014). Acquiring customer knowledge to enhance servitization of industrial companies. *Servitization in Industry* (pp. 191–209). Cham: Springer.
Henseler, J., Ringle, C. M., & Sarstedt, M. (2014). A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the Academy of Marketing Science,* 1–21.
Henseler, J., Ringle, C. M., & Sarstedt, M. (2016). Testing measurement invariance of composites using partial least squares. *International Marketing Review, 33*(3), 405–431.
Homburg, C., Hoyer, W. D., & Fassnacht, M. (2002). Service orientation of a retailer's business strategy: Dimensions, antecedents, and performance outcomes. *Journal of Marketing, 66*(4), 86–101.
Homburg, C., Workman, J. P., Jr., & Krohmer, H. (1999). Marketing's influence within the firm. *Journal of Marketing, 63*(2), 1–17.
Iacobucci, D., & Churchill, G. A. (2005). *Marketing research: Methodological foundations* (9th ed.). Mason, OH: Cengage Learning.
Jaworski, B. J., & Kohli, A. K. (1993). Market orientation: Antecedents and consequences. *Journal of Marketing, 57*(3), 53.
Joshi, A. W., & Sharma, S. (2004). Customer knowledge development: Antecedents and impact on new product performance. *Journal of Marketing, 68*(4), 47–59.
Kindström, D., & Kowalkowski, C. (2014). Service innovation in product-centric firms: A multidimensional business model perspective. *Journal of Business & Industrial Marketing, 29*(2), 96–111.
Kohtamäki, M., & Partanen, J. (2016). Co-creating value from knowledge-intensive business services in manufacturing firms: The moderating role of relationship learning in supplier–customer interactions. *Journal of Business Research, 69*(7), 2498–2506.
Kowalkowski, C., Gebauer, H., Kamp, B., & Parry, G. (2017). Servitization and deservitization: Overview, concepts, and definitions. *Industrial Marketing Management, 60*, 4–10.
Kowalkowski, C., Kindström, D., Alejandro, T. B., Brege, S., & Biggemann, S. (2012). Service infusion as agile incrementalism in action. *Journal of Business Research, 65*(6), 765–772.
Lightfoot, H. W., & Gebauer, H. (2011). Exploring the alignment between service strategy and service innovation. *Journal of Service Management, 22*(5), 664–683.
Mahr, D., Lievens, A., & Blazevic, V. (2014). The value of customer cocreated knowledge during the innovation process. *Journal of Product Innovation Management, 31*(3), 599–615.
Matthyssens, P., & Vandenbempt, K. (2010). Service addition as business market strategy: Identification of transition trajectories. *Journal of Service Management, 21*(5), 693–714.
Melton, H. L., & Hartline, M. D. (2010). Customer and frontline employee influence on new service development performance. *Journal of Service Research, 13*(4), 411–425.
Menguc, B., Auh, S., & Uslu, A. (2013). Customer knowledge creation capability and performance in sales teams. *Journal of the Academy of Marketing Science, 41*(1), 19–39.
Moorman, C., & Rust, R. T. (1999). The role of marketing. *Journal of Marketing, 63*, 180–197.
Nissen, H. A., Evald, M. R., & Clarke, A. H. (2014). Knowledge sharing in heterogeneous teams through collaboration and cooperation: Exemplified through public–private-innovation partnerships. *Industrial Marketing Management, 43*(3), 473–482.
Oliva, R., Gebauer, H., & Brann, J. M. (2012). Separate or integrate? Assessing the impact of separation between product and service business on service performance in product manufacturing firms. *Journal of Business-to-Business Marketing, 19*(4), 309–334.
Oliva, R., & Kallenberg, R. (2003). Managing the transition from products to services. *International Journal of Service Industry Management, 14*(2), 160–172.
Opresnik, D., & Taisch, M. (2015). The value of big data in servitization. *International Journal of Production Economics, 165*, 174–184.
Ordanini, A., & Parasuraman, A. (2011). Service innovation viewed through a service dominant logic lens: A conceptual framework and empirical analysis. *Journal of Service Research, 14*(1), 3–23.
Podsakoff, P. M., MacKenzie, S. B., Lee, J.-Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology, 88*(5), 879.
Rabetino, R., Kohtamäki, M., & Gebauer, H. (2017). Strategy map of servitization. *International Journal of Production Economics, 192*, 144–156.
Raddats, C., & Burton, J. (2011). Strategy and structure configurations for services within product-centric businesses. *Journal of Service Management, 22*(4), 522–539.
Raddats, C., Burton, J., & Ashman, R. (2015). Resource configurations for services success in manufacturing companies. *Journal of Service Management, 26*(1), 97–116.
Ringle, C., Wende, S., & Becker, J. M. (2015). SmartPLS3 (version 3). Hamburg. Retrieved from www.smartpls.com.
Santamaría, L., Jesús Nieto, M., & Miles, I. (2012). Service innovation in manufacturing firms: Evidence from Spain. *Technovation, 32*(2), 144–155.
Sarstedt, M., Henseler, J., & Ringle, C. M. (2011). Multigroup analysis in Partial Least Squares (PLS) path modeling: Alternative methods and empirical results. *Measurement and Research Methods in International Marketing* (pp. 195–218). Emerald Group Publishing Limited.
Sattler, H., Völckner, F., Riediger, C., & Ringle, C. M. (2010). The impact of brand extension success drivers on brand extension price premiums. *International Journal of Research in Marketing, 27*(4), 319–328.
Schaarschmidt, M., Walsh, G., & Evanschitzky, H. (2018). Customer interaction and innovation in hybrid offerings: Investigating moderation and mediation effects for goods and services innovation. *Journal of Service Research, 21*(1), 119–134.
Schirr, G. R. (2012). Flawed tools: The efficacy of group research methods to generate customer ideas. *Journal of Product Innovation Management, 29*(3), 473–488.
Sheth, J. N., & Sharma, A. (2008). The impact of the product to service shift in industrial markets and the evolution of the sales organization. *Industrial Marketing Management, 37*(3), 260–269.
Skålén, P., Gummerus, J., von Koskull, C., & Magnusson, P. R. (2014). Exploring value propositions and service innovation: A service-dominant logic study. *Journal of the Academy of Marketing Science, 43*(2), 137–158.
Snyder, H., Witell, L., Gustafsson, A., Fombelle, P., & Kristensson, P. (2016). Identifying categories of service innovation: A review and synthesis of the literature. *Journal of Business Research, 69*(7), 2401–2408.
Storbacka, K. (2011). A solution business model: Capabilities and management practices for integrated solutions. *Industrial Marketing Management, 40*(5), 699–711.
Storbacka, K., Windahl, C., Nenonen, S., & Salonen, A. (2013). Solution business models: Transformation along four continua. *Industrial Marketing Management, 42*(5), 705–716.
Storey, C., Cankurtaran, P., Papastathopoulou, P., & Hultink, E. J. (2016). Success factors for service innovation: A meta-analysis. *Journal of Product Innovation Management, 33*(5), 527–548.
Storey, C., & Larbig, C. (2018). Absorbing customer knowledge: How customer involvement enables service design success. *Journal of Service Research, 21*(1), 101–118.
Story, V. M., Daniels, K., Zolkiewski, J., & Dainty, A. R. J. (2014). The barriers and consequences of radical innovations: Introduction to the issue. *Industrial Marketing Management, 43*(8), 1271–1277.
Suarez, F. F., Cusumano, M. A., & Kahl, S. (2013). Services and the business models of product firms: An empirical analysis of the software industry. *Management Science, 59*(2), 420–435.
Tuli, K. R., Kohli, A. K., & Bharadwaj, S. G. (2007). Rethinking customer solutions: From product bundles to relational processes. *Journal of Marketing, 71*(3), 1–17.
Turunen, T. T., & Toivonen, M. (2011). Organizing customer-oriented service business in manufacturing. *Operations Management Research, 4*(1–2), 74–84.
Ulaga, W., & Reinartz, W. J. (2011). Hybrid offerings: How manufacturing firms combine goods and services successfully. *Journal of Marketing, 75*(6), 5–23.
Valtakoski, A. (2017). Explaining servitization failure and deservitization: A knowledge-based perspective. *Industrial Marketing Management, 60*, 138–150.
von Hippel, E., & Katz, R. (2002). Shifting innovation to users via toolkits. *Management Science, 48*(7), 821–833.
Wang, W., Lai, K. H., & Shou, Y. (2018). The impact of servitization on firm performance: A meta-analysis. *International Journal of Operations & Production Management, 38*(7), 1562–1588.

Windahl, C., & Lakemond, N. (2006). Developing integrated solutions: The importance of relationships within the network. *Industrial Marketing Management, 35*(7), 806–818.
Witell, L., Gustafsson, A., & Johnson, M. D. (2014). The effect of customer information during new product development on profits from goods and services. *European Journal of Marketing, 48*(9/10), 1709–1730.
Witell, L., Kristensson, P., Gustafsson, A., & Löfgren, M. (2011). Idea generation: Customer co-creation versus traditional market research techniques. *Journal of Service Management, 22*(2), 140–159.
Witell, L., & Löfgren, M. (2013). From service for free to service for fee: Business model innovation in manufacturing firms. *Journal of Service Management, 24*(5), 520–533.
Witell, L., Snyder, H., Gustafsson, A., Fombelle, P., & Kristensson, P. (2016). Defining service innovation: A review and synthesis. *Journal of Business Research, 69*(8), 2863–2872.

A. Elisabeth Johansson is an assistant Professor at the Division of Logistics and Quality Management at Linköping University. She conducts research on servitization, service innovation, customer involvement and quality management. She disseminates her research through conferences as well as academic journals and popular press.

Chris Raddats is a Senior Lecturer at University of Liverpool Management School. Before starting in academia, Chris had a 20-year career in the telecommunications industry. He researches B2B marketing and operations, specifically servitization and disseminates his research through leading conferences and journals such as International Journal of Operations and Production Management, Industrial Marketing Management and Journal of Service Management. He is on the editorial review board for Industrial Marketing Management and Journal of Business Research.

Lars Witell is a Professor at the CTF-Service Research Center at Karlstad University, Sweden. He also holds a position as Professor in Business Administration at Linköping University, Sweden. He conducts research on service innovation, customer co-creation and service infusion in manufacturing firms. He has published about 50 papers in scholarly journals such as Journal of Service Research, Journal of Service Management and Industrial Marketing Management, as well as in the popular press, such as The Wall Street Journal.