

Seeking competitive advantage with service infusion: a systematic literature review

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Abstract

Purpose – The purpose of this paper is to analyze how the service infusion literature explains competitive advantage through services. The four strategic management theories – competitive forces, the resource-based view, dynamic capabilities, and relational view – are applied in the analysis.

Design/methodology/approach – A systematic literature review analyzes the links between the service infusion and strategy literature.

Findings – The review reveals that although discussion of service infusion applies strategic management concepts, the stream lacks rigor with respect to construct definition and justification. Additionally, contextual variables are often missing. The result is an over-emphasis of contextually bound measures, such as technology, and focal actors.

Research limitations/implications – The growing trends toward social networks, co-specialization, actor dependency and shared resources encourage service infusion scholars to focus on network-related and relational capabilities, co-opetition, open business models, and relational rent extraction. Furthermore, service infusion research would benefit from considering strategy-based theoretical discussions, constructs, and constraints that would improve the scientific rigor, impact and contribution.

Originality/value – This paper represents a systematic attempt to link the service infusion literature with strategic management theories and thoroughly analyzes the knowledge gaps and possible misconceptions.

Keywords Servitization, Dynamic capabilities, Competitive advantage, Resource-based view, Relational view, Service infusion

Paper type Literature review

1. Introduction

The competitive pressures of mature markets has forced manufacturing organizations to provide customers with more comprehensive and customized value offerings (Baines *et al.*, 2009; Wise and Baumgartner, 1999; Vandermerwe and Rada, 1988). A stream of literature has attempted to capture the essential characteristics of the change toward customized solutions by focussing on the increase of services and customer orientation in businesses. This phenomenon, conceptualized as service infusion[1], has shown that the transformation from transactional business models to solutions is complex and



multifaceted. Organizations must design new capabilities, business models, and processes to enable and support this paradigm shift (Lightfoot *et al.*, 2013; Baines *et al.*, 2009; Brax and Jonsson, 2009; Kindström and Kowalkowski, 2009; Oliva and Kallenberg, 2003; Mathieu, 2001a, b; Matthyssens and Vandenbempt, 1998; Levitt, 1983).

Empirical evidence suggests that the connection between the expansion of service offerings and firm performance is not straightforward, and even questionable (Neely, 2008; Brax, 2005; Gebauer *et al.*, 2005). The service infusion literature refers widely to theories of strategic management to argue for the benefits and possible service-based competitive advantage. Although strategy focussed theories are widely cited in discussions of service infusion, there seems to be a great deal of confusion and redundancy regarding theories that might explain competitive advantage – or its absence – in service-oriented strategies. The most cited theories to explain competitive advantage from service infusion are the market power and competition paradigm (Porter, 1980), the resource-based theory (Barney, 1991; Rumelt, 1984; Wernerfelt, 1984), dynamic capabilities (Teece *et al.*, 1997), and relationships and network-based argumentation (Dyer and Singh, 1998).

To clarify the underpinnings and premises of competitive advantage from service infusion, we reviewed and analyzed the service infusion literature from the perspective of strategic management. We integrate two, somewhat distinct, discussions to reveal the theoretical underpinnings influencing the development of service infusion as an area of research. Thus, our main research question guiding our review and analysis is the following:

RQ1. How does the service infusion literature explain competitive advantage through services?

By connecting the strategy literature with the empirically motivated service infusion stream, this paper responds to recent studies (e.g. Gebauer *et al.*, 2012b) and complements existing works (e.g. Lightfoot *et al.*, 2013; Velamuri *et al.*, 2011) to reveal the nuances of the link established between the service infusion research and strategic management theories. Our analysis notes the synergies of the research streams, yet reveals construct and contingency ambiguity leading to biases that could be resolved by enhancing the connections between the research streams.

This paper is structured as follows. First, we summarize the strategy literature to form a unitary and concise view of the past and present state of the competitive advantage discussion in the strategy discipline. Then, we present four distinct streams that compose the theoretical framework for our analysis. After that, the methodology we used to analyze the service infusion literature is explained. Next, we proceed with a systematic analysis explicating various strategic approaches within the service infusion literature. Finally, the implications of the findings are discussed, with an emphasis on addressing the gaps in the service infusion literature, and presenting directions for future research.

2. Strategic management theories

In this section, we summarize the major research streams in the strategic management literature that address sources of competitive advantage. We have selected strategic management theories based on the ideology that firms (with strategic actions) shape market structures in their favor, as this is also the ideology behind service infusion. This eliminates evolutionary theories that assume companies cannot affect their market survival with strategic decision making (e.g. industry evolution, path

dependency). The analysis here focusses on theories applied within the discipline of strategic management, identifying key discussions around “competitive advantage.”

We rely on several papers that summarize the development of strategy discussions (see, e.g. Barreto, 2010; Wang and Ahmed, 2007; Borgatti, 2003; Dyer and Singh, 1998; Teece *et al.*, 1997; Wernerfelt, 1995; Peteraf, 1993). Four distinct strategic views informed our analysis: market forces, the resource-based view (RBV), dynamic capabilities approach, and relational view. We analyze the central aspects of each approach to determine the argument for the source of competitive advantage with an emphasis on theory evolution and the current theory stage. The following sections present an overview of the chosen strategic theories.

2.1 Market forces, industry architecture, and strategic conflict

The dominant paradigm of strategy research during the 1980s was competitive market forces (Porter, 1980). This approach views industry structure as a having strong influence on strategic formulation (Utterback and Suárez, 1993). Market dynamics and structure assert the rules under which companies operate. Research has argued that supernormal returns are the result of a firm’s membership in a structurally favorable industry (Klepper, 1996). In the competitive forces model, five industry forces – barriers to entry, threat of substitution, bargaining power of buyers, bargaining power of suppliers, and rivalry among industry incumbents – determine the profit potential and success of an industry or sub-segment of an industry (Porter, 2008).

This approach is relevant when firms defend their market position or try to influence competitive forces. The discussion on market forces was accompanied by the dominant game theory approach (Shapiro, 1989). The intention was to link the economic discussion with competitive interaction between firms. According to this view, firms influence the market structure and its behavior and shape the market environment to their benefit (Shapiro, 1989). Game theory formalizes various business behavior-type arguments (e.g. predatory pricing and patent races) and has increased our understanding of the sources of competitive advantage (Teece *et al.*, 1997; Axelrod and Hamilton, 1981). Strategic behavior is dependent on “game playing” (i.e. firms react in response to anticipated competitor actions). Concepts such as “first-mover advantage” (e.g. Gilbert and Newbery, 1982) and “price competition” (Shaked and Sutton, 1982) have been widely discussed. When competitors do not have ingrained competitive advantages, the moves and countermoves of competitors can be effectively formulated in terms of game theory (Tirole, 1988). For example, according to game theory, rents accrue from the intellectual ability of managers to “play the game” (Teece *et al.*, 1997). This theory is still widely applied e.g. in internationalization studies (e.g. McManus *et al.*, 2008; Birkinshaw *et al.*, 2005).

2.2 The RBV

In contrast, the resource-based approach argues that differences between firms are primarily the result of firm heterogeneity with respect to their bundles of resource and capability endowments (Barney, 1991, 1986; Rumelt, 1984; Wernerfelt, 1984). Firms can achieve sustainable competitive advantage through the accumulation of strategic assets that are hard to imitate, substitute or trade (Amit and Schoemaker, 1993). Firm resources include all assets, capabilities, organizational processes, firm attributes, information, knowledge, etc., controlled by a firm that enable the firm to conceive of and implement strategies that improve its efficiency and effectiveness (Barney, 1991;

Daft, 1983). Such resources are defined as “an asset or input to production (tangible or intangible) that an organization owns, controls, or has access to on a semi-permanent basis” (Helfat and Peteraf, 2003, pp. 999). While offering a simplified prescriptive framework for resource-based strategic management, the study also characterizes the resources that provide sustainable competitive advantage using the criteria of valuable, rare, inimitable, and non-substitutable or “being-organized” (VRIO: Barney, 1995; earlier, VRIN: Barney, 1991).

Since then, resource-based frameworks have been criticized and extended (Kraaijenbrink *et al.*, 2010). The stream has begun to extend the firm’s boundaries to the external environment and shared resources. Most resource-based contributions have evolved toward the dynamic capability perspective (Teece *et al.*, 1997; Mahoney, 1995). The RBV yields contributions to the entrepreneurial side of business (Verbeke and Yuan, 2013) and the formation of resources within a single organization (Nakano *et al.*, 2013; Netland and Aspelund, 2013; Moreno *et al.*, 2012; Henard and McFadyen, 2012). While acknowledging the existence of criticisms and extensions (e.g. Eisenhardt and Martin, 2000), we believe that RBV has contributed strongly to our understanding of competitive advantage of a firm.

2.3 *Dynamic capabilities*

Compared to the classical version of RBV, the dynamic capabilities approach argues that competitive advantage originates from a firm’s ability to integrate, develop, and reconfigure internal and external competencies and resources to address rapidly changing environments (Teece *et al.*, 1997). These capabilities are firm-specific managerial and organizational processes that can be, e.g., sensing, seizing, and reconfiguration capabilities (O’Reilly and Tushman, 2008). Thus, instead of a unique set of resources, the firm’s ability to adapt, reconfigure, and innovate in changing market conditions are central to competitive advantage (Hobday, 1998; Roberts, 1998; Quinn, 1985).

The dynamic capabilities approach addresses the RBV concern for company inertia by emphasizing dynamic, entrepreneurial approaches to volatile and evolutionary market situations (Zahra *et al.*, 2006). In recent dynamic capabilities research, Teece (2007) acknowledged the “systems perspective” and the connections between the firm and its ecosystem, for example, on innovation (Chesbrough, 2003), organizational learning (Powell, 1998), or in the creation of the output (Shan *et al.*, 1994). The systems perspective argues that specialization leads to a need for open innovation processes and integration, which involves the customer, suppliers, and complementary organizations (Lichtenthaler and Lichtenthaler, 2009). The goal is to find new, value-enhancing combinations inside the firm and between different external enterprises through alliances (Eisenhardt and Martin, 2000). Coordination and orchestration are critical sources of sustainable competitive advantage (Wales *et al.*, 2013). Recent contributions have built on dynamic capabilities and focus on the role of technology in the formation of dynamic capabilities (Bernroider *et al.*, 2014), the international aspects of dynamic capability formation (Sambharya and Lee, 2014; Teece, 2014), clarification of cross-organizational boundaries of dynamic capability building (Cheng *et al.*, 2014; Gulati *et al.*, 2000), and the platform perspective (Vickery *et al.*, 2013).

2.4 *Relational view*

According to Dyer and Singh (1998, pp. 661), although earlier contributions to strategy have significantly impacted knowledge concerning the achievement of above-normal

returns by firms, they do not focus sufficiently on the network relationships within which the firm is embedded. The relational view treats the inter-firm network as a unit of analysis and argues that idiosyncratic, inter-firm linkages may be a source of relational rents and competitive advantage (Lavie, 2006; Dyer and Singh, 1998). Thus, Dyer and Singh (1998) focussed on inter-organizational rent generation, stressing the importance of dyadic network routines and processes. Specifically, the interest was in relational inter-firm knowledge sharing (Grant, 1996) between actors, complementary resource endowments, governance methods, dyadic network barriers to imitation, and the sharing of relational rents between actors (Dyer *et al.*, 2008). Lorenzoni and Lipparini (1999) extended the discussion beyond the impact of single alliances by considering a set of relationships that should be activated. Their argument favors the view that inter-firm networks can be shaped and deliberately designed. In other domains, the topic has been discussed in relation to business ecosystems (Adner and Kapoor, 2010; Teece, 2007; Iansiti and Levien, 2004; Moore, 1993), industry architecture (Pisano and Teece, 2007; Jacobides *et al.*, 2006), and supply networks (Choi and Krause, 2006; Lee, 2004; Lamming *et al.*, 2000).

Contrasting with the RBV is the argument that a firm's critical resources may extend beyond its boundaries. Dyer and Singh (1998) argued that a capability, as defined by Teece *et al.* (1997), even a network-related one, is not a sufficient condition for realizing relational rents. However, the relational view (as the term "view" suggests) augments resource-based and dynamic capabilities-based strategies. Instead of creating a new paradigm, the relational approach focusses on the concepts that it deems the most significant in the networked business environment – the change in a unit of analysis to extend a firm's boundaries perhaps being the most fundamental contribution to the strategic discussion. This stream has attracted scholarly interest, and the theory has been applied in a variety of studies that emphasize innovation possibilities in relational networks (Inemek and Matthyssens, 2013; Rass *et al.*, 2013; Dahlander and Frederiksen, 2012; Castaldi *et al.*, 2011; Sammarra and Biggiero, 2008) and social capital development through inter-organizational networks (Rass *et al.*, 2013; Laursen *et al.*, 2012; Dahlander and Frederiksen, 2012; Zaheer *et al.*, 2010; Borgatti and Cross, 2003; Yli-Renko *et al.*, 2001).

Table I summarizes the strategic management disciplines.

3. Method

Having summarized the approaches on strategy and management theories that address the sources of competitive advantage, we now focus on service infusion-related articles to analyze the links between these two distinct research streams. The research method consisted of 11 stages. First, the search criteria were set. Then, we conducted initial literature queries using Thomson Reuters Web of Science (WOS) as the primary search tool. The results were content analyzed, and the main outlets were identified for discussion, facilitating higher resolution queries to the most significant journals using the journals' own tools. We then content analyzed the journal-specific results and merged them into one data set. To verify that our literature sample included the relevant articles, a secondary literature search engine (SciVerse Scopus) was used with the same search criteria as the initial WOS search. After duplicate checks and content analysis, the results were again merged, which provided a primary set of literature for our analysis. We complemented this set with additional strategy-related articles identified in the most comprehensive literature review of the service infusion research stream to date (Lightfoot *et al.*, 2013). Additionally, we added a number

Theory	Sources for competitive advantage	Level of analysis	See e.g.
Market forces	The industry structure determines and limits strategic choices and any available competitive advantage	Industry	Porter (1980, 2008), Shapiro (1989), Utterback and Suárez (1993)
Resource-based perspective	Competitive interaction and entrepreneurial actions can be used to manipulate the market environment. The competitive advantage lies in the upstream and is based on the organizations' idiosyncratic and difficult-to-imitate resources	Organization	Barney (1991), Rumelt (1984), Wernerfelt (1984), Helfat and Peteraf (2003)
Dynamic capabilities	Competitive advantage depends on a firm's capabilities to adapt, integrate, and reconfigure skills, resources, and functional competences in a dynamic environment	Organization	Quinn (1985), Teece <i>et al.</i> (1997), Hobday (1998), Roberts (1998), Powell (1998), Eisenhardt and Martin (2000), Teece (2007)
Relational view	Competitive advantage can be only gained through the joint idiosyncratic contributions of specific alliance partners and the service ecosystem	Industry	Dyer and Singh (1998), Lorenzoni and Lipparini (1999), Chesbrough (2003), Lavie (2006)

Table I.
Summary of the
strategic
management theories

of individual articles to provide sufficient background information on specific research results, theories, or terms referred to in the included literature. Finally, we extended the set with a few seminal articles identifying which items our paper set uses in defining servitization and service infusion.

3.1 Search terms and sources

We decided to include only academic journal articles and excluded working papers and conference papers in the service infusion and servitization literature search criteria. This decision maintains the rigorousness of the review. The rapid evolution of this research field has provided abundant but conflicting views concerning service infusion, and conference and working papers are contexts for this debate. Thus, to maintain focus on the extant views of service infusion, we focussed on articles evaluated by extensive peer review processes of the academic journals.

The selection of the search terms required significant analysis and refinement. Many terms refer to the phenomenon of manufacturers moving toward service offerings. The most common terms are “servitization” (Baines *et al.*, 2009; Vandermerwe and Rada, 1988) and “service infusion” (Brax, 2005). Some researchers use the terms “service-driven manufacturing” (Gebauer *et al.*, 2012b), “service addition” (Matthyssens and Vandenbempt, 2010), “service transition” (Fang *et al.*, 2008), “high-value manufacturing” (MacBryde *et al.*, 2013), and “tertiarization” (Léo and Philippe, 2001), as well as more general level concepts such as “service orientation” (Martin and Horne, 1992), “servicization” (Quinn *et al.*, 1990), and “servicizing” (Reiskin *et al.*, 1999). Recent service infusion literature also focusses on solution business, referring to that construct primarily by use of the terms “integrated solutions,”

“customer solutions,” “total solutions,” and “business solutions” (Nordin and Kowalkowski, 2010).

This paper focusses on the strategic and dynamic process of moving from product orientation to service orientation. Thus, we focus on the transition process from one strategic orientation to another; that is, a change in strategy to gain competitive advantage. We also focus on the context of manufacturing. In our search, we aim to use terms that capture the transition phenomenon and terms that are common in the research stream. Therefore, we decided to focus primarily on the terms “service infusion” and “servitization.” Although both terms have certain shortcomings, they are the most commonly used in the discussions referred to here and within the scope of our analysis. In our literature search, we also included different variations of the “solution” concept to adhere to the current scholarly discussion, which integrates the discussion of solutions into the service infusion context. To verify the completeness of the study, we also included “service orientation,” “service addition,” and “service-driven manufacturing” to our general search terms. However, it must be emphasized that these results showed substantial overlap among the results provided by the primary keywords. The keywords of “high-value manufacturing” and “tertiarization” were not included because of their lack of popularity in scholarly discussion. The same applies to “servicization” and “servicizing,” which seem not to be widely used, especially in mainstream discussions of servitization.

After selecting the search terms, we defined the criteria for refining and limiting the results. Because this literature study focusses on the construct of competitive advantage as defined in the strategic management research stream, we set a limitation criterion of including only articles that discussed “competitive advantage” and “strategy.” Additionally, because the discussion of service infusion, servitization, and solutions also appears in contexts other than manufacturing, we decided to include only papers that refer exactly to “manufacturing.”

3.2 Searches and content analysis of the results

Using the abovementioned criteria, we searched the Thomson Reuters WOS using the “science citation index expanded” and “social sciences citation index” databases. The search resulted in 53 articles. The contents of the papers were analyzed, which revealed that although the criteria were set to “competitive advantage” and “manufacturing,” some articles should be excluded because they only addressed the target contexts in side notes. From a total of 53 articles, 22 were excluded because they exhibited only a weak link to the competitive advantage discussion. We excluded one article because it did not focus on the manufacturing setting. There were also two editorials within the excluded papers. In summary, the first search yielded 53 articles, of which 28 were included and 25 were excluded. Table II summarizes these results.

The content analysis of the initial search also revealed that the discussion on service infusion-related competitive advantage has rapidly evolved during the last two decades. The most recent articles rigorously elaborate the concept and provide articulate references to the strategic management theories. However, particularly in older articles, such reflections are overly general. Although the papers reflected competitive advantage, they did not systematically and coherently address it (e.g. in article topics, keywords, abstracts, and citations). Because the literature search engines rely on fields such as keywords and citations, we conducted a more in-depth search that included content that related to the search context to capture a full picture of the discussion on service infusion and competitive advantage, including earlier texts.

<i>Results of the searches and inclusion/exclusion analysis</i>						Seeking competitive advantage
	WOS	JOSM	IJOPM	IMM	SCOPUS	
Total number of articles	53	26	19	51	112	
Included	28	11	4	18	30	
Excluded	25	15	15	33	82	
Exclusion criteria						
Weak link to competitive advantage discussion	22	8	10	18	38	401
Editorial	2	1	2	3	1	
Not manufacturing related	1	6	2	5	25	
Not service infusion related			1	7		
Conference paper					10	
Book chapter					4	
Lecture notes					1	
No access					3	
<i>Origins of the articles in the merged, final data set</i>						
Paper sources	<i>Total no. of articles</i>	<i>%</i>				
Matching search criteria	58	73				
“Seminal article”	4	5				
Cites research, theory or term referred by an existing article	7	9				
Additional articles from the existing literature review	10	13				

Table II.
Summary of the method

For these searches, we used the search functionalities of individual journals because the literature search engines do not allow targeting of the actual content of articles. Performing these queries for all journals within the WOS results is not feasible; therefore, we decided to focus our detailed queries on the most popular outlets. The content analysis of the initial WOS query revealed that the academic discussion on service infusion has been published mainly in three journals: *Journal of Service Management (JOSM)*, *International Journal of Production and Operations Management (IJOPM)*, and *Industrial Marketing Management (IMM)*. Detailed literature searches were conducted on these publications. It is important to emphasize that this limiting focus on the three most popular servitization and service infusion journals applies only to these journal-specific searches; for all other searches, we have set no such restrictions.

The journal-specific searches found 26 articles in *JOSM*, 19 in *IJOPM*, and 51 in *IMM*. Using the same criteria that we used for the initial WOS-originated papers, we analyzed the content of these journal articles with the following results. Of the *JOSM* articles, 11 were included and 15 were excluded; of the *IJOPM* articles, four were included and 15 were excluded; of the *IMM* articles, 18 were included, and 33 were excluded. After performing all search queries and content analyses, we merged the search results (61 articles) and removed the duplicates (12). The resulting data set was composed of 49 articles.

To ensure that WOS and individual journal searches were sufficiently exhaustive, we ran a secondary search with SciVerse Scopus, using the same criteria as we had used for the WOS search. We retrieved a total of 112 results. Using similar inclusion and exclusion criteria, we obtained 30 included articles and 82 excluded articles. It appeared that we could obtain a greater number of articles using SciVerse Scopus, but the Scopus query results seemed not to follow the search criteria as strictly as the WOS results (exclusion criteria in detail: 38 articles had a weak link to the competitive

advantage discussion, 25 articles did not address the manufacturing context, four items were book chapters, ten items were conference papers, and two items were editorials and lecture notes). The final results provided 58 individual articles (78 with duplicates) once merged with the already collected articles.

3.3 *Verifying the completeness of the literature set*

In our literature sample, there were two systematic literature reviews focussing solely on the servitization phenomenon (Lightfoot *et al.*, 2013; Baines *et al.*, 2009). In the most recent review (Lightfoot *et al.*, 2013), there is a section dedicated to identifying strategy-related articles in the servitization stream. In order to verify the completeness of our literature set, we compared the references of Lightfoot *et al.*'s review with our results and complemented our literature set with ten additional strategy-related articles not yet part of our review. Subsequently, we also added seven articles to correctly cite specific research results, theories, or terms referred to in the included articles.

Finally, we identified the seminal articles that initially influenced the literature on manufacturers' service infusion and servitization to link our research to the origins of the servitization phenomenon. Many of the initial articles are managerial-oriented and use non-established terminology. These articles were not necessarily included in the results of our strict search queries. Their inclusion was verified by analyzing which titles the retrieved articles were citing when defining servitization and service infusion. It became evident that three titles perceived by scholars as highly influential (mentioned in the introduction parts of many articles) were not part of our current literature sample. Those three missing articles (Oliva and Kallenberg, 2003; Vandermerwe and Rada, 1988; Wise and Baumgartner, 1999) were added to our list of "seminal articles." We also complemented the list with the first article to rigorously address the link between the construct of competitive advantage and the phenomenon of servitization (Matthyssens, and Vandenbempt, 1998).

Including the seminal articles (four), articles matching the search criteria directly (58), additional articles (from the existing literature review) (ten), and specific research/theory/term references (seven), our data set was composed of 79 papers. Table II presents these results.

3.4 *Content analysis*

Finally, the merged data set was analyzed to reveal the connections between service infusion-related articles and the strategic concept of competitive advantage. The analysis was carried out by reading the articles and finding references to the primary constructs and strategic actions of the identified four theories on competitive advantage or direct citations of the primary authors regarding the competitive advantage theories. The constructs we looked for included: industry and offering (market forces); resources and capabilities (RBV); capabilities that build competencies, promoting strategic flexibility (dynamic capabilities); and relationships between actors (relational view). The strategic actions we searched for were: positioning in industries and differentiating the offering (market forces); controlling and protecting resources and capabilities (RBV); developing and reconfiguring internal and external competencies and resources to address rapidly changing environments (dynamic capabilities); and leveraging idiosyncratic inter-firm linkages and sharing resources (relational view). With regard to direct citations, we looked for articles that cited the seminal authors of the four strategic discourses. After the analysis, we grouped the papers into four corresponding categories, depending on the justification of service

infusion from a competitive advantage perspective: market forces, the RBV, dynamic capabilities, and the relational view. Table III shows the results of this categorization.

4. Service infusion with respect to strategic management

This section summarizes the service infusion literature's different theoretical approaches toward the concept of competitive advantage. We investigate theoretical reasoning, gaps, and misconceptions in the service infusion literature with respect to particular strategic approaches, enabling us to determine biases, legacy, and potential development directions of the service infusion research.

4.1 Reflections on market forces

Although the recent strategy literature criticizes the market forces view because of the lack of emphasis on dynamic market situations and entrepreneurial approaches, the perspective has profoundly influenced the evolution of the service infusion literature. Early contributions to the service infusion rationalized services as a reaction (adaptation) to changing market situations (e.g. Vandermerwe and Rada, 1988). There has been a transition toward perceiving services as tools that intervene and proactively modify the markets (e.g. Gebauer *et al.*, 2011). However, some concepts originating from the market forces discourse remain in the discussion.

The strategy orientation of the service infusion research stream was introduced in a pioneering paper by Vandermerwe and Rada (1988). The authors focussed on the Porterian-based differentiation of service offerings and argued that firms seek differentiation by changing their competitive dynamics to offer value-adding services and extensive customer-focussed market packages or bundles. The unit of analysis was the offering, and the services were perceived to facilitate firms' repositioning strategies and adaptation to the changing competitive environment (Vandermerwe and Rada, 1988). Since the early years, the popularity of the market forces approach has been gradually waning. However, the view still remains visible in some texts. For example, Davies *et al.* (2007), in their distinction between systems' sellers and integrators, characterized a system's seller as an actor using Porter-originated concepts of vertical integration and bundling strategy. Similarly, Neely (2008) referred directly to Porter (1980), noting that services are the optimal strategy for firms to address the five competitive market forces. Continuing the industry architecture heritage, Gebauer (2008) analyzed service strategies through an environment-strategy fit and competitive position. Additionally, at the generic level, the Porter-originated term "commoditization" also persists in the modern service infusion discussion (e.g. Gebauer *et al.*, 2010a; Nordin and Kowalkowski, 2010) as well as the strategy to avoid "cost leadership."

Many service infusion papers have combined, perhaps unintentionally, the market forces approach with other strategic frameworks. For example, using non-Porterian concepts, Löfberg *et al.* (2010) agreed that the firm's competitive advantage relies on the comparative advantage of its resources. However, the authors later reverted to the market forces approach and analyzed supply chain strategies by prioritizing the competitive position. Correspondingly, Eggert *et al.* (2011) expanded on the strategic fit between the organization and the environment; although, at the same time, the authors stated that services are developed through the combination of resources and capabilities. However, there are also authors who have deliberately exploited the combination of strategic approaches. For example, Matthyssens and Vandenbempt

Strategy model	Basic ideology	Service rationale	Representative research
Market forces	The industry structure determines and limits strategic choices and any available competitive advantage	To differentiate and avoid commoditization, firms need to create service offerings that enhance the strategic fit between the external environment and the organization. With services, a firm can capture its desired market position and build strategic barriers to competition	Vandermerwe and Rada (1988), Gebauer (2008), Neely (2008)
Resource-based perspective	Competitive interaction and entrepreneurial actions can be used to manipulate the market environment. The competitive advantage lies in the upstream and is based on the organizations' idiosyncratic and difficult-to-imitate resources	Services promote the identification and development of valuable, rare, inimitable, and organized resources (and capabilities), thereby providing causal ambiguity and social complexity. These resources include, for example, installed bases, service-enhanced relationships, and unique and complex product-service offerings	Oliva and Kallenberg (2003), Fang <i>et al.</i> , (2008), Gremyr <i>et al.</i> (2010), Ulaga and Reinartz (2011)
Dynamic capabilities	Competitive advantage depends on a firm's capabilities to adapt, integrate, and reconfigure skills, resources, and functional competences in a dynamic environment	There are two approaches: specific service-related capabilities provide a sustainable competitive advantage, and specific capabilities are required to organize service-related resources to leverage the competitive advantage	Hobday <i>et al.</i> (2005), Fischer <i>et al.</i> (2010), Den Hertog <i>et al.</i> (2010), Gebauer (2011), Gebauer <i>et al.</i> (2012a), Kindström <i>et al.</i> (2013)
Relational view	Competitive advantage can be only gained through the joint idiosyncratic contributions of specific alliance partners and the service ecosystem	The relationships in service or solution networks are sources of a sustainable competitive advantage. Both customers and suppliers are part of the service ecosystem. Specific capabilities are required for initiating, maintaining, and capitalizing on these relationships, as well as value constellations and complementarities in the network	Mathieu (2001b), Windahl and Lakemond (2006), Bastl <i>et al.</i> (2012), Hakanen and Jaakkola (2012), Gebauer <i>et al.</i> (2013), Kowalkowski <i>et al.</i> (2013b), Spring and Araujo (2013)

Table III.
Summary of the
service infusion
literature

(1998) formed a model that connected market forces and resource-based approaches and emphasized the dynamic interplay between them.

In summary, the service infusion literature originated from the competitive forces theory, in which the environment is a strategy-guiding principle, and the offering is the primary unit of analysis. However, the authors have rarely analyzed the service infusion phenomenon solely from the perspective of industry architecture. They have, intentionally and unintentionally, reflected and combined other strategic viewpoints as well. Over the years, the direction of the service infusion research stream has, however, been diverging from industry architecture approaches toward modern strategic management theories.

4.2 RBV approaches

The RBV is the most popular strategic perspective on service infusion. This perspective considers service business a method to redefine the industry structure (Gebauer *et al.*, 2011). Competitive advantage originates in resources that are valuable, inimitable, rare, and organized (to deliver their advantageous features) (Barney, 1995; Barney, 1991). The interest in this approach has been explained by the growing difference between the stocks of relevant resources in product-oriented and service firms (Bharadwaj *et al.*, 1993). Additionally, service offerings have been perceived as less vulnerable to imitation (Smith, 2013; Visnjic Kastalli *et al.*, 2013; Salonen, 2011; Turunen and Toivonen, 2011; Oliva and Kallenberg, 2003) although contrary views exist (Antioco *et al.*, 2008). Moreover, because service orientation is seen as a possible provider of totally new VRIO resources, the studies are also concerned with resource development during the manufacturer's transition toward services.

Based on our analysis, resource-based argumentation in the service infusion literature is concerned with resources matching the VRIO characteristics. Scholars have identified three core resources: installed base (e.g. Ulaga and Reinartz, 2011; Oliva and Kallenberg, 2003; Wise and Baumgartner, 1999), unique and complex offerings (e.g. Ulaga and Reinartz, 2011; Gremyr *et al.*, 2010), and service-enhanced relationships (e.g. Nordin and Kowalkowski, 2010; Davies *et al.*, 2007; Tuli *et al.*, 2007). Additionally, "service culture" is mentioned in identification (Gebauer *et al.*, 2010a). Since Matthyssens and Vandenbempt (1998) and Oliva and Kallenberg (2003), researchers have also identified the unique capabilities related to service infusion (e.g. Storbacka, 2011; Gebauer, 2007) and the role of complex resource-capability combinations in preventing imitation (Oliveira and Roth, 2012). Next, we discuss in detail the identified resources and related capabilities.

The role of the installed base with respect to competitive advantage has been recognized since Wise and Baumgartner (1999). The primary argument is that the installed base provides the manufacturer with a knowledge-driven resource (Oliva and Kallenberg, 2003), enabling the manufacturer to understand the product and the customer better than competitors. The possibilities of collecting usage data and information on customer processes provide manufacturers with unique insights that remain immobile and controllable (Ulaga and Reinartz, 2011). Especially when performance-based contracts are used, the service provider becomes closely integrated with the customer's operation and obtains first-hand information (Hypko *et al.*, 2010). Data collection and information-processing capabilities (Kowalkowski *et al.*, 2013a; Kim *et al.*, 2010; Neely, 2008) allow companies to gather and analyze data to organize resources. Manufacturers also protect the immobility of the gained benefits with designs, prohibiting competitors from servicing the installed base (Ulaga and Reinartz, 2011).

The literature also recognizes complex, interconnected, product-service offerings as a VRIO resource. Investment in R&D provides detailed insights into products by companies, providing a complex system that combines products, services, resources, and capabilities (Ulaga and Reinartz, 2011; Gremyr *et al.*, 2010). The authors view the systems as unique combinations of firms' products, services, and solutions made possible by detailed insights into the company's offerings and customers. This phenomenon is explained by knowledge and resource spillovers between product and service operations (Fang *et al.*, 2008). According to RBV terminology, both explanations are manifestations of interconnected resources and skill stocks leading to complexity and causal ambiguity of resource endowments.

Authors reflecting on the resource-based approach emphasize the importance of service-enhanced relationships among suppliers, customers, and networks. This notion is mostly present in solution-related papers (Gremyr *et al.*, 2010; Matthyssens and Vandenbempt, 2010; Nordin and Kowalkowski, 2010; Matthyssens and Vandenbempt, 2008; Davies *et al.*, 2007; Tuli *et al.*, 2007; Windahl and Lakemond, 2006; Davies, 2004). The common denominator in solution approaches is "the close and collaborative modus operandi" (Nordin and Kowalkowski, 2010, pp. 450). Entering into co-operation with the customer, organizing in a customer-focussed way, involving the network of actors working with solutions, and producing customer-oriented results can provide a competitive advantage (Gebauer *et al.*, 2010b; Nordin and Kowalkowski, 2010). The literature has identified many requirements for this development, for example, the interplay between supplier and customer and other stakeholders must be orchestrated with special capabilities (Kohtamäki *et al.*, 2013b; Paiola *et al.*, 2013; Davies *et al.*, 2007; Windahl and Lakemond, 2006). Additionally, the formation of organized value constellations should be facilitated, in which effective information sharing and adjusting the visibility line has a significant role (Holmström *et al.*, 2010). Raddats and Easingwood (2010) elaborated on these constructs with their concept of a "multi-vendor" orientation, moving the unit of analysis beyond the supplier-customer dyad. Following the RBV, this produces socially complex VRIO resources (Barney, 1995; Barney, 1991).

Recent research reports on customer solutions as being vulnerable to imitation (Biggemann *et al.*, 2013). This emphasizes the role of iterative, interactive, and relational processes – with complex and case-specific implementations (Tuli *et al.*, 2007) and favorable identity and reputation (Gebauer *et al.*, 2006). The effective management of complex relationship structures, and firm positions within them, provides competitive advantage – not just protection of dyadic customer relationships and customer information. With these developments, RBV and solution-related service infusion discussions are extended beyond the "traditional" resource-based strategies and toward the "extensions" of RBV (e.g. resource-advantage theory (Hunt, 1997; as mentioned by Raddats and Easingwood, 2010) and the relational view of strategy (discussed later in this paper).

In summary, the resource-based studies in the service infusion literature primarily discuss identifying resources and capabilities and controlling them to foster their inimitability and immobility. Barriers to imitation are becoming greater as offerings shift from product orientation toward supporting customer processes (Mathieu, 2001a). However, although the subject has gained attention in recent years, the literature is scarce on empirical proof that services, as a resource, provides financial value (Dachs *et al.*, 2014; Kohtamäki *et al.*, 2013b; Visnjic Kastalli and Van Looy, 2013; Neely, 2008).

4.3 Research expanding on the dynamic capabilities perspective

Substantial research addresses the capabilities required in shifting to a service orientation. A comparison of the strategic origins of capability-based contributions to competitive advantage requires identifying articles that reflect a primarily dynamic capabilities approach, and those associating themselves with the RBV. The distinction suggested by Gebauer (2011), Gebauer *et al.* (2013), Spring and Araujo (2009), and Visnjic Kastalli and Van Looy (2013) divides capabilities into operational and dynamic. Operational capabilities range from service delivery to sales, whereas dynamic capabilities include enabling service deployment; that is, service management and organizing the product-service transition of the firm (Visnjic Kastalli and Van Looy, 2013). However, the vagueness of the terminology renders the distinction indiscernible in some articles. Therefore, this literature review adopts an additional criterion: an article only qualifies for the dynamic capabilities “category” if it clearly refers to dynamic capabilities as a strategic management construct (i.e. the authors argue that dynamic capabilities enable the transition to service orientation and claim that static RBV alone cannot address servitization challenges).

Fang *et al.* (2008) viewed service transition as a process of leveraging the firm’s products and resources for specific customer applications as service extensions. The role of core (dynamic) capabilities is to organize the resources. The firm will not gain a competitive edge until its core capabilities are developed. Hobday *et al.* (2005, pp. 1110) adhered to the resource-capability connection yet initiated capability-driven argumentation. The authors argued that systems integration represents “an empirical instantiation of [a] firm’s dynamic capabilities” providing a source of sustainable competitive advantage. Systems integration enables a company to shape its boundaries and flexibly decide “who to compete with, who to collaborate with, what to make in-house and what to outsource.”

Contributions to the dynamic capabilities largely include service innovation and development-related endeavors. Fischer *et al.* (2010) elaborated on the consequences of explorative and exploitative (dynamic) capabilities in the context of service innovation. This research revealed that exploitative dynamic capabilities prioritize existing knowledge and conservative movements along the product-service transition line, whereas explorative dynamic capabilities allow companies to explore beyond existing assumptions. The research suggests that company performance benefits from simultaneous exploitation and exploration; that is, ambidexterity (March, 1991) in a service setting.

Continuing in the field of service innovation, Den Hertog *et al.* (2010) authored one of the first papers to apply dynamic capabilities as a comprehensive framework for managing service infusion-enabled competitive advantage. The suggested six dynamic service innovation capabilities emphasize user needs and technological options in addition to conceptualizing, bundling, co-producing, orchestrating, scaling, stretching, learning, and adapting. Gebauer (2011) endorsed this view by stating that servitizing manufacturers attempt to “achieve competitive advantages by challenging and modifying their sensing, seizing, and reconfiguring capabilities” (pp. 1249). Moreover, Kindström *et al.* (2013) used empirical data to further develop the dynamic capability-based framework. They moved closer to the actual strategic management terminology and identified pre-requisites of service innovation: to sense (new approaches to opportunity discovery), seize (capitalize on service innovation opportunities), and reconfigure (shift the competitive arena).

To conclude, a capabilities-based approach to servitization is prominent in the service infusion literature, but direct links to actual dynamic capabilities literature are often imprecise – with the exception of the work of Kindström *et al.* (2013), Gebauer (2011), and Den Hertog *et al.* (2010). The authors refer to capabilities as potential sources of sustainable competitive advantage; however, despite few exceptions, relatively weak linkages to the ontology of dynamic capability theory hinder an extensive conceptual analysis in the service infusion context. Therefore, we agree with Gebauer *et al.* (2012a), who posit that service infusion research would benefit from a rigorous connection to the dynamic capabilities approach and elaboration of capability-driven competitive advantage.

4.4 Relational view endeavors

The relational view research in the service infusion literature often combines analyses of service infusion-related dynamic capabilities. However, in most recent studies, these lines of thought diverge and form independent and even differing chains of argumentation. The relational view is anecdotally reflected in the early phases of the service infusion research: Mathieu (2001b) referred to the “collaborative option” for implementing service strategy, suggesting partnerships with potential competitors. The paper presented four potential benefits of this option that outweigh the risks associated with co-opetition: access to resources and skills, innovativeness, imaginativeness, and political cost moderation. Mathieu (2001b) applied these concepts to facilitate relational approaches to service infusion although it was some time before these perspectives became popular.

The relational view has recently been reflected from the dynamic capability perspective. Spring and Araujo (2009) recognized the importance of intra-firm and inter-firm capabilities as well as complementarity between firms. Den Hertog *et al.* (2010) offered a conceptual framework for service development by proposing six dynamic service innovation capabilities, one of which was “co-producing and orchestrating.” These capabilities are significant with respect to open innovation (Sisodiya *et al.*, 2013; Chesbrough, 2011). Furthermore, Kohtamäki *et al.* (2013a) argued that specific network capabilities are required to develop and utilize inter-organizational relationships in service innovation contexts. Kohtamäki *et al.* (2013b) also combined the literature on network orchestration and service infusion to identify three categories of capabilities: network management, network integration, and network learning. These arguments are consistent with Spring and Araujo (2013), who, building on the “service factory” concept of Chase and Garvin (1989), emphasized the importance of capabilities that enable the firm to act with, instead of acting in response to, the firms in its network.

Gebauer *et al.* (2013) approached the theme of the capabilities-driven relational view from a slightly different perspective. The authors focussed on inter-firm network structures and created a link between the network-oriented dynamic capabilities approach and the service networks perspective (Henneberg *et al.*, 2013). Four types of service networks were identified with an explorative study: a vertical after-sales network, a life cycle services network, a horizontal outsourcing network, and an integration service network. The solution service components define a preferred network form. Proceeding with the service networks perspective, Bastl *et al.* (2012) made a direct contribution to the relational view of strategy, stating that relationship structures provide a competitive advantage because they are a source of above-normal firm returns. The study analyzed and identified many different dimensions of the

relationship, calling for an inter-disciplinary approach toward networked service infusion. In abstract terms, the message was that the relational view requires a balanced approach using many theoretical streams.

The relational view has also been approached from the service offering perspective, particularly in the discussions concerning integrated solutions. Windahl and Lakemond (2006) established a basis for this work reflecting on the concept of an integrated solution to the relational view. They recognized six factors in solution development: “the strength of the relationships between the different actors involved in the project,” “the firm’s position in the network,” “the firm’s network horizon,” “the solution’s impact on existing internal activities,” “the solution’s impact on the customers’ core processes” and “external determinants.” The authors clearly view the integrated solution more broadly than scholars that utilized the resource-based and capability-oriented approaches. This view was complemented by Hakanen and Jaakkola (2012), who investigated co-creation in solution networks. Their findings revealed the importance of the customer’s participation preferences, the extent of network competition, role division, and rapport between the actors in the networked setting. An definitive link between integrated solutions and the relational view of strategy was made by Spring and Araujo (2013) who, expanding on Windahl and Lakemond (2006) and Davies *et al.* (2007), examined manufacturing firms’ generation of new, product-related services using their own and other firms’ resources. This creates intertwining of actors’ business models and creates a need to seek reciprocal external fit between the suppliers, customers, and providers (Ferreira *et al.*, 2013; Li, 2011).

Finally, Kowalkowski *et al.* (2013b) viewed servitization from the perspective of inter-firm networks. The authors examined service infusion and its value-creation logic through networks. They analyzed the phenomenon in a small and medium-size enterprise context, in which firms could not rely solely on their own resources and capabilities because of their size. Instead, the actors formed value constellations with each other and developed a competitive advantage based on their relational resources. These results both exhibit a link to the relational view and offer a potential context for further research. Moreover, the use of value constellation as a unit of analysis closes the gap between the service infusion and service systems literature (Maglio and Spohrer, 2008), and forms a link with the service-dominant logic of marketing (Vargo and Lusch, 2004, 2008).

To conclude, research on service infusion from a relational perspective is in its early stages, a consensus on the relational approach has not been reached, and the phenomena have been addressed from different, independent viewpoints. The literature on solution networks and value constellations, however, has already shown that the relational view provides new perspectives to service infusion. The greatest unknown in the relational approach to service infusion lies in the operations management field (Bikfalvi *et al.*, 2013). This is of relevance as it appears that competitive advantage can emerge from co-creation between network actors (Barquet *et al.*, 2013). Interestingly, it may also be that the actors can share competitive advantage (Chen *et al.*, 2011).

5. Key findings and implications

The service infusion research has gradually evolved in terms of how the transition from goods orientation to service orientation is justified from a competitive advantage perspective. Common across the service infusion literature is the view that services bring competitive advantage for the manufacturer. However, the answer to the question of how competitive advantage is created has evolved gradually, matured,

5.1 *A lag in reflections on the strategic management discussion*

The discussion about acquiring a service infusion-related competitive advantage has closely followed the paths created by strategic management scholars, who, in recent decades, have tried to thoroughly explore the sources of competitive advantage and its sustainability (e.g. D'Aveni *et al.*, 2010; Teece, 2007; Dyer and Singh, 1998; Teece *et al.*, 1997; Barney, 1991; Eisenhardt, 1989; Rumelt, 1984; Wernerfelt, 1984; Porter, 1980). Removed from the temporal context, this finding seems obvious. What makes the finding interesting is that the service infusion literature lags behind the discussion on strategic management by approximately ten to 15 years.

The earliest contributions (in the early 2000s) to service infusion saw service business as the manufacturer's answer to the evolving industry structure and architecture. This ideology is based on the competitive market forces and industry structure approach that was used in the strategy literature more than 15 years earlier (Utterback and Suárez, 1993; Porter, 1980). This view is interested in how firms choose a favorable competitive position and defend it from competition. The seminal authors on service infusion, e.g. Vandermerwe and Rada (1988), adhered to this approach and argued that firms seek differentiation by introducing value-adding services to products and forming customer-focussed market packages or bundles.

During the 2000s, interest moved toward firms' abilities to change the markets with their service-related resources and capabilities (e.g. Ulaga and Reinartz, 2011; Gremyr *et al.*, 2010; Fang *et al.*, 2008; Oliva and Kallenberg, 2003). This view originated in the resource-based approach discussed ten years earlier (Barney, 1991; Rumelt, 1984; Wernerfelt, 1984), arguing that differences between firms were primarily caused by the heterogeneity of their resources and capabilities. Furthermore, in line with the strategic management literature, because of criticism about the boundary of the firm, the stream broadened its views to include shared resources and new resource combinations between the firms (e.g. Eisenhardt and Martin, 2000). However, the majority of the contributions were still primarily concerned with a single firm's actions in developing its resources.

The most recent service infusion research (especially from 2010 onward) shifted the focus of the discussion on competitive advantage toward dynamic capabilities (established in the strategy discussion during the late 1990s and early 2000s). There are a considerable number of contributions in the service infusion literature elaborating on the dynamic capabilities approach (e.g. Kindström *et al.*, 2013; Gebauer *et al.*, 2012a; Gebauer, 2011; Den Hertog *et al.*, 2010; Fischer *et al.*, 2010; Hobday *et al.*, 2005). Furthermore, service infusion scholars have also adhered to the later views of this strategy stream, focussing on the role of system perspectives and emphasizing the connections between the firm and the broader ecosystem (e.g. Vickery *et al.*, 2013; Adner and Kapoor, 2010; Lichtenthaler and Lichtenthaler, 2009; Teece, 2007; Iansiti and Levien, 2004; Moore, 1993). The authors have examined the competitive advantage gained from new, value-enhancing combinations of actors (Gebauer *et al.*, 2013; Kowalkowski *et al.*, 2013b; Spring and Araujo, 2013; Bastl *et al.*, 2012; Hakanen and Jaakkola, 2012; Windahl and Lakemond, 2006; Mathieu, 2001b).

Thus, the servitization stream seems to be evolving toward the firm's service-related dynamic capabilities and the so-called "relational view" of (e.g. Jacobides *et al.*, 2006;

Lorenzoni and Lipparini, 1999; Dyer and Singh, 1998). However, servitization writings seldom reflect the more recent nuances especially regarding a relational view (Dyer *et al.*, 2008; Lavie, 2006). This gap may inhibit the development of the literature in this area of study.

5.2 *Vague justification of competitive advantage*

By taking extant strategic management theories as a starting point, we described the diversity of opinions concerning the sources of competitive advantage in service-infusion contexts. However, in many cases, we found conflicting arguments regarding strategic management constructs. These were evident in the earliest contributions, in which industry architecture and resource-based strategies were in some cases mixed (Eggert *et al.*, 2011; Löfberg *et al.*, 2010). In resource-based contributions, the RBV and dynamic capabilities were sometimes combined (e.g. Fang *et al.*, 2008). Furthermore, many service infusion studies elaborated on dynamic capability and on the relational view constructs at the same time, without making a clear distinction (e.g. Gebauer *et al.*, 2013; Kohtamäki *et al.*, 2013b; Kowalkowski *et al.*, 2013b; Den Hertog *et al.*, 2010; Spring and Araujo, 2009; Windahl and Lakemond, 2006).

We perceive that the reason for the inaccuracies in theoretical anchoring is that neither the constructs nor the linkages were defined precisely in many service infusion articles. The papers overlap with regard to the views of strategy, and texts must be viewed through “several strategic lenses.” In addition, our analysis revealed the specific concern that although many service infusion studies chose a strategic management theory as a starting point, they did not justify their choice or the benefits and limitations caused by it (e.g. a RBV may cause issues in analyzing resources outside firm boundaries).

These findings point to a significant problem in the service infusion research, that is, an inaccurate link to the management strategy literature. Fortunately, many articles have made clear connections to strategic management viewpoints. These studies have advanced the research substantially, as we have shown in this study. However, the studies that are not so precise in defining the constructs as a basis for theorizing have already lead to certain biases in the field. Two of these biases are found in this study: the single firm and technology dominance. However, there might also be other yet to be identified misconceptions in the servitization literature. Rigorous analysis of the usage of strategic management constructs should therefore be performed when developing new contributions to the servitization discourse.

5.3 *From single organizations to inter-firm networks*

One of the key biases that this research was able to uncover was the single firm dominant view to service infusion. The research has, fortunately, gradually moved toward more holistic approaches. However, especially in the beginning, service infusion-related competitive advantage was discussed mainly in the intra-firm context (e.g. Oliva and Kallenberg, 2003). Services were viewed from a perspective in which the firm infusing service was the most interesting entity. The assumption was that with an enhanced offering, the firm could fight the commoditization of product-based business. The research relied heavily on offering-related questions, such as how services increased the competitive advantage of the product base (e.g. Mathieu, 2001a). At this stage, much research has been done on understanding and conceptualizing the different types of service concepts that manufacturers could offer. However, it was soon

recognized that services were not only add-ons to products but also require a comprehensive understanding of their management and organization (Turunen and Toivonen, 2011) – the interest shifted from single services to organizations (e.g. Gebauer *et al.*, 2010a, b).

In the 2000s, the service infusion literature moved from the firm's service offering management to the ability to change markets through service-related resources (Gebauer *et al.*, 2011). This mode of thought quickly led to questions concerning the alignment of the service offerings with the external environment. The competitive advantage was seen as originating not only from the firm's actions but also from the service-enabled relationships with the customers and suppliers. This changed the unit of analysis to a dyadic relationship (Matthyssens and Vandenbempt, 2010, Nordin and Kowalkowski, 2010; Tuli *et al.*, 2007; Windahl and Lakemond 2006). The concept of "solution" became a popular complement to the general term "service" and, in some texts, even replaced it. The analysis of the solution-oriented approach suggested that it could tighten relationships between the supplier and customer, and even form mutual relational processes, such as in the case of developing high-level services.

In the most recent research, the unit of analysis has widened to networks of actors (e.g. Gebauer *et al.*, 2013; Kowalkowski *et al.*, 2013b; Spring and Araujo, 2013; Hakanen and Jaakkola, 2012). The research has suggested that the co-creation of value with services requires value co-creation systems that interact at different levels of networks and supply chains (Lay *et al.*, 2010). In this view, firms require a new set of dynamic capabilities in orchestrating capability-resource combinations that are only available in inter-firm networks (e.g. Kowalkowski *et al.*, 2013b; Spring and Araujo, 2013; Li, 2011). The dyadic perspective no longer is sufficient to explain the possibility of co-creating value at different interaction levels.

When the level of analysis is raised to the "service system perspective," our argument is that companies must consider how this complex network of resources, people, products, capabilities, and relationships could be leveraged. With this approach, the effectively organized network is seen as the primary source of competitive advantage. The major gap in the knowledge of the network approach to service infusion appears to lie in orchestration and operations management of the service networks (Bikfalvi *et al.*, 2013). Further studies are needed to understand and develop the interactions among different players (cf. Spring and Araujo, 2013). In this setting, the primary question is not who creates value but how the system creates value to benefit all its members. According to the findings, we argue that in the service networks, it seems that the key to sustaining competitive advantage lies in addressing five key challenges: capturing value from complex networked operations, understanding and developing the value-based exchange in many-to-many relationships, making new offerings possible by facilitating the formation of inter-firm value constellations and managing complementarities, managing flexible governance methods to facilitate agility and prevent opportunism (especially in informal and unsigned situations) and determining which service infusion-related resources and capabilities are kept in house and which are acquired from the network.

5.4 From technology orientation to socio-technical systems

This study also found another bias in the research field developments. The resources, having the most strategic importance, have been mostly connected to products and technology (e.g. installed base, product information, and technological expertise) (e.g. Ulaga and Reinartz, 2011; Kim *et al.*, 2010; Neely, 2008; Oliva and Kallenberg, 2003). Identifying technology-related resources is well known in the service infusion stream

(Uлага and Reinartz, 2011; Kim *et al.*, 2010; Neely, 2008; Oliva and Kallenberg, 2003), and there are attractive methods with which the company can try to protect them (Uлага and Reinartz, 2011). The problem, however, with this approach is that the strategic management stream has challenged the sustainability of the competitive advantage gained via technology-based solutions and their protection (Eisenhardt and Martin, 2000; Thomas, 1996). This implies that the approaches that servitizing companies are using are vulnerable for competitive attacks. According to our analysis, the bias of the service infusion research is an evident result of the empirical context of the field: technology-oriented manufacturing firms (Lightfoot *et al.*, 2013; Baines *et al.*, 2009). However, we argue that the lack of clarity regarding strategic management theories (as described earlier), and especially the dominance of the RBV, which specifically aims to build resource position barriers (Barney, 1991), has made this bias even stronger.

According to our findings, research that privileges the role of technology in solutions has been decreasing for some time. Servitization scholars have been moving toward a systemic perspective in service network research, that is, agreeing that service networks include many different actors – technical and non-technical – connected with each other through direct and indirect relationships (Henneberg *et al.*, 2013; Kowalkowski *et al.*, 2013b; Maglio and Spohrer, 2008). However, these approaches seem to apply only to more advanced service offerings. The dominant approaches toward servitization, which emphasize the transition from basic services to more advanced ones (Baines *et al.*, 2009), still maintain that technology orientation is the primary building block for servitization.

Based on the findings of this study, our argument is that the service infusion scholars should favor the relational view to strategy (instead of RBV) already when acting on the basic service level. We argue that by taking the relational view as a starting point, the servitizing companies could gain competitive advantage primarily by leveraging the inherent relationship complexity of their service networks. This would enable these companies to move away from the protection of technology-related assets, and focus directly on the relational aspects that are essential in creating value-adding processes in service contexts (Turunen and Toivonen, 2011; Brax and Jonsson, 2009).

5.5 Addressing challenges to the sustainability of competitive advantage

Closely related to the technology discussion in the previous paragraph, our fifth main finding is that the service infusion research papers do not widely reflect the strategic management discourse on shortening timespans of sustainability with regards to competitive advantage. Already for some time, the strategy literature has recognized that especially in so-called high-velocity (e.g. Eisenhardt, 1989) or hypercompetitive (e.g. D'Aveni, 2010) environments, the sources of competitive advantage can only be protected for limited timespans, and these firms must rely on agility. For coping with these settings, the strategic management literature prescribes a strategic flexibility approach (e.g. Sanchez, 1995; Garud and Kotha, 1994). According to the hypercompetition writings, the relationship orientation as such does not provide competitive advantage – actually, forming relationships may escalate hypercompetition. However, the relationships can be leveraged to foster strategic flexibility (D'Aveni, 2010, p. 338).

The service infusion scholars have recently moved their interest toward these challenges. The approaches are primarily done through reflecting the dynamic capabilities

view to strategy (Kindström *et al.*, 2013; Gebauer, 2011; Den Hertog *et al.*, 2010), and there seems to be clear interest to proceed along this line (Gebauer *et al.*, 2012a, b). Also Kowalkowski *et al.*'s (2012) work on agile incrementalism directly addresses the challenges of the hypercompetition. We argue that this area should receive greater attention in the future. The rapid pace of technological development and digitalization (Brynjolfsson and McAfee, 2012) may render the competition in manufacturers' service business so dynamic that competitive equilibrium-based strategic management approaches (such as strategies based on building resource position barriers) may no longer work.

6. Concluding discussion

We have systematically analyzed the service infusion literature and clarified its reflections on the strategic management literature. We have exposed the foundations on which the service infusion discourse has developed its justifications of servitization as a means of gaining and sustaining competitive advantage. The analysis revealed that although the strategic origins of service infusion are based on the industry architecture approach (e.g. Vandermerwe and Rada, 1988), the resource-based perspectives have provided the predominant basis for the majority of the service infusion literature discussions (e.g. Ulaga and Reinartz, 2011; Gremyr *et al.*, 2010; Fang *et al.*, 2008; Oliva and Kallenberg, 2003). Our analysis of the relevant literature revealed a clear movement toward the dynamic capabilities (e.g. Kindström *et al.*, 2013; Gebauer *et al.*, 2012a; Gebauer, 2011; Den Hertog *et al.*, 2010; Fischer *et al.*, 2010; Hobday *et al.*, 2005) and relational view of strategy (Gebauer *et al.*, 2013; Kowalkowski *et al.*, 2013b; Spring and Araujo, 2013; Bastl *et al.*, 2012; Hakanen and Jaakkola, 2012; Windahl and Lakemond, 2006; Mathieu, 2001b). We reported in detail on how competitive advantage in many recent studies originates from complex networks of actors (firms, people, and technological machinery), systems, and structures.

Our analysis also revealed a lack of clarity in terms of theoretical linkages between service infusion and strategic management literature. This may have created two major misconceptions in the field. First, many contributions have offered insights predominantly from the perspective of a strong focal company (e.g. integrator) and its customers and suppliers (Gebauer *et al.*, 2011; Matthyssens and Vandenbempt, 2010; Nordin and Kowalkowski, 2010; Tuli *et al.*, 2007; Windahl and Lakemond, 2006; Oliva and Kallenberg, 2003; Mathieu, 2001a). We believe that systemic approaches and combining a larger set of actors in agile ways could yield more useful findings. The effectively organized network could thereby be leveraged as the primary source of competitive advantage. The importance of this development has been heightened due to digitalization, as it has facilitated the formation of highly specialized and rapidly changing firm networks (Yoo *et al.*, 2012). Therefore, we argue that researchers should adopt service networks as a predominant construct when analyzing servitization. The diversity of different relationships in networks should be thoroughly elaborated, especially from complex many-to-many perspectives.

Second, existing contributions to service infusion research suffer from contextual biases related to an over-emphasis of technology (e.g. Ulaga and Reinartz, 2011; Kim *et al.*, 2010; Neely, 2008). Technology-based service offerings are widely perceived as the mandatory first step for more advanced services (Baines *et al.*, 2009). We argue that service infusion scholars should adhere to the relational view approach to strategy by leveraging the complex service network in their ecosystems, as well as going beyond customer's organization boundaries. In other words, the service would not be targeted

only to the technological installed base, but for the whole socio-technical system involved in customer's business.

Our findings also highlight a dearth of service infusion discussion regarding the potential transience of competitive advantage (e.g. D'Aveni, 2010; Eisenhardt, 1989). By building longer-term relationships with customers, suppliers, and third parties, manufacturers are trying to fight back and preserve longer-term competitive advantage. However, the hypercompetition literature maintains that a service business by definition cannot provide an antidote for dynamic competition (D'Aveni, 2010, p. 338), but instead argue the focus should be in promoting continuous change: sensing the possibilities, seizing them and reconfiguring the existing resources to support the change (e.g. Teece, 2007). What makes this issue complex is that the manufacturing sector seems rather slow to embrace change, thus adoption of agile ways of working is challenging (Kowalkowski *et al.*, 2012). Therefore, we suggest that this area should be of utmost importance in future servitization research. The dynamic capability theory offers a solid background for this work. In addition, researchers could further investigate novel ways of addressing the dynamic competition – e.g. sharing the competitive advantage between many actors in the networks (Chen *et al.*, 2011). These avenues might also offer contributions to the strategy discourse.

In this review, we presented many theories and insights concerning the direction of future research on service-infusion. To summarize, we perceive that the growing trends of social networks, co-specialization, actor dependency and shared resources offer productive avenues for research. Interesting topics include network-related and relational capabilities, co-opetition, open business models, and relational rent extraction. By definition, the unit of analysis in these avenues should be predominantly networks of firms or business ecosystems, not single organizations or even dyadic relationships. Furthermore, the recognition that networked business models form relational processes might also resolve some concerns related to service business profitability and difficulties in broadening capability requirements.

In order to avoid contextual biases, we also encourage research that combines data from other settings than just manufacturing. To facilitate and also leverage these developments, valuable results related to one industry could be applied to another, especially from information technology services to the manufacturing sector. Digitalization is a strong driver of these combinations (e.g. Brynjolfsson and McAfee, 2012; Yoo *et al.*, 2012). Regarding methodological designs of future studies, we adhere to the common view that empirical and even explorative service infusion research would benefit from rigorous quantitative approaches. This has already been done in studies elaborating the profitability results of different service infusion strategies and quantitatively addressing the phenomenon of the service paradox (Dachs *et al.*, 2014; Visnjic Kastalli and Van Looy, 2013; Kohtamäki *et al.*, 2013b; Neely, 2008). However, as our literature analysis showed, also qualitative and explorative research can tighten the link between the literature streams of strategic management and service infusion – and reduce the lag between strategic management development and service infusion reflections.

To conclude, the service infusion scholars' path in elaborating the sources of service-driven competitive advantage has been long but necessary. Consequently, service infusion is now considered through well-elaborated strategic argumentation. The evolution of this field has ensured that service infusion is not attached to a specific strategic perspective but to general views of the firm seeking to account for competitive advantage. We hope to enhance the structure of the discussion with this study. In addition, we anticipate that empirically driven research on service infusion

could contribute to the more theoretical discussion of strategy if the contextual variables and constructs are validated and extended. Hence, future research in the service infusion field should further focus on determining the reasons for a firm's success in gaining competitive advantage – as well as why the success of some firms is only temporary.

Acknowledgement

This research was conducted in the Future Industrial Services (FutIS) research program, managed by the Finnish Metals and Engineering Competence Cluster (FIMECC), and funded by the Finnish Funding Agency for Technology and Innovation (TEKES), research institutes and companies involved. Their support is gratefully acknowledged. The authors would also like to show the gratitude to Cambridge Service Alliance for support and guidance.

Note

1. The terms service infusion, servitization, service transition, service-driven manufacturing, and development of product-service systems are used by different authors to refer to the same concept. This paper uses the terms service infusion and servitization interchangeably.

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