Journal of Cleaner Production 97 (2015) 61–75

Contents lists available at ScienceDirect

Journal of Cleaner Production

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

Product–Service Systems (PSS) business models and tactics – a systematic literature review

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ARTICLE INFO

Article history:
Received 21 March 2013
Received in revised form
30 June 2014
Accepted 3 July 2014
Available online 12 July 2014

Keywords:
Product–Service Systems (PSS)
Business model
Tactics
Literature review
Servitization
Sustainability

ABSTRACT

Studies on Product–Service Systems (PSS) are emerging as a growing body of literature driven by the desire to combine economic prosperity and sustainable resource management. However, knowledge about how companies can adopt and implement PSS has remained limited. In this study, a systematic literature review is conducted related to understanding implementation of PSS business models and five sets of tactical practices. Based on an in-depth analysis of 67 articles, it was found that PSS is increasing rapidly as a research field, which is spread across a variety of disciplines and research domains. More specifically, research findings were accumulated from the field to present a framework supporting the implementation of well-established categories of PSS business models, that is, product-oriented, use-oriented, and result-oriented business models. Each business model category is linked to five operational-level tactics that ensure the model can be implemented successfully and subsequently generates value. These tactical sets include 1) contracts, 2) marketing, 3) networks, 4) product and service design, and 5) sustainability operational practices. This study concludes by proposing suggestions for future research.

1. Introduction

Integrating products and services is a growing trend among companies in today's globally competitive business environment (Mont, 2002). This phenomenon is of equal importance for both product and service providers (Baines et al., 2009; Meier et al., 2010). Integrating product and service offerings has the potential to improve efficiency, which can lead to positive economic and environmental effects for industry and society (Mont et al., 2006). Such improvements tend to add uptime or total-care services, which can lead to intensified use of products and timely replacement with newer, more efficient, and innovative products (Sundin and Bras, 2005). Building on a true life-cycle costs perspective, product and service solutions create incentives for optimizing energy and consumables, as well as prolonging a product's life (Tukker, 2004). Thus, the potential benefits of offering integrated product and service solutions has economic, social, and environmental effects as companies improve resource utilization and competitiveness (Beuren et al., 2013; Boehm and Thomas, 2013; Gaiardelli et al., 2014; Kohtamäki et al., 2013).

Research on this emerging phenomenon is discussed largely under the topic of Product–Service Systems (PSS) (Baines et al., 2007; Beuren et al., 2013). PSS are defined as a marketable set of products and services that are capable of jointly fulfilling customers' needs in an economical and sustainable manner (Goedkoop et al., 1999; Tukker, 2004). The rapid growth of the field, however, contributes to problems associated with accumulating and systematising research findings. Although recent studies have highlighted several potential benefits of PSS, insights about how companies can adopt and implement PSS business models is still very limited (Baines et al., 2007; Gaiardelli et al., 2014; Meier et al., 2010; Yoon et al., 2011). To address this shortcoming, the present study undertakes a systematic literature review that focuses on implementing PSS business models. Our justification for this review is based on two conditions.

First, although PSS represents a potential path toward sustainable resource use, it requires radical transformations for product- and service-oriented companies at the value-chain and industrial level (Martinez et al., 2010). PSS that are not developed carefully run the risk that the environmental potential will be offset by rebound effects and less careful behaviour (Kuo, 2011; Tukker,

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http://dx.doi.org/10.1016/j.jclepro.2014.07.003
0959-6526/

2004). Implementing successful eco-efficient PSS is still very limited. As such, the PSS business model might be the critical factor that distinguishes PSS with positive results in terms of eco-efficiency and sustainability from those that do not capture environmental potential (Ceschin, 2013). Bocken et al. (2014) emphasised the importance and difficulties of developing sustainable business models that succeed on environmental, economic, and social levels. This triple bottom line approach is essential to evaluating the overall payoff of a PSS and underscores the importance of all three components working together (Lee et al., 2012).

In general, the literature suggests that a company's business model explains the design or architecture of the company's mechanisms to create, deliver, and capture value (Teece, 2010; Osterwalder and Pigneur, 2010). This means that every company either explicitly or implicitly employs a particular business model. In the present study, three general categories of PSS business models (product-oriented, use-oriented, and result-oriented) are discussed in relation to implementing PSS. Because the PSS literature has not discussed business models extensively (Kindström, 2010; Meier et al., 2010), a research gap exists that supports the need to develop a better understanding of how PSS business models are implemented. Thus, to contribute to contemporary knowledge about implementing PSS, a literature review focusing on business model development was undertaken. In doing so, it is possible to extend insights about the crucial factors that may differentiate successful and unsuccessful PSS companies.

Second, our current understanding of the underlying foundations for implementing PSS business models is, largely, a neglected research area (Azarenko et al., 2009; Mont et al., 2006). This literature review focuses on different operation or implementation practices that companies employ in order to maximize value and revenue creation through each of the chosen PSS business models. These practices can be regarded as tactics or tactical sets, which are defined as the residual choices that can be adapted after choosing a business model or as the business model is applied. Furthermore, the practices must fit the company's operations (Casadesus-Masanell and Ricart, 2010; Evans et al., 2007). Thus, a structured aggregation and understanding of tactics within the PSS literature can help companies successfully implement diverse PSS business models.

Based on the stated research foci, the aim in the present study is to conduct a systematic literature review of how business models are implemented and their associated tactical practices. By fulfilling this purpose, how PSS strategy can be adopted is explained in two ways: (1) at a strategic level by considering business models carefully and (2) at an operational level by understanding tactical sets that can create and extract value from implementing PSS. Thus, the present study holds value for both academics and practitioners seeking to advance their knowledge about PSS business models and tactics.

2. Methodology

To advance our understanding of implementing PSS business models, the present study consisted of a systematic literature review with a specific focus on research related to business models and operational tactics. According to Cook et al. (1997), systematic review differs from a traditional general review in that it adopts a replicable, scientific, and transparent process. This leads to developing collective insights based on theoretical synthesis of existing studies. Previous researchers have argued that using such an approach to review literature can ensure that bias (i.e., systematic error) is limited, chance effects are reduced, and the legitimacy of data analysis is enhanced. All of these benefits lead to more reliable results that form the basis for drawing conclusions (Becheikh et al., 2006; Tranfield et al., 2003). Systematic review studies are common in the field of medicine, and studies in the domains of engineering and social science have started to adopt this methodological approach more frequently (Geraldi et al., 2011; Pittaway et al., 2006), particularly as the number of studies on PSS has increased dramatically. Furthermore, because PSS shares conceptual closeness with related topics (e.g., industrial product–service systems, integrated product and service offerings), there is an increased need to synthesize the findings of existing studies and provide directions for future research on the important topics of PSS business models and tactics.

A literature search was conducted through the authors' library service using the Scopus database, one of the largest multidisciplinary (i.e., including social science and engineering studies) abstract and citation databases of peer-reviewed literature (Geraldi et al., 2011). The database covers research from both major and minor publishers, including Elsevier, Emerald, Springer, and Wiley, among others. Because this database covers peer-reviewed multidisciplinary research studies, it was certain to find a large number of studies on PSS and other related literature using the systematic review method.

We used several keywords to find relevant articles. The articles resulting from the initial search were refined through three steps that were inspired by previous studies that adapted the systematic review approach (Farashahi et al., 2005; Petticrew, 2001) An overview of the process used to identify the articles for this study is illustrated in Fig. 1 and described as follows.

Step 1: Identifying publications and applying practical screening. The first step begins by setting certain practical screening criteria to ensure that only quality publications are included in the review. During the first search, therefore, conference articles, working papers, commentaries, and book review articles were excluded, aiming instead for a focus on journal publications (Seuring and Müller, 2008). This delimitation also secured the focus on quality publications related to PSS and related concepts. No other quality criteria were used (e.g., journal rankings) for filtering; indeed, publications that cover the topic of PSS may not always be published in highly ranked journals because it is still an emerging topic. The search also excluded articles that were not peer-reviewed or not written in English.

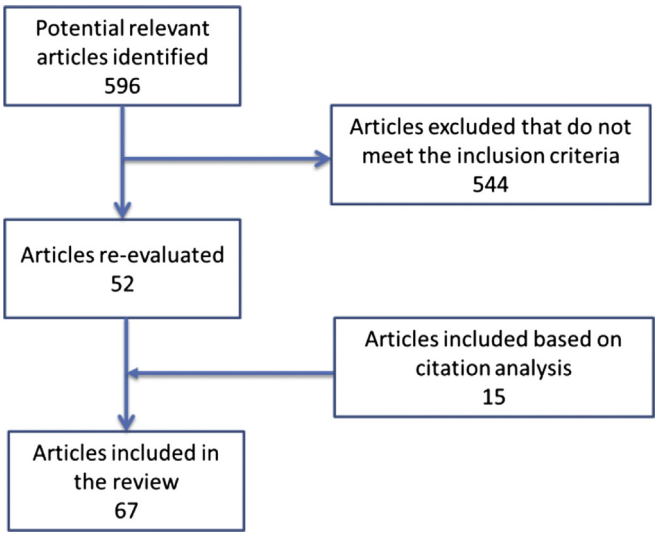

Fig. 1. Systematic review flow diagram.

Using recent literature review papers on PSS, several keywords closely related to studying similar phenomena were identified (Baines et al., 2007, 2009; Meier et al., 2010). In addition to *product–service systems (PSS)*, the terms *industrial product service systems (IPSS)*, *service-dominant logic*, *servitization*, *servicification*, *functional products*, *functional product development*, *integrated product service engineering*, *functional sales*, *service infusion*, *integrated product service offering*, *service transition*, *hybrid offerings*, *product bundling*, *shared economy* and *sharing economy* were used in the search. This search, which was intended to be all-inclusive, resulted in identifying 596 articles considered relevant for analysis. The citation information, abstracts, and keywords of all articles were exported to an Excel spread sheet for further analysis.

Step 2: Applying theoretical screening criteria. Because the purpose of the present study is to focus on PSS business models and tactical practices, only conceptual or empirical articles that discussed implementing or applying PSS business models were included. More specifically, the inclusion criteria for articles selected for full analysis were as follows:

1. Explicitly discuss business models. Studies that either conceptually or empirically discussed business models or business model implementation explicitly (either by stating it or referring to it directly) were retained.
2. Implicitly discuss business models. Studies that implicitly or indirectly provided conceptual or empirical references to business models or business model implementations, such as discussing the logic of how companies create value or generate revenue through a certain PSS application were retained.
3. Refer to operational tactics. Studies that provided a general discussion of the operational tactical practices that companies employ to implement a PSS business model were retained, even if they did not mention business models directly.

The article information exported in step 1 was analysed based on these three inclusion criteria. For this evaluation, at least two researchers separately read the articles' titles and abstracts. Based on the criteria assessment, each article was either included or excluded. In cases where researchers' views on the abstract screening differed, both researchers scanned the entire article for relevance. This time-consuming process resulted in excluding 544 journal articles that did not meet the inclusion criteria. The remaining 52 articles were considered for further analysis (Table 1).

Table 1
Initial search results and filtered publications according to search term.

Search term	Total publications	Filtered publications
PSS	150	27
IPSS	22	4
Service-dominant logic	140	3
Servitization	25	2
Servicification	8	0
Functional product	113	1
Functional product development	22	0
Integrated product service engineering	2	0
Integrated product service offering	2	1
Functional sales	6	3
Service infusion	13	1
Service transition	32	0
Product bundling	44	7
Hybrid offerings	8	2
Sharing economy	8	1
Shared economy	1	0
Total	596	52

Note: 15 additional publications were included based on analysing references cited in articles identified via the search process.

Step 3: Final filtering and reference analysis. In this final stage, all 52 articles that met the inclusion criterion were downloaded and read in detail as a final analysis of the content. Each article's cited references were used as a secondary source of literature analysis. This led us to identify 15 additional articles that were perceived to provide prominent contributions to the understanding of PSS business models and tactics. Thus, this systematic literature review is based on 67 articles with a specific focus on implementing PSS business models and tactics. For the analysis of these articles, an open coding content analysis technique was employed. Using this technique, notes and headings are written in the text based on their association with the research focus. While inductively reviewing the studies, we also acknowledged that each study can contribute to several different headings. Thereafter, all headings were collected on a coding sheet and categories were generated (Elo and Kyngäs, 2008). Through open coding, the main themes were discussed in relation to operational tactical sets for different PSS business implementation models. In total, five tactical sets emerged from this review as clearly unique and widely influential.

The systematic literature review process places strong emphasis on the importance of ensuring a high level of validity and reliability. Therefore, to ensure the analysis would remain objective, the literature review process and analysis protocol was discussed with researchers both within and outside the field. This approach enabled us to increase the validity of the literature review by decreasing the risk of the file drawer effect, a bias among unpublished studies that may distort systematic reviews. To address concerns related to reliability, two steps were taken. First, four researchers participated in the present review to increase inter-rater reliability during the literature analysis (Seuring and Müller, 2008). Second, the researchers clearly and carefully explained each of the steps followed during the systematic literature review to increase the possibility of future replication.

3. Descriptive analysis

Fig. 2 shows the distribution over time of the 67 articles related to PSS implementation, business models, and tactics. As the figure shows, the major works on this topic were published in 2003 or later. This is not surprising, as the term 'PSS' was first convincingly established in 1999 by Goedkoop et al. (1999), and related research began to emerge around that time. Research on business models has been driven mainly by the advent of the Internet, which, along with PSS, has grown significantly since the mid-1990s. Vandermerwe and Rada's (1988) article on servitization and the two articles from 1997 (Boyt and Harvey, 1997; Frambach et al., 1997) included in the review do not explicitly use the phrase 'business model' in their texts, but instead emphasize the importance of product–service strategies. Tukker (2004) made a significant impact on the progression of this research topic; indeed, eight other papers included in this literature review cited Tukker (2004). The distribution, however, shows only a slow increase in the number of articles, which indicates that the discussion of business models and tactics within the PSS literature is still immature.

The high number of included articles from the year 2006 can be explained by a special issue on PSS in the *Journal of Cleaner Production*. The *Journal of Cleaner Production* is also the dominant source of articles in this literature review overall, accounting for 17 of the 67 articles. This also shows that research related to PSS business models is well-connected to the cleaner and sustainable aspects of PSS. In

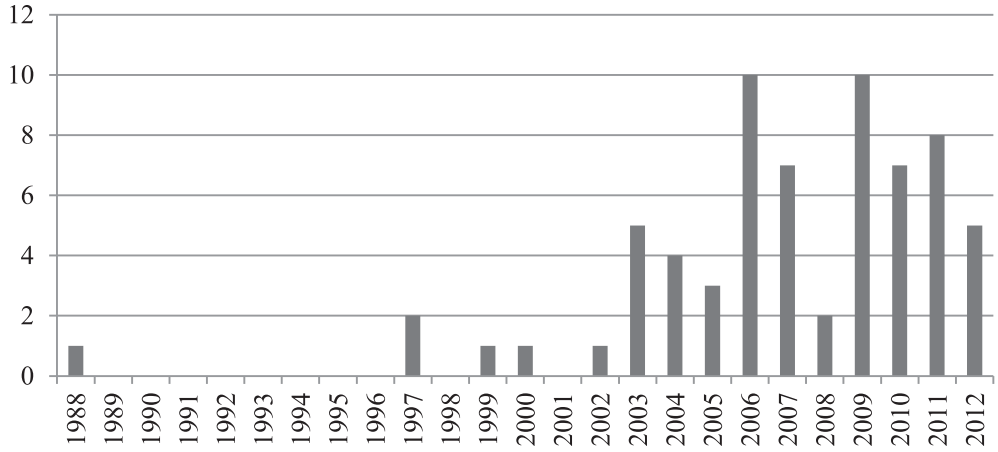

Fig. 2. Distribution of publications over time.

Table 2
Top journals with at least two publications included in the review.

Journal	Number of articles
Journal of Cleaner Production	17
European Management Journal	4
Industrial Marketing Management	3
International Journal of Operations & Production Management	3
Business Strategy and the Environment	2
CIRP Annals – Manufacturing Technology	2
CIRP Journal of Manufacturing Science and Technology	2
Ecological Economics	2
Harvard Business Review	2
International Journal of Advanced Manufacturing Technology	2
Journal of Manufacturing Technology Management	2
Journal of Marketing	2
Production Engineering Research Development	2

addition, the *European Management Journal* accounts for four articles and *Industrial Marketing Management* and the *International Journal of Operations & Production Management* account for three articles each in the review (Table 2). Combined, the articles in the present review appeared in 36 different journals; thus, it is clear that the topic applies to many different research areas.

In performing the literature review on business models, studies on PSS and related concepts such as servitization, industrial product–service systems, service-dominant logic, functional sales, and product bundling were incorporated (the literature search is described in more detail the *Methods* section). In Table 3, several of the core concepts that form a large part of the review study on PSS business model implementation and tactics are defined.

To analyse previous research in the considered area, it is interesting to examine the type of research articles uncovered via the literature review. Thirty-seven of the 67 articles are conceptual in nature but often include existing PSS examples to support their arguments or to illustrate their findings. For example, Mont (2004) used car sharing, washing centres, and tool sharing to clarify the institutionalisation of PSS. Similarly, Tukker (2004) used examples such as carpooling to illustrate different categories of PSS. The conceptual considerations evolve around product–service combinations in general, including their benefits, barriers, and categorizations. Furthermore, themes such as strategic and managerial implications, as well as the importance of marketing and contracts, are covered from a theoretical perspective.

On the topics of both PSS and servitization, Baines and his colleagues conducted a literature review (Baines et al., 2007, 2009) that accumulated previous findings in these areas to create a starting point for further research. The other articles included in the present review are empirical (28 of the 67) and include mainly case studies but also several survey-based studies. Because companies already frequently offer product–service combinations and it is easy to illustrate certain relationships and potentials, much of the empirical research has been conducted in this area. Empirical studies often focus on specific industries or business models and address questions such as how the companies adapt their networks

Table 3
Definitions of PSS and related concepts.

Study	Concept	Definition
Goedkoop et al. (1999)	PSS	"A product service system (PSS) is a marketable set of products and services capable of jointly fulfilling a user's need" (p. 18).
Vandermerwe and Rada (1988)	Servitization	"Modern corporations are offering fuller market packages or 'bundles' of customer-focused combinations of goods, services, support, self-service, and knowledge. But services are beginning to dominate" (p. 314).
Meier et al. (2010)	Industrial product–service system	"An Industrial Product–Service System is characterized by the integrated and mutually determined planning, development, provision and use of product and service shares including its immanent software components in Business-to-Business applications and represents a knowledge-intensive socio-technical system" (p. 608).
Vargo and Lusch (2004) in Ford (2011)	Service-dominant logic	Service-dominant logic "means that service is provided in interaction with customers, but more controversially, that goods purchased and used by customers become a delivery mechanism for service" (p. 231).
Sundin and Bras (2005)	Functional sales	"Within functional sales, the function-providing company decides how to fulfil the function that the customer is buying" (p. 914).
Kameshwaran et al. (2009)	Product bundling	"Bundling is the sale of two or more products in combination as a package" (p. 92).

and their product and service design for PSS application (Stoughton and Votta, 2003; Sundin et al., 2005). The predominant industries represented are the chemical and tooling industries, because these industries contain great potential for improved environmental performance and better use of resources. The literature also includes examples of service providers who integrate products into their offers in order to sustain competitiveness (Kriston et al., 2010) and examples of small- and medium-sized enterprises that adopt or even start out with PSS business models (Schweitzer and Aurich, 2010). In this respect, PSS business models offer more than just a cure for large, established manufacturing companies but may also hold potential for small and new service providers.

4. A PSS perspective on business model implementation

The purpose of the present study is to advance our understanding of implementing PSS business models through a systematic literature review. The present study adopts the generic competitive process framework proposed by Casadesus-Masanell and Ricart (2010) to outline the general structure and process of PSS business model implementation. Adopting this logic guided our explanation that a company can select from different categories of business models based on the company's strategic direction. The framework also acknowledges that business model categories are linked with operational-level tactics, or tactical sets, defined as the residual choices open to a company given a certain business model. The tactical sets determine how much value a company can create and capture through its selected business model. They are thus important to consider when deciding and designing implementation of PSS business models. As such, this framework was found to be suitable for structuring and visualizing the dependence of PSS business model implementation on a generic set of tactics.

4.1. PSS business models

Although previous studies have acknowledged the importance of PSS implementation (Maxwell and van der Vorst, 2003; Wise and Baumgartner, 1999), only a few studies have explained the mechanism by which such intent can lead to competitiveness. For example, when companies pursue PSS implementation strategies, they add either service or product elements to their operations in different ways, which results in different outcomes. This explains why certain companies are more successful with PSS, whereas others fail despite adopting a similar PSS strategy. Following the studies of Casadesus-Masanell and Ricart (2010) and Yip (2004), it has been argued that selecting a business model is one key choice that drived the fulfilment of a company's differentiation strategy. Indeed, recent PSS studies have highlighted the fact that business models are central to implementing PSS successfully (Kindström, 2010; Mont et al., 2006).

Although the business model as a concept has been part of the business jargon for a long time, it has only been pursued critically in management research during the last decade (Zott et al., 2011). To date, no definition of business models has become accepted widely; thus, they are often studied without first being defined explicitly (Halme et al., 2007; Richardson, 2008). However, a common argument in the literature states that the business model refers to the logic of the company, including how it operates and how it creates value for stakeholders (Magretta, 2002). Within the PSS literature, business models are mentioned or discussed frequently. In the present literature review, 67 articles were found that explicitly or implicitly address PSS business models. Notably, only a handful of these studies clearly define the term 'business model'. Overall, six studies were identified that emphasize different aspects of business models when proposing a definition (Table 4). Based on critically considering these related but diverse definitions, an inclusive definition has been chosen for the present study based on Teece (2010) and Osterwalder and Pigneur (2010). Our working definition states that business models describe the design or architecture of the value creation, delivery and capture mechanisms.

Baden-Fuller and Morgan (2010) argued that business models are very suitable for classifying businesses and should be used to categorize businesses with similar characteristics. According to this perspective, each company should frame its business model individually to fit the company's strategy and operations. This view implies there are as many business models as there are companies using them. However, by analysing how business models have been used in the literature, support was found to classify three distinct categories of business models: product-oriented, use-oriented, and result-oriented models. These categorizations are in line with the prevalent view that previous researchers have acknowledged (e.g., Baines et al., 2007). The categories differ in terms of creating, delivering, and capturing value (see Table 5 for the most significant differences).

In the *product-oriented* (PO) category of PSS business models, a provider, in addition to selling a product, commits to deliver a service related to the product (Tukker, 2004). Several examples were found of business models observed in the present literature review. For example, Tonelli et al. (2009) conducted a case study of a healthcare equipment supplier that agreed to retrieve its equipment from hospitals after it was used for the purpose of recycling or disposing of the equipment. Thus, by extending their part of the supply chain, the company was paid for another service in addition to providing the product. This is a typical example of the product-oriented business model category. Similarly, a business-to-customer example might be a take-back agreement for household appliances (Sundin and Bras, 2005). The value created for the buyer relates to the reduced work they must do themselves and to a reduced number of suppliers. As is characteristic for this category, the focus remains mainly on selling a product but it comes with extra services (Tukker, 2004; Baines et al., 2007). The property rights to the product are transferred to the customer, and the

Table 4
Business model definitions from the literature review.

Author	Business model definition
Meier (2004)	The use of the customer (result dimension) defines the market segments and the corresponding business models on the strategic level.
Richter and Steven (2009)	Business models that are based on the dynamic bundles describe the design of the customer–supplier relationship in the form of performance schemes and responsibilities.
Schuh et al. (2009)	The main aspect in the definition of a business model should be the capitalization and the benefit mechanisms of a company.
Spring and Araujo (2009)	Common themes in business model literature include a concern with network structure; a focus on how transactions are made; revenue models and incentives; and how providers' capabilities are transferred or accessed through products, services, or combinations thereof.
Meier et al. (2010)	A business model can be described by a user model, architecture of value creation and turnover model and by describing the design of the customer–supplier relation.
Gao et al. (2011)	A business model depicts the way in which the partners of a business collaborate with one another.

Table 5
Comparison of business model categories in terms of value creation, value delivery and value capturing.

	Product-oriented	Use-oriented	Result-oriented
Value creation	Provider takes responsibility for the contracted services.	Provider is responsible for the usability of the product or service.	Provider is responsible for delivering results.
Value delivery	Provider sells and services the product sale and service (e.g., maintenance or recycling).	Provider assures the usability of the physical product along with service.	Provider actually delivers result.
Value capturing	Customer pays for physical product and for the performed services.	Customer can make continuous payments over time (e.g., leasing).	Customer payments are based on outcome units; that is, they pay for the result.

provider is responsible for providing the agreed-upon services (Azarenko et al., 2009).

In the *use-oriented* (UO) category of PSS business models, a provider does not sell a physical product but instead makes the product available under rental or leasing agreements (Tukker, 2004). Sundin et al. (2005) presented a representative case study for this category. Here, the provider offered forklift trucks for long-term rental, in which the provider retains ownership and the responsibility for the products' usability. An example of a business-to-customer PSS business model in this category can be seen in a study conducted by Mont et al. (2006), in which the provider leased baby prams. Upon return, they were leased to the next user. These cases illustrate clearly that the product, while still central, is not sold to the customer; rather, the use or availability is guaranteed for a certain period during which the provider is paid periodically (Baines et al., 2007; Meier et al., 2010). The ownership of the product in this case is not transferred to the customer, and the risks and responsibilities for the provider increase compared to PO business models.

Finally, in the *result-oriented* (RO) category of PSS business models, a provider agrees to provide the customer with a certain result or outcome rather than a specific product or service (Tukker, 2004). An example of the result-oriented business model category is Stoughton and Votta's (2003) case study, in which chemical suppliers are paid for chemical services rather than for the volume of the chemical provided. Cleaning services are also a common example of result-oriented business models on a B2C market. In this model, the outcome of cleanness is agreed upon without defining the physical product(s) used to reach the outcome. In these cases, no specific product is necessarily involved; rather, the supplier gets paid for a result, for which the supplier is totally responsible. The property rights stay with the provider, and the customer pays only for the supplier providing the agreed-upon result (Baines et al., 2007). In this case, the complete responsibility falls on the provider (Meier et al., 2010).

Table 6 summarizes the case studies identified from the conducted literature review. The table includes a short description of the PSS business model case in each study, as well as the business model to which the case corresponds.

4.2. PSS Tactics

By analysing the content of the identified articles, it was found that scholars tend to discuss PSS business models and implications for implementation using five distinct sets of tactics. Tactics are defined as the company's residual choices at an operational level after deciding which business model to apply (Casadesus-Masanell and Ricart, 2010). As such, a company's business model will determine the range of tactics available to the company under that model, and this range will differ for each business model. Fig. 3 shows the relationships among a company's strategy, business models, and tactics for PSS implementation. Business models describe how value is created, delivered, and captured. In contrast, tactics determine how much value is created and captured when a particular business model is implemented. The term 'tactics' has also been used explicitly in PSS studies to describe decisions that improve the amount of value created after choosing a particular business model (Evans et al., 2007; Meier, 2004).

In total, five prominent tactics related to contracts, marketing, network, product and service design, and sustainability were identified. These tactics emerged as the content analysis of the articles was conducted, specifically through open coding technique. The identified tactics were found to be unique and influential, with several studies highlighting their role as central to PSS business model implementation. Table 7 provides an overview of studies that address each identified tactic. The next several subsections discuss specific aspects associated with each tactic and their roles related to PSS business model implementation. Most importantly, each section attempts to illustrate how companies can employ the identified tactics differently based on the PSS business model the company intends to implement.

Table 6
Case study examples from the present literature review.

Author	PSS offer studied in the case study	BM category
Azarenko et al. (2009)	Vertical integration of an ultra-precision, free-form grinding machine run by the provider.	RO
Besch (2005)	Office furniture for leasing.	UO
Evans et al. (2007)	Food delivery services with online ordering and waste management.	PO
Gruneberg et al. (2007)	Performance-based construction in which the provider and customer agree upon the outcome.	RO
Halme et al. (2007)	Material efficiency services (chemicals) in which the provider is responsible for material handling at the customer's plant.	RO
Kriston et al. (2010)	Car sharing.	UO
Kuo (2011)	Office copy machines for rental.	UO
Mont et al. (2006)	Baby prams for leasing.	UO
Morelli (2003)	Telecentre/office space for rent.	UO
Ng et al. (2009)	Service contracts that ensure the availability of certain defence equipment.	RO
Shih and Chou (2011)	Leasing of solar power cells.	UO
Stoughton and Votta (2003)	Chemical management systems in which the provider is responsible for material handling at the customer's plant.	RO
Sundin et al. (2005)	Forklift trucks for long-term rental.	UO
Tonelli et al. (2009)	Healthcare equipment supply and take-back.	PO

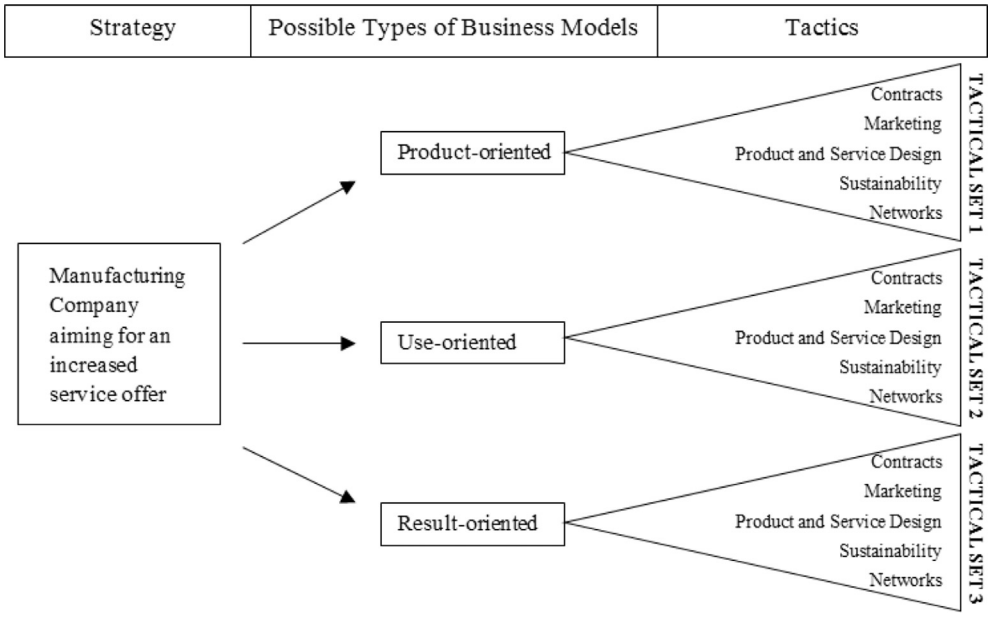

Fig. 3. Relationships among strategy, business models, and tactics for PSS.

4.2.1. PSS contract tactic

The first of the five tactic areas, labelled 'contracts,' is addressed in studies that describe how rights and liabilities are distributed among the involved parties (e.g., provider or customer). In total, 13 studies focused on contractual aspects (see Table 7 for an overview). Contracts define the responsibilities of the involved parties (e.g., between a PSS provider and its customer) during a specific contractual period. A PSS contract is designed to address all aspects related to providing the service and to state the rights and liabilities of involved parties clearly. Gruneberg et al. (2007), for example, described result-oriented construction assignments that required contract terms on everything that might possibly go wrong. Schuh et al. (2011) emphasized legal considerations for the monitoring required to fulfil the PSS task. Such contracts are significantly more complex than selling a specific product outright, and the terms of the agreement must be adapted according to the PSS context (Richter and Steven, 2009). The complexity of the contract depends on the quantity of the specified regulations included in the contract. Hence, a legal contract is always complex, but this complexity differs based on the PSS business model category used. Contrary to the complexity of a contract, the level to which a contract is formalized indicates

Table 7
Articles that discuss the five identified tactics.

Contracts	Marketing	Network	Product & service design	Sustainability
Azarenko et al., 2009	Azarenko et al., 2009	Azarenko et al., 2009	Aurich et al., 2006	Anttonen, 2010
De Coster, 2011	Baines et al., 2007	Baines et al., 2007	Azarenko et al., 2009	Bartolomeo et al., 2003
Gruneberg et al., 2007	Bhargava, 2012	Briscoe et al., 2012	Cheng et al., 2006	Evans et al., 2007
Meier, 2004	Boyt and Harvey, 1997	Evans et al., 2007	Correa et al., 2007	Kriston et al., 2010
Meier et al., 2010	Czarnecki and Spiliopoulou, 2012	Ford, 2011	Czarnecki et al., 2010	Kuo, 2011
Morelli, 2006	Ford, 2011	Gao et al., 2011	Evans et al., 2007	Manzini and Vezzoli, 2003
Ng et al., 2009	Frambach et al., 1997	Halme et al., 2007	Isaksson et al., 2009	Maxwell and van der Vorst, 2003
Richter et al., 2010	Halme et al., 2007	Kindström, 2010	Kriston et al., 2010	Maxwell et al., 2006
Schuh et al., 2011	Kindström, 2010	Krucken and Meroni, 2006	Kumar and Kumar, 2004	Mont and Tukker, 2006
Shih and Chou, 2011	Kowalkowski, 2011	Kuo, 2011	Kuo, 2011	Tonelli et al., 2009
Stoughton and Votta, 2003	Krucken and Meroni, 2006	Maxwell and van der Vorst, 2003	Maxwell et al., 2006	Tukker, 2004
tasaki et al., 2006	Mont, 2002	Maxwell et al., 2006	Meier, 2004	Tukker and Tischner, 2006
Tukker, 2004	Mont, 2004	Meier et al., 2010	Mont et al., 2006	
	Mont et al., 2006	Mont, 2002	Morelli, 2003	
	Schmenner, 2009	Mont et al., 2006	Roy, 2000	
	Schuh et al., 2009	Morelli, 2006	Sundin et al., 2005	
	Schuh et al., 2008	Ng et al., 2009	Sundin and Bras, 2005	
	Shankar et al., 2009	Schuh et al., 2009	Ulaga and Reinartz, 2011	
	Sundin et al., 2010	Schuh et al., 2008	Williams, 2007	
	Tonelli et al., 2009	Schuh et al., 2011		
	Tukker, 2004	Stoughton and Votta, 2003		
	Tukker and Tischner, 2006	Sundin et al., 2010		
	Tuli et al., 2007	Surti and Hassini, 2012		
	Ulaga and Reinartz, 2011	Tonelli et al., 2009		
	Vandermerwe and Rada, 1988	Tukker, 2004		
		Ulaga and Reinartz, 2011		
		Vandermerwe and Rada, 1988		
		Yoon et al., 2011		

how much of the contract needs to be adapted to each new customer. Formalized contracts tend to be less complex, because they fit many different cases. Importantly, the long-term relationship between the provider and customer based on the PSS contract is crucial; therefore, it must to be handled carefully in order to balance the interests of both parties. It is also important to establish incentives to reduce the risk of adverse behaviour in the relation (Azarenko et al., 2009). The PSS literature indicates the importance of assessing risk carefully and ensuring suitable compensation for the risk-bearing party.

Richter and Steven (2009) perceived PSS contracts as the foundation for representing and implementing a particular business model. Formulating the contract has a major impact on creating value and generating revenue while operating under a specific business model. To maximize the captured value of the PSS offer, it is essential to align the PSS business model categories with the contract-related aspects of responsibility and terms of agreement, contract formalization and complexity, and incentives and risk level. These aspects were observed in the literature review and are elaborated in the following paragraphs.

First, responsibility and terms of agreement relate to how tasks are divided between the contract parties and what specifications are needed to clarify rights and liabilities from a legal perspective. With PO business models, the customer owns the product, and the provider's sole responsibility is to undertake agreed-upon services related to the product. This means the contract must establish and define the level of service delivery and outputs clearly. With a maintenance contract, this would mean agreeing on tasks to be included and the time frame for completing the task. It is also particularly important during the contract period to agree on payment details and how extra costs (e.g., for repair parts) will be added if unexpected events occur (Azarenko et al., 2009). Schuh et al. (2011) emphasized that the contract should also cover how information sharing and data from providing the service will be handled. For UO business models, Azarenko et al. (2009) listed important contract terms that need to be covered, including the level of availability, price, control of the machine's use, and responsibility for downtime. In this case, because ownership is not transferred to the customer, decision rights must be allocated carefully (Richter et al., 2010). The provider's responsibility is greater under a UO contract compared to a PO contract. The responsibility increases even further with the RO business model, because the provider has complete responsibility for delivering the agreed-upon result (Meier et al., 2010). With increasing levels of responsibility, the terms of the agreement become extremely important and should focus on developing the terms carefully and accurately. This implies not only increased responsibility but also a greater need to exchange information regarding delivery. Because such information can be sensitive, it is important to agree on how information will be handled. The contract is a suitable vehicle to state all such conditions of the parties' agreements before engaging in co-creation activities.

The extent to which a contract is formalized and its complexity, the second contract-related aspect, will differ based on the business model. Furthermore, the levels of formalization and complexity will be described in relation to each other rather than in absolute terms. Formalization is highest in contracts for PO business models because this business model allows companies to offer fairly standardized PSS solutions. Therefore, it is possible to use largely similar contracts for each customer. The lowest level of formalization can be expected in RO business model contracts, because the offers must be adapted to each specific customer. As such, formalization is not feasible in this case (Meier et al., 2010). An exception to this condition occurs when a service-oriented provider operates under the RO model because they can continue to maintain a high level of formalization thanks to their prior service delivery know-how. Contract complexity will increase with the provider's level of responsibility, because the contract must detail the agreed-upon services and define how the parties will integrate. Agreeing on the services delivered when operating under the PO business model is not overly complicated, and it is easy for both parties to control whether or not the agreement is fulfilled. The level of contract complexity is highest with RO business models, because results need to be delivered according to well-defined specifications. Also, as the provider–customer relationship becomes more integrated, the complexity increases. When operating under high complexity, it can be helpful to have multiple contracts to reduce the agreement's complexity (Azarenko et al., 2009).

The third contractual aspect relates to risk level. In general, the level of risk increases as the provider moves from the PO business model toward the RO business model, but this is not true for all PSS offers. The PSS provider may seek responsibility for new risks based on the potential to secure incentives after the contract solution is fulfilled. In this way, contracts are used to mitigate or acknowledge risks. This notion is similar to insurance, with a risk premium given to the risk-bearing party (Meier et al., 2010; Tukker, 2004). In this way, the risks based on the PSS business models are ultimately linked to the compensation the PSS provider receives. In PO business models, risks are related mainly to situations in which more effort than expected might be needed to fulfil the agreement, which makes it necessary for the provider to review its operations. However, adverse customer behaviour is also a risk that can be mitigated through terms in the agreement (e.g., reducing the product's warranty when customers do not follow the agreement; Azarenko et al., 2009). The risk of adverse behaviour even increases in the case of UO business models, because product ownership remains with the provider. This makes it necessary to agree on responsibilities and decision rights clearly, such as what expenses the customer will be charged based on his or her use of the product (Richter et al., 2010; Richter and Steven, 2009). For the provider, the main incentive with this type of contract is additional revenue that can be expected from the services offered; however, the provider also needs to have certain mechanisms in place to ensure that risks related to PSS are well considered (Azarenko et al., 2009). With RO business models, in which the contract is based on providing specific results, risks are based mainly on delivering the results according to the terms of the agreement. In this case, the provider has total responsibility and therefore bears higher risks. Only manufacturers that are willing to sustain high risk premiums offer this type of service. The customer, in turn, benefits from the reduced effort required to reach a certain result. Moreover, providers need to emphasize good relationships with customers to improve the contractual outcomes under RO business models (Meier, 2004; Tukker, 2004). Table 8 summarizes the results of the contract tactic as found in the articles included in this literature review.

4.2.2. PSS marketing tactic

The second of the five identified tactics drawn from literature describes how PSS providers interact, communicate, and use customer and market insights to implement their PSS business model. In total, 25 studies were identified that focused on these aspects, labelled as the ‘marketing’ tactic (see Table 7 for an overview). Several studies noted that implementing a PSS business model has important implications for the company's marketing activities (Kindström, 2010; Kowalkowski, 2011; Schuh et al., 2008). Halme et al. (2007) described examples from the chemical industry, in which different customers had very different needs. And, Mont et al.'s (2006) study on leasing prams pointed out that a new customer segment can be attracted, or different customers groups

Table 8
Summary of the aspects related to the contract tactic.

Key aspects	Key references	Product-oriented	Use-oriented	Result-oriented
Responsibility and terms of agreement	Azarenko et al. (2009) Meier et al. (2010) Richter et al. (2010) Schuh et al. (2011)	▪ Responsibility for agreed-upon service ▪ Agreement focuses on tasks, payment and information	▪ Responsibility for availability ▪ Agreement focuses on level of availability and monitoring	▪ Responsibility for result ▪ Agreement focuses on characteristics of the result
Formalization and complexity	Azarenko et al. (2009) Meier et al. (2010)	▪ Highest Formalization ▪ Lowest Complexity	▪ Medium Formalization ▪ Medium Complexity	▪ Lowest Formalization ▪ Highest Complexity
Risk level	Azarenko et al. (2009) Richter et al. (2010) Richter and Steven (2009) Tukker (2004)	▪ Low level ▪ Higher than expected service efforts ▪ Adverse behaviour	▪ Medium level ▪ Make clear who is charged for what ▪ Adverse behaviour	▪ High level ▪ More freedom in provision of the result

can be simultaneously offered customized value, by using marketing effectively.

When competing with low-cost producers, the service offering is a very important method of nonprice marketing that can attract customers (Gao et al., 2011; Schuh et al., 2008) and thus differentiate the provider from competitors. In addition, many authors stressed that the long-term relationship (as opposed to a transition-based relationship) has a significant impact on customer loyalty in the PSS context (Ng et al., 2009; Sundin et al., 2010; Tukker, 2004). This intimate relationship ensures increased insight into the customer's operations and an understanding of their needs and preferences. Such insights are extremely valuable for developing new PSS offers (Azarenko et al., 2009; Tukker, 2004). Moreover, more intense customer interaction means that PSS-related marketing activities differ significantly from traditional product- or service-oriented innovation marketing.

From the literature review, three marketing aspects were identified that are essential in applying a PSS business model and have different characteristics and implications for the three PSS business model categories. By applying marketing tactics strategically, companies can ensure their PSS business model is implemented successfully.

The first of these aspects is communicating value, which refers to the path through which the PSS provider chooses to differentiate its offerings from its competitors. Because PSS offers tend to be complex and include physical and service components, focusing on value-driven communication becomes central. For PO business models, the increased value will be realized by ensuring functionality and durability at the point of sale (Azarenko et al., 2009) and ensuring the customer feels confident about buying the PSS offer (see Table 9). In most PSS cases, providers need to communicate the added value associated with the PSS offer clearly. This is the case because the customers are buying a solution that is sold in a totally new configuration compared to their earlier experiences (e.g., they might be asked to use a car pool solution instead of buying a car). This is particularly relevant in the B2C market setting, in which PSS providers interact with diverse customers, such as for instance the e-health industry. If PSS providers are successful, they can achieve market acceptance and increased sales, leading to higher profitability (Sundin et al., 2010). Because target customers can be quite diverse when applying PSS business models, different offers need to be developed for different customers.

Promotion and pricing guidelines based on the level of PSS service offered can contribute to increased transparency and reduced ambiguity. The PSS literature also emphasizes that customers have different abilities (e.g., handling maintenance tasks); thus, the offer must be adapted to customers' needs and capabilities (Boyt and Harvey, 1997; Frambach et al., 1997). For UO business models, it is very important to influence customers' attitudes and behaviours positively toward ownerless consumption, because this represents a significant transition for customers who are familiar with owning products (Baines et al., 2007). Therefore, promotion campaigns are crucial not only to provide insights about each customer's specific sociocultural context (Mont, 2004), but also to establish the particular product or service company as the PSS provider.

Using marketing tactics, a new customer segment can be attracted; for example, customers with lower financial capacity may prefer ownerless consumption at a reasonable price (Mont et al., 2006). Moreover, promotional marketing activities for UO and RO business models could use incentives such as that the PSS offer leads to a more positive effect on the environment and society in addition to being financially valuable (Mont, 2002). For RO business models, communicating value is based on the notion that customers have fewer tasks to perform; thus, the provider takes a significant amount of responsibility for delivering the results.

The second aspect of the marketing tactic is the extent of interaction with customers, which generally increases as the company becomes more service-oriented (Azarenko et al., 2009). For PO business models, regular or on–demand interaction will occur (e.g., maintenance or consulting activities), and the extent of such interaction will be stated in the contract (Tukker, 2004). For UO business models, the interaction will be higher because the provider ensures the product is usable. To fulfil this responsibility, a closer relationship with the customer is needed to build trust with customers (Azarenko et al., 2009). In addition, customers are not restricted to

Table 9
Summary of aspects related to the marketing tactic.

Key aspects	Key references	Product-oriented	Use-oriented	Result-oriented
Communication of value	Boyt and Harvey (1997) Frambach et al. (1997) Mont (2004) Sundin et al. (2010)	Related to functionality and durability ▪ Information campaigns related to the benefits	▪ Influence attitude towards ownerless consumption ▪ Try to reach new customer segments	▪ Task and responsibility reduction on customer side
Extent of customer interaction	Azarenko et al. (2009) Kindström (2010) Tukker (2004)	▪ Regular or on–demand interaction ▪ Relation building	▪ Frequent interaction ▪ Trust building	Frequent interaction ▪ Trust is necessary
Customer and market insights	Briscoe et al. (2012) Sundin et al. (2010) Ulaga and Reinartz (2011)	▪ Insights into functionality and durability from usage information ▪ Efficiency of the service	▪ Insights into customer habits when using the product ▪ Data on service design	▪ Comprehensive data collection ▪ Increased speed of innovation

one manufacturer for the entire product life but may instead switch to another PSS provider. An alternate provider could be an entrepreneur, for example, who is willing to offer a competitively priced PSS offering and has a strong focus on relationship-building activities. The level of interaction is highest for RO business models due to continuous contact between the PSS provider and its customers. As the provider becomes fully responsible for delivering a specific result, any divergence from the expected result needs to be mitigated immediately. This requires close relationships, where trust between the actors is necessary for this business model to function and fulfil its goals (Kindström, 2010).

Finally, the third marketing aspect deals with the customer and market insights. This aspect considers the increased possibility of collecting 'product or service in use' data through increased interaction with customers. For PO business models, customer insights are related mainly to the functionality and durability of the sold product and the offered services. Valuable insights are also gathered from the customer's operations to identify potential needs that can be met with future product and service offers. This is possible because the very fact of providing the service enables the provider to capture and evaluate the product while in operation (Azarenko et al., 2009; Sundin et al., 2010). UO business models present additional ways to gather information about the customers' habits in using the product or service, such as in the case of leasing. Such feedback is crucial for adapting the product characteristics and the contracting terms to create benefits for both sides (Briscoe et al., 2012; Tukker, 2004). Similarly, it is important to gather information to design service offers that deliver the maximum benefit to both the provider and customer. Because service providers largely depend on co-creating value with customers, their success with PSS depends on understanding customers in the context of the UO and RO business models. The most significant benefits can be gained when implementing RO business models, because the speed of innovation increases radically due to comprehensive data gathered based on interacting closely with the customer (Azarenko et al., 2009; Ulaga and Reinartz, 2011).

4.2.3. PSS network tactic

The third of the five identified tactical areas drawn from literature describes how PSS providers use their network relationships with external partners to ensure PSS business models are implemented successfully. In total, 28 studies focused on network tactics (see Table 7 for an overview). Providing services adds several new tasks to the operations of manufacturing or service companies. Because the companies cannot perform these tasks independently, they must develop networks and partnership infrastructures (Baines et al., 2007; Gao et al., 2011; Kuo, 2011). In this context, a network describes the relationships and interactions with different external stakeholders (e.g., customers, dealers, service partners, and suppliers). The need to collaborate closely makes the partner selection process important (Mont, 2002; Tonelli et al., 2009). PSS providers must be willing, for example, to work with unfamiliar prospective partners as they attempt to compensate for lack of in-house competences (Evans et al., 2007).

This tactic, however, is not only about with whom to collaborate but also the type of collaboration, which can differ significantly based on the services offered (Schuh et al., 2008). After choosing a partner or partners and determining the level of interaction, much effort is needed to develop ways to coordinate the relationships and share the right information efficiently in the network (Schuh et al., 2009). From the literature review, three common aspects, namely, type of partners, type of relationships, and sharing and coordination activities were identified as most relevant the discussion on the PSS network tactic (see Table 10). The following paragraphs discuss how these aspects need to be adapted to implement each business model.

The first aspect, type of partners, can vary significantly based on the service provided, but some general reflections can be proposed based on the different business model categories. PO business models are likely to offer maintenance, consumable supply, or take-back agreements. Delivering service in these offers is usually conducted by a provider or dealer that has a partnership with the manufacturing company (Azarenko et al., 2009; Sundin et al., 2010; Tukker, 2004). This also implies that, in certain settings, the manufacturer may not have direct interaction with the customer due to the presence of delivery network partners. This, in turn, increases the need to streamline the flow of information between the provider and the service delivery network partner.

With UO business models, the manufacturer does not usually perform the service tasks. It is common to use third-party providers for PSS delivery in both business-to-business (B2B) and B2C settings, such as leasing, sharing, and pooling activities, as well as managing the related reverse logistics (Gao et al., 2011; Tukker, 2004). However, a major difference in UO business models is that revenues are not generated at the point of sale but instead are divided over the contracting periods. For example, financial service institutions may establish partnerships with product providers to develop PSS offers, because they may possess the financial power to offer PSS through the UO business models (Azarenko et al., 2009; Mont et al., 2006). A partner to handle reverse logistics is also necessary, as Mont et al. (2006) emphasized in their example of baby pram leasing. In RO business models, the network structure changes significantly. This type of service provision is close to vertical integration, and direct contact with the customer is crucial. In addition to close collaboration with the customer, other stakeholders (e.g., financial institutions, recycling or transportation companies, or entrepreneurial start-ups) may be involved to handle required tasks (Azarenko et al., 2009).

The second aspect of the network tactic is the type of relationships. For PO and UO business models, the service is usually offered to a diverse range of customers; therefore, it is suitable for dealers

Table 10
Summary of the aspects related to the network tactic.

Key aspects	Key references	Product-oriented	Use-oriented	Result-oriented
Type of partners	Azarenko et al. (2009) Gao et al. (2011) Mont et al. (2006) Sundin et al. (2010)	▪ Dealer and providers are intermediates between manufacturer and customer.	▪ Third-party provider. ▪ Financial institutions.	▪ Direct contact with customer. ▪ Some tasks can be completed by third-party providers.
Type of relationships	Halme et al. (2007) Maxwell et al. (2006) Ng et al. (2009) Schuh et al. (2008)	▪ Direct contacts with customers are handled by dealers or providers. ▪ Manufacturer needs to establish close relationship with dealer.		▪ Focus on co-creation. ▪ Close to vertical integration. ▪ Based on trust.
Sharing and coordination activities	Krucken and Meroni (2006) Mont (2002) Stoughton and Votta (2003)	▪ Establish methods to coordinate tasks, focus on formalization. ▪ Legal considerations.		▪ Much personal communication. ▪ Implement new working routines.

and service partners to handle direct customer contacts. However, the manufacturing company must then maintain very close interactions with the dealers and service partners to gain insights into customer needs and future demands. This form of intermediate interaction may lead to innovative PSS development in the future (Tukker, 2004). Generally, studies have proposed that to implement PSS successfully, network partners should be incorporated early in the PSS development process to ensure a well-organized PSS network (Maxwell et al., 2006). For RO business models, the main focus is on direct interaction with the customers. As such, services should only be offered to customers with whom the PSS provider has an existing, trusted relationship. Therefore, the number of potential customers for such offers may be limited in a B2B setting but not necessarily in a B2C setting (Halme et al., 2007). This is most common with the RO business model, which means that individual systems of partners need to be adapted and synchronised to reduce ineffectiveness. Furthermore, the connection to the customer's value chain needs to be well managed (Ng et al., 2009; Schuh et al., 2008). To maximize the value created from the partnership, the customer should be treated as an innovator by emphasizing the co-creation processes (Baines et al., 2007).

The third aspect of network activities deals with the importance of efficient information sharing among the network partners. In the B2C setting, a large number of customers are usually offered PO and UO services. In such situations, methods must be established to coordinate tasks and share information. Several authors proposed web-based collaboration platforms as a tool to link partners and customers. Although these online portals are good for reducing information asymmetry, it is also important to consider the legal implications (e.g., access rights and privacy) when implementing such systems (Schuh et al., 2009, 2011; Sundin et al., 2010).

Online or electronic collaboration systems are not a substitute for personal contact or customer feedback but rather serve as an additional tool to implement PSS. As the number of customers decreases as is the case with RO business models, the communication between the partners will be more personal in nature. While this may lead to building trust, it creates additional requirements for task coordination. The new working routines must be communicated proactively and responsibilities need to be clarified. This solution-oriented partnership integrates two operational systems; therefore, communication and coordination need to be handled very carefully (Kindström, 2010; Krucken and Meroni, 2006; Mont, 2002; Stoughton and Votta, 2003).

4.2.4. PSS product and service design tactic

The fourth of the five identified tactical areas drawn from literature describes how PSS providers design product and services to meet the diverse needs of customers and successfully implement PSS business models. In total, 19 studies were identified that focus on such aspects (see Table 7 for an overview). Product and service requirements change along with the various types of services provided as companies offer PSS solutions. To meet new product and service design requirements, special emphasis is placed on aligning physical product characteristics with service offer characteristics and vice versa. Several preferable product properties (e.g., the ability to be maintained, upgraded, and reused easily) can be identified, which will increase the value creation of the PSS business model (Sundin and Bras, 2005). A close, long-term relationship with customers may also favour or require a product and service design that is adapted to special customer needs. This adds further complexity to providing the service (Azarenko et al., 2009). In the literature on PSS business models, several case studies and conceptual papers highlight the importance of an adapted product and service design in which the entire life cycle of the product is considered (Aurich et al., 2006; Sundin and Bras, 2005). In these studies, two major aspects are identified that place different requirements on the product and services based on the business model applied; these aspects are functionality and customization. The results from the literature review that relate to this tactic are summarized in Table 11.

The functionality aspect considers how the product or service component should be designed to incorporate an additional component in a way that offers high value to customers. For PO business models, this implies that it is preferable for the product to be easy to maintain when a maintenance contract is signed or for the parts to be easy to reuse when a take-back agreement is made (Sundin and Bras, 2005; Williams, 2007). Sundin and Bras (2005) exemplified this point in their study of take-back agreements for household appliances, which must be easy to remanufacture; this allows the business model to work in a B2C setting. The manufacturer also benefits from products' improved reliability and supportability (Meier et al., 2010). In UO business models, the provider is responsible for the products' usability; therefore, it is even more important that the product be easy to maintain (Azarenko et al., 2009). In addition, the frequent use of the products aimed at this business model favours a more durable design (Evans et al., 2007). Because the provider remains the products' owner and that users change during the products' lifetime suggests that ease of upgrading and remanufacturing enable a longer lifetime for the product. This, in turn, is beneficial for the PSS provider and partners (Aurich et al., 2006; Kuo, 2011; Mont et al., 2006). Furthermore, ensuring a certain level of availability makes it especially important in the case of UO business models that the services are designed to reliably meet the contracted availability.

The opportunities for functionality are significant in the case of RO business models because any specific product or service can be combined to design a PSS offering that would meet the agreed-upon requirements or results. However, this also means that flexibility becomes central, because customers can have different requirements and operational processes that must be considered (Azarenko et al., 2009; Meier et al., 2010; Ulaga and Reinartz, 2011).

The second aspect, customization, describes how much the products and services are adapted to individual customers' needs. For the PO and UO business models, the number of customers is quite high. For PO services in particular, no major changes are made to the products and services; therefore, customization is limited (Azarenko et al., 2009). When UO services are offered, it is possible

Table 11
Summary of aspects related to the product and service design tactic.

Key aspects	Key references	Product-oriented	Use-oriented	Result-oriented
Functionality	Aurich et al. (2006) Evans et al. (2007) Kuo (2011) Sundin and Bras (2005) Williams (2007)	▪ Easy to maintain ▪ Easy to reuse ▪ Improved reliability	▪ Easy to maintain ▪ Increased durability ▪ Easy upgrading and remanufacturing ▪ Reliable service provision	▪ Significantly large opportunities ▪ High flexibility
Customization	Azarenko et al. (2009) Tukker (2004)	▪ Very limited	▪ Some customization for large customers	▪ High degree of customization

to customize products for large customers, such as sharing and pooling activities. In contrast, RO business models will always require a higher degree of customization, because the service is integrated with the customer's operations. Therefore, the product and service design must be adapted to customers' special needs. This leaves room for innovations that would benefit not only the provider and the customer but even society in general (Tukker, 2004).

4.2.5. PSS sustainability tactic

Sustainability focused operational practices represent an important and final tactical area. Most PSS studies take for granted that implementing PSS drives environmental benefits. However, recent studies have acknowledged that PSS business models in some cases can even have a negative effect on the environment while maintaining only economic benefits (Kuo, 2011; Tukker, 2004). Thus, deploying sustainability tactics can ensure PSS business models are implemented successfully and can signal a proactive approach that will ensure sustainability driven changes meet the dual goals of economic and environmental benefits. The literature review uncovered twelve studies that explicitly discussed use of operational practices related to sustainability tactics and PSS business models (see Table 7 for an overview). They argued that the highest potential for sustainability improvements results from either increased resource use or innovations that make the production or delivery process more sustainable. Thus, the studies reviewed suggest that companies should actively strive to optimize their use of resources and design their PSS offers to be more sustainable and avoid rebound effects (Tukker, 2004; Tukker and Tischner, 2006).

The motives for deploying sustainability tactics can be driven by three broad factors. First, legal and market conditions can be important motivators for companies to endeavour to use the full potential of the PSS offering in terms of sustainability (Maxwell et al., 2006). Second, customers may favour PSS offers with a higher sustainability focus, because they are likely to represent greater value to the customers' business operations (Kriston et al., 2010). Finally, PSS providers can be inclined to emphasize sustainability because it promotes exploring novel technologies, developing solutions, and implementing business models that meet both economic and environmental goals (Bocken et al., 2014; Lee et al., 2012).

The methods and opportunities for improvement with regard to sustainability differ significantly depending on the PSS business model used. Through the literature review, two main aspects were found to be associated with improved resource utilization and the extent of innovation. In the following sections, these aspects are discussed in relation to the PSS business model categories, because they affect creating value and generating revenue. A summary of the differences for each business model based on the aspects found in the literature review related to sustainability is shown in Table 12.

Resource utilization is related to the fact that the offered services will improve efficiency and product lifetime, as well as reduce the number of products in use. For PO business models, the benefits relate to more well-organized maintenance or automatically generating information that will improve the product's or service's functionality by prolonging the duration in which the PSS offer is used. In addition, take-back agreements allow for a higher efficiency recycling and reuse process for the PSS provider (Evans et al., 2007; Tonelli et al., 2009; Tukker and Tischner, 2006). When UO business models are applied, the provider may maintain ownership of the product, which increases incentives to prolong the lifecycle of the products through repairs and maintenance. Even more sustainability can be achieved through the intensified use of the product that results from product sharing and pooling. Kriston et al. (2010) combined the positive effects of car sharing with introducing hydrogen cars, which could further increase positive sustainability effects. However, for the UO business models in particular, the provider must address issues of careless behaviour and rebound effects related to ownerless consumption (Manzini and Vezzoli, 2003; Tukker, 2004). RO business models are solution-oriented; in these models, providing the agreed-upon service will be adapted to the customer's needs. The incentives for the provider to improve resource utilization are extremely high, because the operational savings will benefit the potential for the PSS provider to generate revenue (Tukker and Tischner, 2006).

The second aspect, regarding the extent of innovation, addresses how incremental or radical innovations can be used as part of sustainability tactics. Beyond innovations that improve the characteristics of the product or service, business model innovations play a crucial role in achieving greater levels of sustainability (Bocken et al., 2014). For the PO and UO business models, changes will be made mainly to support ease of maintenance and remanufacturing, as well as ways to improve durability. This is because these business models seek to make intensive use of the product. Because the services are related to a particular product, innovations are generally incremental, with the main character of the product staying the same throughout innovations (Tukker, 2004). However, in some cases, major service and business model innovations are possible, which could significantly improve the PSS provision. For example, introducing innovative service design and delivery may provide added value to customers and move them toward sustainable use of the product. Bocken et al. (2014) identified that further innovations to the business model are instrumental for reaching high-level sustainability goals by, for example, creating value from waste, delivering functionality, and encouraging sufficiency. Integrating such practices into models that support innovation toward more sustainable products and service in providing PSS enables companies to tap the full potential of PSS (Low et al., 2001).

In contrast, radical innovations, through which novel means of fulfilling function are established, are possible outcomes to fulfil the RO business models. Here, the provider and customer agree only on a result, with no particular product or service necessarily considered for fulfilment. This gives the manufacturer the incentive to try totally new ways to operate; this, in turn, creates incentives for better resource utilization, leading to improved sustainability (Manzini and Vezzoli, 2003; Tukker, 2004).

Table 12
Summary of the aspects related to the sustainability tactic.

Key aspects	Key references	Product-oriented	Use-oriented	Result-oriented
Improved resource utilization	Evans et al. (2007) Manzini and Vezzoli (2003) Tonelli et al. (2009) Tukker and Tischner (2006)	▪ Prolonged lifetime of the product or service. ▪ Better recycling.	Intensified use. ▪ Prolonged lifetime of the product or service. ▪ Risk of rebound effects.	▪ High incentives for provider to improve resource utilization.
Extent of innovation	Manzini and Vezzoli (2003) Tukker (2004)	▪ Incremental innovation addressing durability and usability ▪ Product and service innovations ▪ Business model innovations		▪ Radical innovations can lead to significant sustainability effects

5. Discussion and conclusion

Driven by the need for a more effective and sustainable way to use our planet's resources, research on PSS reveals high potential for balancing economic, social, and environmental benefits (Sundin and Bras, 2005; Tukker, 2004; Mont, 2002). For example, customers who are not regular users of cars may choose to use car-sharing solutions rather than buying a car. They also choose a sustainable and resource efficient solution (Kriston et al., 2010).

Still, most companies are challenged by efforts to offer PSS solutions because of their internal inability to design and implement PSS business models successfully. A recent PSS literature review study, for example, concluded that "knowledge and experience regarding the PSS business models are limited" (Beuren et al., 2013, p. 229)—a finding that can explain why many companies' fail to engage in PSS. This shortcoming is addressed with the present systematic literature review, which summarizes the implementation of PSS business models, as well as the operational tactics associated with each model.

The present results show an increasing number of publications address the phenomenon of companies offering product–service and service–product solutions. Abandoning traditional business models that focus on a dominant product or service in favour of the newer PSS business models continues to be a complex undertaking. Although 'business model' is a widely used term in the PSS literature, most studies still use it superficially. This is evident in the fact that the literature review identified only 67 articles that explicitly or implicitly discuss PSS business models.

We found support for the notion that most PSS offers can be categorised into the product-oriented, use-oriented, and result-oriented business models, as these continue to be the most prevalent types of PSS business models. Although prior studies that have addressed how to implement a specific PSS offering, they tend to avoid linking the discussion to more than one of these PSS business models categories. The three categories adopted in this review study are clearly different in terms of creating, delivering, and capturing value (see Table 4). For example, a tool manufacturing company that intends to make a product-oriented offering (e.g., tool and tool optimization software), activities that surround creating, delivering, and capturing value will continue to be linked primarily to products, but with an added service function. With a result-oriented offer (e.g., milling blocks of metal), in contrast, the PSS provider takes full responsibility for providing the promised results by intimately combining products and services. Ultimately, by highlighting the similarities and differences of the three business models, the conceptual understanding of these models for PSS researchers is extended (c.f. Tukker, 2004).

Moreover, the present review's main contribution lies in advancing our understanding of PSS operational tactics, which numerous articles recognized and discuss as being central for PSS business model implementation. Based on the present literature review, five tactical sets were identified that elucidate the competitive choices associated with each business model category. By unravelling the role of identified tactics in relation to PSS business models, a novel relationship is established between PSS business models and tactics; indeed, this has not been discussed previously in the PSS literature.

The five influential tactics identified for applying PSS are 1) contracts, 2) marketing, 3) networks, 4) product/service design, and 5) sustainability. The contract tactic addresses how the more advanced relationship between a provider and a customer is incorporated into a formal agreement that balances mutual interests (Grunberg et al., 2007; Shih and Chou, 2011). The marketing tactic communicates the PSS offer's value to customers, while also capturing customers' needs and requirements (Azarenko et al., 2009; Kindström, 2010). Generally, a single company cannot independently create, deliver, and capture PSS value; this means emphasising the role of the network tactic, where using relationships with external partners becomes central for implementing a PSS business model (Schuh et al., 2008; Gao et al., 2011). The product and service design tactic relates to how a product's higher usability requirements can be handled most appropriately (Sundin and Bras, 2005; Meier et al., 2010). Finally, the importance of capturing the full environmental and social value is combined in the sustainability tactics, which focuses on not missing this potential or even ending up with negative effects in sustainability (Tukker, 2004; Tukker and Tischner, 2006).

We argue that the five tactics are equally important when considering operational tactics to implement a PSS business model. However, because each company has a unique business model, they are likely to combine and deploy the five operational tactics in a customized way to maximize the outcome. For example, a manufacturing company that offers a leasing solution compared to a company that intends to offer a machine availability solution, are likely to use operational tactics differently. The relationship between PSS business models and tactics can be influenced by internal and external organizational conditions. Although the literature review for the present study did not focus specifically on these conditions, the literature analysis concludes that the internal and external conditions can have a profound effect on the companies' ability to implement PSS business models through effective use of the operational tactics.

More specifically, based on literature analysis, initial insights regarding three conditions can be provided. First, the internal condition of a dominant product or the service nature of the provider can be influential to PSS business models and tactics. Essentially, certain tactics are likely more appropriate to the purposes of a product-oriented provider than that of a service-oriented provider. Second, the company's size denotes the availability of resources, competences, and level of strategic flexibility, which can influence both the composition of and use of the tactics. For example, a start-up and a large manufacturing company are likely to vary significantly regarding how they would implement certain PSS business models. Finally, the customer focus toward business-to-customer or business-to-business markets has implications for how companies work with operational tactics and ensure they implement the business model successfully. Thus, it is proposed that the above-stated conditional factors can be influential when discussing PSS implementation. Future research is needed to understand their impact on PSS business models and tactics fully.

In conclusion, it can be highlighted that PSS business model implementation remains an important yet understudied area of research in the PSS literature. The present study identifies five prominent operational-level tactics for PSS business model implementation. Thus, identifying and discussing several empirically rooted examples of tactics and their related aspects can provide further guidance to companies that are in the process of gaining value from implementing a PSS business model.

While the systematization of the literature on PSS business models and tactics makes significant contributions to this emerging research field, it also acknowledges potential paths for future research, which are summarize as follows:

- As presented above, the effect of the proposed tactics on different business models can vary based on internal and external organizational conditions. For example, industrial variance acknowledges that differences can exist between how companies in the manufacturing industry implement business

models compared to a service provider or even the process industry or high-tech industry. Further research is recommended to expand our understanding of these conditions and critically evaluate their impacts when interpreting empirical material regarding PSS success stories.

- The present study grouped business models into three well-established categories. However, as PSS implementation evolves, other new business models may emerge, potentially making it necessary to revise and expand the proposed business model categories. Thus, research efforts are welcomed that can conceptually and empirically contribute to developing new PSS business model categories.
- Similar to point 2, the tactics identified in the present study do not represent a complete list of tactics but are instead prominent tactics identified based on the undertaken systematic literature review. Future research efforts should address the tactics that influence business model implementation by composing a comprehensive list of tactics that organizations evaluate. Moreover, tactics can have different effects when employed jointly; indeed, they can enhance or suppress each other's effects on success. Research has not undertaken a specific focus on this interaction effect among the five tactics. However, this represents an important future research direction that will advance our knowledge regarding how to maximize the positive effect from operational tactics.
- The present study proposes a critical link between business models and tactics, linking strategic-level decisions to operational-level actions. Tactics are mentioned frequently in the literature, but their impact on how much value is created is rarely discussed. For example, the sustainability tactic—a very important aspect of PSS implementation—is very seldom connected to its impact on the value the company creates. Seeking further clarity about such relationships is important for understanding the micro-foundation for successful PSS business model implementation. Future research efforts are encouraged in the form of longitudinal qualitative case studies aimed at providing a better understanding of the complex relationship between business models and operational tactics.
- Finally, more quantitative studies are needed to empirically examine different business models and test their influence on company performance and growth. Recent study by Parida et al. (2014) has made some interesting funding about effect of four different PSS business models to sale growth. Still, more research effort in needed in this direction. Moreover, by introducing the moderating effect of the proposed tactics, it is possible to understand more about the conditions under which certain business model categories influence company performance.

The present study has made an initial attempt to systematize research on PSS business models and tactics. Although the results clearly contribute to the PSS literature, the study has certain limitations that should be considered when evaluating the results. First, articles captured discuss the transition of companies from a product orientation to a product–service orientation through the use of several well-established keywords. However, there may be other relevant keywords that have not been considered in the present study. Second, conference articles and articles written in a language other than English have been excluded to ensure the study remained focused and quality-conscious. The omitted sources, however, may hold potential value for research on this topic. Thirdly, only one database was used for the review, which may have implications for the results. Finally, the identified tactics were unique and most widely discussed in relation to PSS business model implementation during the literature search. It may be the case, however, that other aspects that did not dominate in the articles used for the present study could also qualify as tactics for PSS business models. Despite these limitations, this study has made a considerable contribution to developing a discussion that guides both practitioners and researchers interested in the accumulated knowledge related to implementing PSS business models.

Acknowledgements

This work was conducted at the VINNOVA Excellence Centre the Faste Laboratory at Luleå University of Technology, Sweden. We would further like to acknowledge support of three researchers from Mälardalen University that have assisted in the early stage of literature review.

References

Anttonen, M., 2010. Greening from the front to the back door? A typology of chemical and resource management services. Bus. Strategy Environ. 19 (3), 199–215.
Aurich, J.C., Fuchs, C., Wagenknecht, C., 2006. Life cycle oriented design of technical Product–Service Systems. J. Clean. Prod. 14 (17), 1480–1494.
Azarenko, A., Roy, R., Shehab, E., Tiwari, A., 2009. Technical product–service systems: some implications for the machine tool industry. J. Manuf. Technol. Manag. 20 (5), 700–722.
Baden Fuller, C., Morgan, M.S., 2010. Business models as models. Long. Range Plan. 43 (2), 156–171.
Baines, T.S., Lightfoot, H.W., Benedetti, O., Kay, J.M., 2009. The servitization of manufacturing: a review of literature and reflection on future challenges. J. Manuf. Technol. Manag. 20 (5), 547–567.
Baines, T.S., Lightfoot, H.W., Steve, E., Neely, A., Greenough, R., Peppard, J., Roy, R., Shehab, E., Braganza, A., Tiwari, A., Alcock, J., Angus, J., Bastl, M., Cousens, A., Irving, P., Johnson, M., Kingston, J., Lockett, H., Martinez, V., Michele, P., Tranfield, D., Walton, I., Wilson, H., 2007. State-of-the-art in product–service systems. Proc. Institut. Mech. Eng. Part B J. Eng. Manuf. 221 (10), 1543–1552.
Bartolomeo, M., dal Maso, D., de Jong, P., Eder, P., Groenewegen, P., Hopkinson, P., James, P., Nijhuis, L., Örninge, M., Scholl, G., Slob, A., Zaring, O., 2003. Eco-efficient producer services—what are they, how do they benefit customers and the environment and how likely are they to develop and be extensively utilised? J. Clean. Prod. 11 (8), 829–837.
Becheikh, N., Landry, R., Amara, N., 2006. Lessons from innovation empirical studies in the manufacturing sector: a systematic review of the literature from 1993–2003. Technovation 26 (5), 644–664.
Besch, K., 2005. Product–service systems for office furniture: barriers and opportunities on the European market. J. Clean. Prod. 13 (10), 1083–1094.
Beuren, F.H., Gomes Ferreira, M.G., Cauchick Miguel, P.A., 2013. Product–service systems: a literature review on integrated products and services. J. Clean. Prod. 47, 222–231.
Bhargava, H.K., 2012. Retailer-driven product bundling in a distribution Channel. Mark. Sci. 31 (6), 1014–1021.
Bocken, N.M.P., Short, S.W., Rana, P., Evans, S., 2014. A literature and practice review to develop sustainable business model archetypes. J. Clean. Prod. 65, 42–56.
Boehm, M., Thomas, O., 2013. Looking beyond the rim of one's teacup: a multidisciplinary literature review of Product–Service Systems in information systems, business management, and engineering & design. J. Clean. Prod. 51, 245–260.
Boyt, T., Harvey, M., 1997. Classification of industrial services: a model with strategic implications. Ind. Mark. Manag. 26 (4), 291–300.
Briscoe, G., Keränen, K., Parry, G., 2012. Understanding complex service systems through different lenses: an overview. Eur. Manag. J. 30, 418–426.
Casadesus Masanell, R., Ricart, J.E., 2010. From strategy to business models and onto tactics. Long. Range Plan. 43 (2), 195–215.
Ceschin, F., 2013. Critical factors for implementing and diffusing sustainable product–Service systems: insights from innovation studies and companies' experiences. J. Clean. Prod. 45, 74–88.
Cheng, H.K., Tang, Q.C., Zhao, J.L., 2006. Web services and service-oriented application provisioning: an analytical study of application service strategies. Eng. Manag. IEEE Trans. 53 (4), 520–533.
Cook, D.J., Greengold, N.L., Ellrodt, A.G., Weingarten, S.R., 1997. The relation between systematic reviews and practice guideline. Ann. Intern. Med. 127 (3), 201–216.
Corrêa, H.L., Ellram, L.M., Scavarda, A.J., Cooper, M.C., 2007. An operations management view of the services and goods offering mix. Int. J. Operat. Prod. Manag. 27 (5), 444–463.
Czarnecki, C., Spiliopoulou, M., 2012. A holistic framework for the implementation of a next generation network. Int. J. Bus. Inform. Syst. 9 (4), 385–401.
Czarnecki, C., Winkelmann, A., Spiliopoulou, M., 2010. Services in electronic telecommunication markets: a framework for planning the virtualization of processes. Electron. Mark. 20 (3–4), 197–207.

De Coster, R., 2011. A collaborative approach to forecasting product–service systems (PSS). Int. J. Adv. Manuf. Technol. 52 (9–12), 1251–1260.
Elo, S., Kyngäs, H., 2008. The qualitative content analysis process. J. Adv. Nurs. 62 (1), 107–115.
Evans, S., Partidário, P.J., Lambert, J., 2007. Industrialization as a key element of sustainable product–service solutions. Int. J. Prod. Res. 45 (18–19), 4225–4246.
Farashahi, M., Hafsi, T., Molz, R., 2005. Institutionalized norms of conducting research and social realities: a research synthesis of empirical works from 1983 to 2002. Int. J. Manag. Rev. 7 (1), 1–24.
Ford, D., 2011. IMP and service-dominant logic: divergence, convergence and development. Ind. Mark. Manag. 40 (2), 231–239.
Frambach, R.T., Wels-Lips, I., Gündlach, A., 1997. Proactive product service strategies: an application in the European health market. Ind. Mark. Manag. 26 (4), 341–352.
Gaiardelli, P., Resta, B., Martinez, V., Pinto, R., Albores, P., 2014. A classification model for Product–Service offerings. J. Clean. Prod. 66, 507–519.
Gao, J., Yao, Y., Zhu, V., Sun, L., Lin, L., 2011. Service-oriented manufacturing: a new product pattern and manufacturing paradigm. J. Intelligent Manuf. 22 (3), 435–446.
Geraldi, B., Maylor, H., Williams, T., 2011. Now, let's make it really complex (complicated) A systematic review of the complexities of projects. Int. J. Operat. Prod. Manag. 31 (9), 966–990.
Goedkoop, M., van Halen, C., te Riele, H., Rommens, P., 1999. Product Service Systems, Ecological and Economic Basics.
Gruneberg, S., Hughes, W., Ancell, D., 2007. Risk under performance-based contracting in the UK construction sector. Constr. Manag. Econ. 25 (7), 691–699.
Halme, M., Anttonen, M., Kusima, M., Kontoniemi, N., Heino, E., 2007. Business models for material efficiency services: Conceptualization and application. Ecol. Econ. 63 (1), 126–137.
Isaksson, O., Larsson, T.C., Öhrwall Rönnbäck, A., 2009. Development of product–service systems: challenges and opportunities for the manufacturing firm. J. Eng. Des. 20 (4), 329–348.
Kameshwaran, S., Viswanadham, N., Desai, V., 2009. Bundling and pricing of product with after-sale services. Int. J. Oper. Res. 6 (1), 92–109.
Kindström, D., 2010. Towards a service-based business model-Key aspects for future competitive advantage. Eur. Manag. J. 28 (6), 479–490.
Kohtamäki, M., Partanen, J., Parida, V., Wincent, J., 2013. Non-linear relationship between industrial service offering and sales growth: the moderating role of network capabilities. Ind. Mark. Manag. 42 (8), 1374–1385.
Kowalkowski, C., 2011. Dynamics of value propositions: insights from service-dominant logic. Eur. J. Mark. 45 (1–2), 277–294.
Kriston, A., Szabó, T., Inzelt, G., 2010. The marriage of car sharing and hydrogen economy: a possible solution to the main problems of urban living. Int. J. Hydrog. energy 35 (23), 12697–12708.
Krucken, L., Meroni, A., 2006. Building stakeholder networks to develop and deliver product–service-systems: practical experiences on elaborating pro-active materials for communication. J. Clean. Prod. 14 (17), 1502–1508.
Kumar, R., Kumar, U., 2004. Service delivery strategy: trends in mining industries. Int. J. Surf. Min. Reclam. Environ. 18 (4), 299–307.
Kuo, T.C., 2011. Simulation of purchase or rental decision-making based on product service system. Int. J. Adv. Manuf. Technol. 52 (9), 1239–1249.
Lee, S., Geum, Y., Lee, H., Park, Y., 2012. Dynamic and multidimensional measurement of product–service system (PSS) sustainability: a triple bottom line (TBL)-based system dynamics approach. J. Clean. Prod. 32, 173–182.
Low, M.K., Lamvik, T., Walsh, K., Myklebust, O., 2001. Manufacturing a green service: engaging the TRIZ model of innovation. Electron. Packag. Manuf. IEEE 24 (1), 10–17.
Magretta, J., 2002. Why business models matter. Harv. Bus. Rev. 80 (5), 86–92.
Manzini, E., Vezzoli, C., 2003. A strategic design approach to develop sustainable product service systems: examples taken from the 'environmentally friendly innovation' Italian prize. J. Clean. Prod. 11 (8), 851–857.
Martinez, V., Bastl, M., Kingston, J., Evans, S., 2010. Challenges in transforming manufacturing organisations into product–service providers. J. Manuf. Technol. Manag. 21 (4), 449–469.
Maxwell, D., Sheate, W., van der Vorst, R., 2006. Functional and systems aspects of the sustainable product and service development approach for industry. J. Clean. Prod. 14 (17), 1466–1479.
Maxwell, D., van der Vorst, R., 2003. Developing sustainable products and services. J. Clean. Prod. 11 (8), 883–895.
Meier, H., 2004. Life cycle-based service design for innovative business models. CIRP Ann. 53 (1), 393–397.
Meier, H., Roy, R., Seliger, G., 2010. Industrial Product–Service Systems–IPS2. CIRP Ann. 59 (2), 607–627.
Mont, O., 2004. Institutionalisation of sustainable consumption patterns based on shared use. Ecol. Econ. 50 (1–2), 135–153.
Mont, O., Dalhammar, C., Jacobsson, N., 2006. A new business model for baby prams based on leasing and product remanufacturing. J. Clean. Prod. 14 (17), 1509–1518.
Mont, O., Tukker, A., 2006. Product–Service Systems: reviewing achievements and refining the research agenda. J. Clean. Prod. 14 (17), 1451–1454.
Mont, O.K., 2002. Clarifying the concept of product–service system. J. Clean. Prod. 10 (3), 237–245.
Morelli, N., 2003. Product–service systems, a perspective shift for designers: a case study: the design of a telecentre. Des. Stud. 24 (1), 73–99.
Morelli, N., 2006. Developing new product service systems (PSS): methodologies and operational tools. J. Clean. Prod. 14 (17), 1495–1501.
Ng, I., Maull, R., Yip, N., 2009. Outcome-based contracts as a driver for systems thinking and service-dominant logic in service science: evidence from the defence industry. Eur. Manag. J. 27 (6), 377–397.
Osterwalder, A., Pigneur, Y., 2010. Business Model Generation: a Handbook for Visionaries, Game Changers, and Challengers. Wiley.
Parida, V., Parida, V., Sjödin, D.R., Wincent, J., Kohtamäki, M., 2014. Mastering the transition to product-service provision: Insights into business models, learning activities, and capabilities. Res. Technol. Manag. 57 (3), 44–52.
Petticrew, M., 2001. Systematic reviews from astronomy to zoology: myths and misconceptions. Br. Med. J. 322 (7278), 98.
Pittaway, L., Robertson, M., Munir, K., Denyer, D., Neely, A., 2006. Networking and innovation: a systematic review of the evidence. Int. J. Manag. Rev. 5 (3–4), 137–168.
Richardson, J., 2008. The business model: an integrative framework for strategy execution. Strateg. Change 17 (5–6), 133–144.
Richter, A., Sadek, T., Steven, M., 2010. Flexibility in industrial product–service systems and use-oriented business models. CIRP J. Manuf. Sci. Technol. 3 (2), 128–134.
Richter, A., Steven, M., 2009. On the relation between industrial Product–Service systems and business models. Oper. Res. Proc. 2008, 97–102.
Roy, R., 2000. Sustainable product–service systems. Futures 32 (3), 289–299.
Schmenner, R.W., 2009. Manufacturing, service, and their integration: some history and theory. Int. J. Oper. Prod. Manag. 29 (5), 431–443.
Schuh, G., Boos, W., Kozielski, S., 2009. Life cycle cost-orientated service models for tool and die companies. In: Proceedings of the 19th CIRP Design Conference–competitive Design. Cranfield University Press, pp. 249–254.
Schuh, G., Boos, W., Völker, M., 2011. Collaboration platforms to enable global service provision in the tooling industry. Prod. Eng. 5 (1), 9–16.
Schuh, G., Klotzbach, C., Gaus, F., 2008. Service provision as a sub-model of modern business models. Prod. Eng. 2 (1), 79–84.
Schweitzer, E., Aurich, J.C., 2010. Continuous improvement of industrial product–service systems. CIRP J. Manuf. Sci. Technol. 3 (2), 158–164.
Seuring, S., Müller, M., 2008. From a literature review to a conceptual framework for sustainable supply chain management. J. Clean. Prod. 16 (15), 1699–1710.
Shankar, V., Berry, L.L., Dotzel, T., 2009. A practical guide to combining products and services. Harv. Bus. Rev. 87 (11), 94–99.
Shih, L.H., Chou, T.Y., 2011. Customer concerns about uncertainty and willingness to pay in leasing solar power systems. Int. J. Environ. Sci. Technol. 8 (3), 523–532.
Spring, M., Araujo, L., 2009. Service, services and products: rethinking operations strategy. Int. J. Operat. Prod. Manag. 29 (5), 444–467.
Stoughton, M., Votta, T., 2003. Implementing service-based chemical procurement: lessons and results. J. Clean. Prod. 11 (8), 839–849.
Sundin, E., Bras, B., 2005. Making functional sales environmentally and economically beneficial through product remanufacturing. J. Clean. Prod. 13 (9), 913–925.
Sundin, E., Larsson, M., Nielsen, A., 2005. Design for functional sales – a case study of forklift trucks at BT industries. In: Environmentally Conscious Design and Inverse Manufacturing, 2005. Eco Design 2005. Fourth International Symposium on. IEEE,, pp. 378–385.
Sundin, E., Öhrwall Rönnbäck, A., Sakao, T., 2010. From component to system solution supplier: strategic warranty management as a key to efficient integrated product/service engineering. CIRP J. Manuf. Sci. Technol. 2 (3), 183–191.
Surti, C., Hassini, E., 2012. Bundling in a supply chain: insights and implications. Eur. J. Indust. Eng. 6 (5), 542–571.
Tasaki, T., Hashimoto, S., Moriguchi, Y., 2006. A quantitative method to evaluate the level of material use in lease/reuse systems of electrical and electronic equipment. J. Clean. Prod. 14 (17), 1519–1528.
Teece, D.J., 2010. Business models, business strategy and innovation. Long. Range Plan. 43 (2), 172–194.
Tonelli, F., Taticchi, P., Starnini Sue, E., 2009. A framework for assessment and implementation of Product–Service systems strategies: learning from an action research in the health-care sector. WSEAS Trans. Bus. Econ. 7, 303–310.
Tranfield, D., Denyer, D., Smart, P., 2003. Towards a methodology for developing evidence informed management knowledge by means of systematic review. Br. J. Manag. 14 (3), 207–222.
Tukker, A., 2004. Eight types of product–service system: eight ways to sustainability? Experiences from SusProNet. Bus. Strategy Environ. 13 (4), 246–260.
Tukker, A., Tischner, U., 2006. Product–services as a research field: past, present and future. Reflections from a decade of research. J. Clean. Prod. 14 (17), 1552–1556.
Tuli, K.R., Kohli, A.K., Bharadwaj, S.G., 2007. Rethinking customer solutions: from product bundles to relational processes. J. Mark. 71, 1–17.
Ulaga, W., Reinartz, W.J., 2011. Hybrid offerings: how manufacturing firms combine goods and services successfully. J. Mark. 75 (6), 5–23.
Vandermerwe, S., Rada, J., 1988. Servitization of business: adding value by adding services. Eur. Manag. J. 6 (4), 314–324.
Vargo, S.L., Lusch, R.F., 2004. Evolving to a new dominant logic for marketing. J. Mark. 68 (1), 1–17.
Williams, A., 2007. Product service systems in the automobile industry: contribution to system innovation? J. Clean. Prod. 15 (11–12), 1093–1103.
Wise, R., Baumgartner, P., 1999. Go downstream. Harv. Bus. Rev. 77 (5), 133–141.
Yip, G.S., 2004. Using strategy to change your business model. Bus. Strategy Rev. 15 (2), 17–24.
Yoon, B., Kim, S., Rhee, J., 2011. An evaluation method for designing a new product–service system. Expert Syst. Appl. 39 (3), 3100–3108.
Zott, C., Amit, R., Massa, L., 2011. The business model: recent developments and future research. J. Manag. 37 (4), 1019–1042.