GUEST EDITORIAL
Industrial services – the solution provider's stairway to heaven or highway to hell?

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Abstract

Purpose – The role of industrial services has increased in importance as product manufacturing oriented companies have been moving towards industrial services and integrated solutions. While migrating towards solutions provision, manufacturing companies have been developing new Service offerings, service business models logics and methods of service delivery are developed by using new technologies for value co-production and co-creation. The purpose of this paper is to discuss the solution providers perspective by illustrating central approaches tapping into industrial services, such as environment-strategy-fit, scope of industrial service offering, industrial service business capabilities, and servitization process.

Design/methodology/approach – The paper reviews literature related to industrial service phenomenon providing a: framework for environment-strategy-fit in the context of Industrial Services taking Fit; defining industrial service business; defining industrial service business capabilities; and a critical perspective toward industrial service business research.

Findings – Where this paper provides a framework for environment-strategy-fit in the context of Industrial services, it also develops grounds to consider the maturity levels of servitization in a solution provider context. This paper recognizes the maturity levels of manufacturing companies providing a typology to analyze the level of servitization. Finally, this paper also serves as an introduction to an interesting special issue on industrial services.

Originality/value – The existing industrial service theory related industrial services can be strengthened by developing frameworks and typologies to better understand the transformation from products to industrial services and integrated solutions. technology digitalization and enable operational and outsourcing services, in addition to performance services.

Keywords Manufacturing, Service strategy, Dynamic capabilities, Service organization, Industrial services, Remote diagnostics

Paper type Viewpoint

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Introduction

Studies suggest that the role of industrial services has increased in importance as product manufacturing firms and solution providers have struggled with price erosion and a decreasing competitive edge with respect to their products. The overarching argument in the existing industrial service literature seems to be, that services create an opportunity for product manufacturers to enable value creation by providing add-on services, bundling services and products into integrated solutions, selling operational or outsourcing services or even by selling value instead of products (Oliva and Kallenberg, 2003; Windahl and Lakemond, 2010). In a similar vein, reported firm cases seem to provide evidence on product firms' transformation to services-dominant business models (Vargo and Lusch, 2008), such as Xerox moving from office equipment to document flow (Reinartz and Ulaga, 2008), KONE from elevators to people flow and IBM from hardware to IT services. Often, as in the cases of Xerox and KONE, services are bundled with products to provide more attractive customer solutions and to co-create an improved customer experience. In the case of IBM, service transformation led the firm to actually outsource much of its hardware production and to change its industry classification from products to services. ZipCar and Rolls-Royce's Power-by-the-Hour concept are notable examples of performance-based services in which ZipCar bills based on kilometers driven and Rolls-Royce on the hours of engine use. In both cases, customers are charged based on the customer value created by the solution (product +services). These firms provide all-encompassing examples of service transformation, moving toward service business models, service-dominant logic, servitization and service infusion. According to existing industrial service literature, services are playing an increasingly dominant role in manufacturing, technology and production companies offering alternative tactics for differentiation (Raddats, 2011; Vanderstraeten and Matthyssens, 2012) and diversification (Partanen and Kohtamäki, 2011).

It has been argued that services generate more stable revenues and profits than products (Gebauer *et al.*, 2012; Kohtamäki *et al.*, 2013) and that they protect service-oriented manufacturing firms against economic volatility, economic recession and the resulting decreases in product and project sales. In these instances, services offer an alternative strategic choice for industrial manufacturing firms to protect sales, profits and market value (Fang *et al.*, 2008; Kohtamäki *et al.*, 2013). It appears that certain industrial firms have recognized the importance of services to generate revenues and profits (Kohtamäki *et al.*, 2013). However, relatively few studies have offered evidence about the performance effect of industrial services; thus, more evidence is required (Gebauer *et al.*, 2012). One such study is that of Kohtamäki *et al.* (2013), who have demonstrated the non-linear impact of industrial services on manufacturing firms' sales growth in times of economic uncertainty. Previously, Fang *et al.* (2008) had demonstrated the non-linear effect of industrial services on firm value.

Moreover, some empirical evidence has been presented regarding the effect of industrial service organization on the relationship between service offering and company performance. Prior service research has highlighted the role of relational capabilities in the co-production of services and solutions (Kohtamäki *et al.*, 2013; Ramírez, 1999) and in the co-creation of value in service interactions (Grönroos and Helle, 2010; Lusch *et al.*, 2010; Vargo and Lusch, 2011). Previous studies have also noted the interactive role of service value creation and have suggested the need for customer understanding (Kohtamäki *et al.*, 2013), particularly in cases in which solutions are co-designed.

From an engineering point of view, technological developments, including remote diagnostics and online monitoring, provide new opportunities for industrial

service businesses (Brax and Jonsson, 2009). Remote diagnostics enable manufacturing companies to proactively monitor and diagnose problems before product breakdowns, which prevents productivity and profit losses. Service business models bundled with new technologies maximize profits throughout the product life cycle. Overarching service concepts enable service production to be outsourced and effective solution ecosystems to be developed as the customer buys value delivered by the performance provider coordinating the service supply chain.

This paper will provide an introduction to the special issue on industrial services. The industrial service literature is growing rapidly, and specific special issues focussing on the topic are needed. The present paper illustrates central approaches tapping into industrial services, such as environment-strategy-fit, scope of industrial service offering, industrial service business capabilities and servitization process. This paper does not only consider the up-sides of these phenomena, but also takes a critical look at the industrial service literature as a whole providing insight and suggestions for future research. In the end of this paper, we present the papers in the special issue.

Theoretical development

Framework for industrial service fit

The contingency approach – more specifically, the configuration approach – suggests that firms seek a fit and appropriate configuration between strategy and structure to gain a competitive advantage in changing strategic landscapes (Gerdin and Greve, 2004). As Fiss (2007, p. 1180) notes "A core theme of strategy concerns how firms can achieve a match among structures, activities, and the environment, suggesting that configuration itself is the very essence of strategy." Although contingency theory has garnered much attention in the strategic management literature, it has rarely been applied to an industrial service business. Considering some of the relatively rare empirical industrial service studies, Gebauer *et al.* (2010) have provided evidence about the validity of the configuration approach in industrial service research. In addition, Kohtamäki *et al.* (2013) have demonstrated how industrial service capabilities interact with the service strategy. Raddats and Burton (2011) have provided evidence on the changes in structure when the service strategy changes. However, no overarching frameworks have been offered to suggest that a concept that considers the environment-strategy-structure fit in the context of industrial services is required. We provide a conclusive framework (Figure 1) that highlights the main dimensions when considering strategic fit in industrial service research. Whereas this framework may only enable the systematic identification of potential configurations at a higher-order level, further studies may engage in more detailed considerations of fit among various sub-dimensions.

Figure 1 provides a framework linking industrial service strategy, service organization and the business environment. In this framework, the business environment includes a typical construct that is applied to understand the nature of the business environment, such as dynamism, complexity and hostility. Environmental dynamism refers to the rate of environmental change that is often related to the length of new product of service development cycles or to the rate of change in customer needs (Wijbenga and van Witteloostuijn, 2007). As firm's transformation toward solutions provision suggest that the firm's offering become customized, when deciding on solutions provision strategy, the firm decides on a more dynamic business environment as tailored service interactions imply dynamism as well

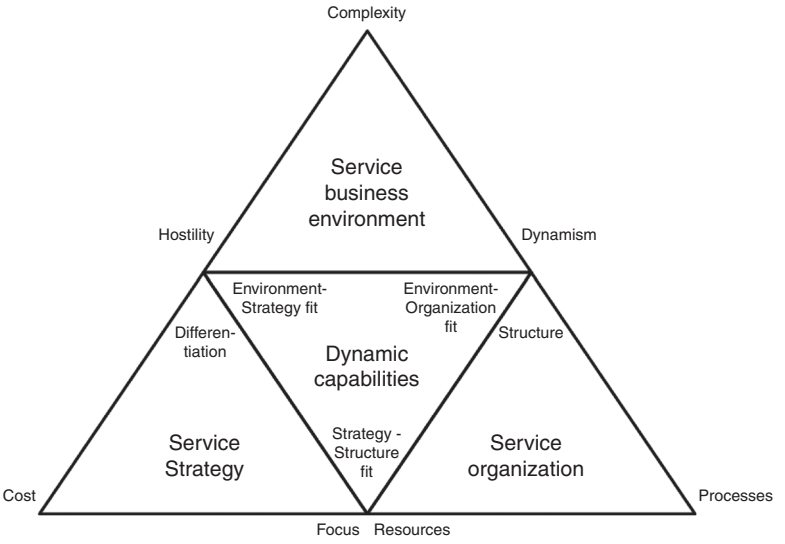

Figure 1.
Industrial service fit

as complexity in firm-market interactions. Similarly, industrial services add to the complexity of the integrated solutions and customer interactions; therefore, a broadened and more customized scope of products, services and solutions add complexity to firm-market interactions. Finally, adding to the level of customization may decrease the amount of direct competition – and thus environmental hostility – but simultaneously increase production costs. Conversely, standardization may decrease complexity, product development and production costs but also increase direct competition due to market attractiveness. Our underlying argument is that the environment-strategy-structure relationship is not simple and deterministic, where the firm adjusts its strategy according to market conditions; instead, firms may impact markets by making strategic decisions, developing offerings and innovating. This has been previously suggested by the set-theoretic approach and the concept of equifinality, which suggests that from various starting points and by taking different paths, firms can achieve the same end-result, e.g. the state of success or failure (Fiss, 2007).

The service strategy determines the scope of the firm's product and service portfolio and competitive means. Building on Porter's view, a strategy may be based on low costs or differentiation, i.e., a narrow or broad scope of offering. Bowman (Bowman and Faulkner, 1997) suggested that firms often apply various types of hybrid models that combine low-cost manufacturing and high-value differentiation. Regarding services, industrial service transformation may provide companies a means of differentiation to momentarily generate market conditions of disequilibrium, which transforms into equilibrium through competitors' imitation. Forms of offering differentiation vary from brand differentiation to product characteristics, services and the level of customization.

The organizational dimension includes sub-dimensions of organizational structure, processes and resources. Studies on organizational capabilities indicate that capabilities are created as a unique combination of resources and processes (Barney, 1991; Peteraf, 1993). Processes, systems and structures enable value creation from resources – such as tangible and intangible assets – from machinery,

tools, competencies, patents and brand name, among others. Value-creating processes may be integrated by management systems that optimize the chain instead of sub-optimizing the parts, IT systems and organizational culture. As Long and Vickers-Koch (1995, p. 12) suggest: "competencies relate to the skills, knowledge, and technological know-how that give a special advantage at specific points of the value chain, which in combination with the strategic processes that link the chain together, form core capabilities." Organizational competitive advantage is generated as a valuable, unique and sustainable combination of the sub-dimensions of these factors (Barney, 1991; Peteraf, 1993). As a relevant dimension of structures and processes, the service literature considers that value creation occurs in supplier-customer interactions, which highlights the role of relational capabilities (Grönroos and Voima, 2012; Kohtamäki *et al.*, 2013; Theoharakis *et al.*, 2009). Studies use the concept of co-production in reference to customers' involvement in co-designing or co-developing solutions and co-creation when referring to processes in which suppliers and customers create positive customer experience through interactions. These concepts are obviously closely related, and these phenomena often occur in similar interactions. For instance, customer involvement in product co-design enables the emergence of positive customer experience. When services and solutions add market and exchange complexity, "organizations exist to integrate and transform micro-specialized competences into complex services that are demanded in the marketplace," as Vargo and Lusch (2006, p. 53) stated in their foundational premise 9.

Finally, at the center of Figure 1, we position a firm's dynamic capabilities, which may be defined as "the firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments" (Teece *et al.*, 1997, p. 516). Dynamic capabilities enable the configuration of strategy and organizational capabilities to create competitive advantage in rapidly changing environments. Dynamic capabilities facilitate firm-level adjustment, resource configuration and renewal and is a necessary precondition for effective adaptation and fast strategy (Doz and Kosonen, 2010; Eisenhardt and Martin, 2000; Eisenhardt and Sull, 2001). Relatively little empirical research exists on the concept of dynamic capabilities, but the existing research on absorptive capacity (Lane and Lubatkin, 1998; Zahra and Gerard, 2002), organizational learning (Crossan and Berdrow, 2003; Holmqvist, 2003) and strategic learning (Kuwada, 1998; Sirén *et al.*, 2012) fills the gap from the learning perspective. These streams of literature examine the firm's ability to adjust and align its capability base to fit changing market conditions. Absorptive capacity is at the center of adaptation and of the environment-strategy-structure fit. However, we also understand that there is a need for further research on the capabilities necessary for resource re-configuration to complement the knowledge base we have on organizational learning and absorptive capacity.

Defining industrial service business

Prior studies have defined services by their IHIP (intangibility, heterogeneity, inseparability and perishability) qualities (Zeithaml and Bitner, 2003), and studies suggest that "services are consumed but not possessed" (Berry, 1980, p. 24). Vargo and Lusch have highlighted the importance of interactive processes in which customer value is co-created from supplier's resources: "the application of specialized competences (knowledge and skills), through deeds, processes, and performances for the benefit of another entity or the entity itself." Finally, Grönroos (2011, p. 241)

considers services as interactive processes that support customers' practices with extended offerings. In the context of manufacturing, it is useful to make a clear distinction between products and services that may be bundled into solutions (Baines *et al.*, 2009). We also note the danger that manufacturing firms' service business strategies and strategic thinking may be often limited to add-on services (Oliva and Kallenberg, 2003) – where services are considered to be product-like – because this type of approach fits in the existing product/technology-centric business model.

A firm's offerings may include products, services and integrated solutions that are bundled from products and services. Prior studies have often considered service strategy to become manifest in a firm's service and solution offering. Studies apply various dimensions to conceptualize industrial service offering. Kohtamäki *et al.* (2013) have used a construct consisting of the following three dimensional construct for service offering based on an empirical data analysis of the Finnish manufacturing industry: maintenance services, R&D services and customer services. Mathieu (2001) defined an industrial manufacturing firm's services as follows: product services, services as products and customer services. Homburg *et al.* (2003) define services as the following: first, information and consulting services; second, services for training and further consulting; third, services in the business-related field; fourth, services for technical security and optimization; and fifth, services supporting cooperation. Meier *et al.* (2011) provide a definition that distinguishes between product-oriented services (e.g. installation), user-oriented services (e.g. customer services) and result-oriented services (e.g. GE's power-by-the-hour concept).

In total, the prior quantitative studies appear to measure service strategy as offerings by: first, using dichotomous measures and summing services offered (Homburg *et al.*, 2003); second, using reflective scale with multiple dimensions (Kohtamäki *et al.*, 2013); or third, formative scales with multiple dimensions (Gebauer *et al.*, 2010). When analyzing the extent or level of offering, studies ask respondents to evaluate how actively services are being offered (Homburg *et al.*, 2003; Kohtamäki *et al.*, 2013) or what the share of revenue created by certain services is (Kohtamäki *et al.*, 2013). Partanen and Kohtamäki (2011) have developed and validated a method for measuring the scope of industrial services (ServScope) to provide a better method of measuring industrial service strategies (Table I). Methodological developments in this field that produce more valid and reliable empirical research should be continued.

Defining industrial service business capabilities

Studies suggest that firms require capabilities to co-produce or co-design service and solution offerings and to co-create value together with the customer (Kohtamäki *et al.*, 2013). The service-capability approach builds on the resource-based view, core competencies, core capabilities and strategic capabilities. Aligned with the resource-based view, a firm requires capabilities to create a sustainable competitive advantage that is valuable, rare, inimitable and non-substitutable (Barney *et al.*, 2001; Long and Vickers-Koch, 1995). In particular, processes and activities are required to co-create customer value from the supplier firm's resources and competencies through interactive processes together with the customer. Competitive advantage is generated from the combination of resources, activities and processes and is often measured as long-term profits relative to competitors.

Studies highlight the importance of customer-oriented capabilities that are related to customer interactions in which value is co-created. Studies have suggested that companies require network capabilities to effectively build, coordinate, develop

Dimension	Related services according to authors review
Optimization services	Installation service (Gebauer *et al.*, 2010; Homburg *et al.*, 2003; Morris and Davis, 1992; Oliva and Kallenberg, 2003; Samli *et al.*, 1992)
	Delivery service (Homburg *et al.*, 2003; Morris and Davis, 1992; Oliva and Kallenberg, 2003)
	Technical support for similar products of other manufacturers (Homburg *et al.*, 2003; Partanen and Kohtamäki, 2011)
	Repair service (Boyt and Harvey, 1997; Gebauer *et al.*, 2010; Oliva and Kallenberg, 2003)
	Spare parts (Gebauer *et al.*, 2010; Oliva and Kallenberg, 2003; Partanen and Kohtamäki, 2011)
	Electronic ordering system for the customer (Homburg *et al.*, 2003; Morris and Davis, 1992; Samli *et al.*, 1992)
	Recycling service (Homburg *et al.*, 2003; Oliva and Kallenberg, 2003)
	Product upgrading service (Homburg *et al.*, 2003)
	Maintenance (Boyt and Harvey, 1997; Gebauer *et al.*, 2010; Oliva and Kallenberg, 2003; Samli *et al.*, 1992)
	Warranty (Morris and Davis, 1992; case and expert interviews)
R&D services	Product tailoring service (Homburg *et al.*, 2003; Samli *et al.*, 1992)
	Prototype design and development service (case and expert interviews)
	Feasibility studies (Homburg *et al.*, 2003)
	Problem analyses (Homburg *et al.*, 2003; Oliva and Kallenberg, 2003)
	Analyses of product's manufacturability (Oliva and Kallenberg, 2003)
	Research services (Gebauer *et al.*, 2010; Homburg *et al.*, 2003)
Business services	Procurement service (Homburg *et al.*, 2003)
	Warehousing services for other manufacturers' products (Homburg *et al.*, 2003)
	Mediation of products (Homburg *et al.*, 2003)
	Project management (Homburg *et al.*, 2003)
	Service for operating the product sold for the customer (case and expert interviews)
	Service for operating customer's process (Gebauer *et al.*, 2010; Oliva and Kallenberg, 2003)
	Consulting service (Boyt and Harvey, 1997; Homburg *et al.*, 2003; Oliva and Kallenberg, 2003)
	Mediation of personnel (Homburg *et al.*, 2003)
	Financing service (Homburg *et al.*, 2003; Samli *et al.*, 1992)
	Insurance service (Homburg *et al.*, 2003)
Customer services	Product demonstrations (Homburg *et al.*, 2003)
	Customer seminars (Homburg *et al.*, 2003)
	Technical user training (Homburg *et al.*, 2003; Morris and Davis, 1992; Oliva and Kallenberg, 2003; Samli *et al.*, 1992)
	Documentation service (case and expert interviews)
	Written information material (Homburg *et al.*, 2003)
	Customer consulting and support by phone (Homburg *et al.*, 2003)
	Cost-benefit calculation (Homburg *et al.*, 2003)

Sources: Kohtamäki *et al.* (2013), Partanen and Kohtamäki (2011)

Table I.
ServScope – manufacturing firm's scope of industrial services

and absorb knowledge from service interactions that occur in customer relationships (Kohtamäki *et al.*, 2013). Studies have also highlighted the importance of bridging capabilities – abilities to create trustworthy relationships that enable dialogical interactions (Portes, 1998). Seminal papers in economic sociology conceive of economic exchanges embedded in social relationships and suggest that "social" is

inevitably inherent in all economic exchanges (Adler and Kwon, 2002; Granovetter, 1985; Uzzi, 1997).

Industrial service research emphasizes the importance of solution sales capabilities. Studies suggest that firms require capabilities to recognize customer needs to co-produce and bundle solutions together with the customer to customize solutions that fit the customer's needs but that are also effective solutions for manufacturing, producing and providing. Therefore, the configuration of solutions (products + services) to provide value or performance is central for successful customer interactions and for a service business. Certain core resources, activities and processes may be recognized, such as an effective solutions configuration that includes product features, services and value packages or real-time production scheduling that provides accurate information for the customer and the solution seller's competencies, among many others.

For effective operation in customer relationships, solution integrators require capabilities to develop a relational form of social capital that facilitates effective interactions to decrease information asymmetries and the potential risk of high transaction costs, particularly with respect to knowledge-intensive service interactions, such as R&D service exchanges (Kohtamäki *et al.*, 2013). Kohtamäki *et al.* (2012) suggest that "enabling relational structures" (combination of relationship structures and relational form of social capital) are needed to facilitate effective and dialogical customer interactions. For example, Ballantyne (Ballantyne, 2004; Ballantyne *et al.*, 2011) has stressed the importance of dialogical interaction in service exchanges. Studies have also noted the importance of empathy in customer interactions (de Ruyter and Wetzels, 2000).

Certainly service delivery – that may more accurately be called "value co-creation" – in industrial service interaction requires certain key activities/processes. For instance, the rise of new technologies related to remote diagnostics enable real-time awareness of the installed base, proactive maintenance planning and delivery as well as customer data collection and usage as a resource for improved customer understanding and solution development (Brax and Jonsson, 2009). Most importantly, remote diagnostics enables prevention of customer's process downtime and production losses and enables the manufacturer to provide life-cycle and/or performance services.

Stairway toward industrial service business

Transformation from product and technology dominant business models toward industrial service business logic is far from easy. Studies suggest either incremental service development or radical transformation. Consistent with Mintzberg and Lampel (1999) on emergent strategic transformations, we find it difficult to consider that product/technology companies might rapidly transform themselves from product- to service-dominant business models. The strategic emergence view suggests that company-level transformations frequently occur through parallel incremental developments facilitated by the business environment, strategic decisions and strategic learning (Sirén *et al.*, 2012). Studies of strategic learning find that there are many obstacles when firms attempt to implement new strategies to exploit business opportunities.

Studies on service implementation have mapped phases of service business model transformations. A vast number of studies discuss the transformation from a product-dominant business to a service business by applying several concepts, such as servitization (Baines *et al.*, 2011; Neely, 2008; Vandermerwe and Rada, 1988; Visnjic Kastalli and Van Looy, 2013), servicization (Santamaría *et al.*, 2012.; Vits and Gelders, 2002) and service infusion (Eggert *et al.*, 2011; Kowalkowski *et al.*, 2013), just to name a

few. Vandemerwe and Rada offered a classic definition of servitization, which was applied by many scholars, "the increased offering of fuller market packages or 'bundles' of customer focused combinations of goods, services, support, self-service and knowledge in order to add value to core product offerings" (Vandermerwe and Rada, 1988, p. 314).

To summarize the existing literature, three maturity levels of servitization in manufacturing companies were identified: equipment providers, solution providers and performance providers. The first step includes equipment providers applying technology and product orientation. Equipment providers offer services as add-on elements, develop services as separate service products, and often bill the services based on transactions or working hours. Equipment providers often separate service sales from the product organization. Solution providers offer physical products and intangible services as integrated solutions. The firm often provides services covering the product life cycle from product customization and co-design to customer services, maintenance services, retrofit and recycling (Levitt, 1965; Potts, 1988). At times, these manufacturers consult the customer to reduce the total cost of ownership (Markeset and Kumar, 2005).

In solution providers, product and service divisions are often separate but organizationally integrated such that products and services may be sold simultaneously as integrated solutions. Performance providers refer to firms offering operational services and performance services, which suggests that the manufacturer provides the operation of the manufactured machine within the customer's process and/or bills the services based on value created or performance instead of selling products and/or service agreements. Windahl and Lakemond (2010, p. 1278) state that "In a fully-fledged integrated solution, the supplier retains ownership of the equipment and increases the value for the customer (fulfils the customer's need) by reducing the customer's costs and/or enabling the customer to create new and more competitive offerings." The Power-by-the-Hour concept from Rolls-Royce discussed above offers a good example of providing performance; instead of selling engines, Rolls-Royce aims to sell the performance generated by the engines. This type of concept lends visibility to product life-cycle costs, which frees the purchaser from considering costs related to breakdowns and spare parts. Moreover, this model may motivate the supplier to develop better products to limit breakdowns and maintenance costs (Kim *et al.*, 2007). In this sense, the Rolls-Royce example illustrates a far-reaching service-dominant business model and earnings logic. As a form of providing performance, some firms offer profit optimization for the product life cycle. The intention is not only to provide performance but also to enable the customer to continuously increase the value it co-creates together with its customers. Therefore, the manufacturer continuously interacts with the customer to enable future value co-creation for the benefit of the manufacturer, the customer and the customer's customer (Figure 2).

A critical perspective toward industrial service business research

Thus, some evidence exists about the usefulness of the industrial service business (Fang *et al.*, 2008; Kohtamäki *et al.*, 2013). However, the benefits of services are not easy to demonstrate because benefits are also bundled with the performance effects created by products and solutions. Thus, services may generate favorable direct but non-linear performance effects (Fang *et al.*, 2008; Kohtamäki *et al.*, 2013) but also support product and solution sales and thus enable the manufacturer to provide solutions with higher margins. Alternatively, high-margin maintenance services may enable the manufacturer to

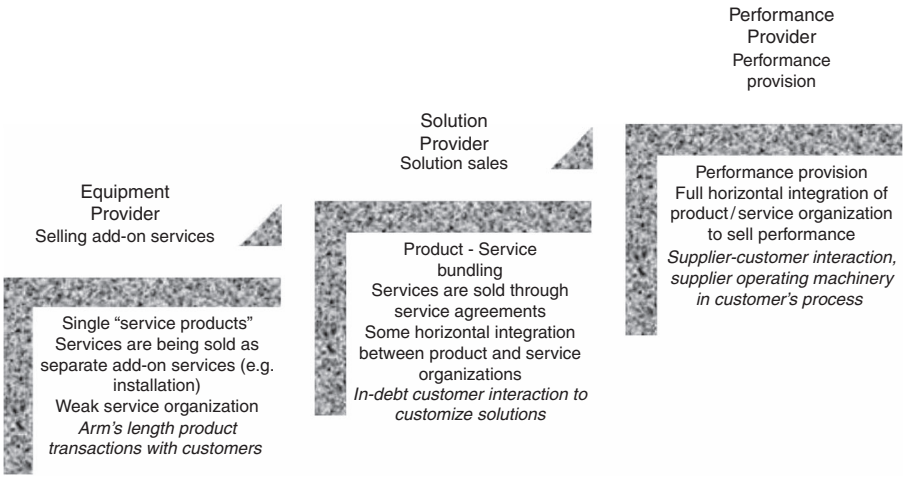

Figure 2.
Industrial services – a manufacturing firm's potential stairway to heaven

provide products at lower margins to increase product sales. In the context of certain industries in which a customer's process/product downtimes are important, performance life-cycle/performance services generate new business opportunities. We call for empirical research studying the performance effects of life-cycle services and performance services.

Much of the industrial service research is based on qualitative and case-based evidence, which is justified to an extent because of the richness of the empirical phenomenon. However, the generalizability of the existing empirical research is questionable, and further quantitative research may be needed to establish a valid knowledge base of industrial service businesses. Moreover, the existing logical analyses of the performance effects of industrial service business are based on linear models. This approach should be challenged because it is highly likely – and has previously been demonstrated to an extent by prior studies (Fang *et al.*, 2008; Kohtamäki *et al.*, 2013) – that in the manufacturing technology business, service visibility is needed to create performance effects, such as effects on sales revenues (Kohtamäki *et al.*, 2013), profits and firm-market value (Fang *et al.*, 2008). It is likely that stronger offerings are needed to create service visibility and a credible service offering that enables the bundling of products and services into integrated turnkey solutions (see Kohtamäki *et al.*, 2013). Therefore, it is likely that a weak offering will not have performance effects, whereas strong service offerings generate performance effects. Therefore, the effect of service offerings would be non-linear and *J*-shaped, as demonstrated by Kohtamäki *et al.* (2013). Therefore, a critical perspective might be taken toward linear models, and we encourage more empirical research testing non-linear relationships. This approach requires sophisticated statistical techniques that should be considered in service business research.

Moreover, much of the existing industrial service research considers the service organization as a "black box" and ignores the role of the organizational capabilities that enable value co-production and value co-creation in customer interactions. As structure should follow strategy (Chandler, 1962), organizational service resources and competencies, management systems, IT systems and organizational culture should be aligned with the service strategy. This approach requires the alignment

of structures, systems and cultures with the idea of customer interactivity and not simply with product or technology orientation (Hakala and Kohtamäki, 2011). This requirement suggests that companies providing integrated solutions need dynamic capabilities that facilitate the application of complex combinations of service, product, technology and learning orientations.

Moreover, industrial service research has focussed to a great extent on add-on services and to a lesser extent on outsourcing, operational and performance services or, in other words, integrated solutions as bundles of product and services. Further research on these fields is required to provide generalizable evidence on the performance effects of integrated solutions and their potential moderating factors. This need proposes a serious challenge for industrial service researchers to find quantifiable measures for integrated solutions; this task may be particularly difficult because integrated solutions are a relatively complex entity to measure.

Papers in this special issue

This special issue includes eight papers demonstrating different aspects of how businesses are transforming toward offering services and product service combinations. The first four papers are related to service value creation, maintenance and the use of technology in industrial services.

First, Antero Putkiranta considers strategic roles of service sites and demonstrates them with an application of Ferdow's Model. This paper uses short cases to describe the application. The authors note certain key differences between physical products and services and conclude that there are also certain similarities in development.

Remote diagnostics and IT-based installed base management has gained interest in many B2B industries. Tuomo Heikkilä analyzes payback models in remote diagnostics systems by using examples from windmills and automatic meter readings. This approach might be benchmarked to other industries with a real-time monitored installed base.

Yang Liu and Wenshan Yang present an application from the energy business. Their paper demonstrates how a meteorological information service may be used as part of maintenance management. The proposed technical solution demonstrates that merging data on the product and the environment (weather) may enable a new approach to operating windmills.

Stephan Klinger *et al.* analyze service productivity in different industries and present empirical analyses based on data from industry expert interviews. Company-level productivity analysis, which is traditionally used in manufacturing companies, must change, in their view. The paper outlines a need for further research related to this knowledge gap that is recognized by industrial experts.

Pekka Töytäri *et al.* aim to capture the value potential of services and propose a management framework for assessing value co-creation and value-capture potential in services. Their framework is based on a multiple case study research originating from IT, IT outsourcing, industrial services and industrial process management solutions.

The remaining four papers focus on supply chain issues. The literature on extended enterprise calls for novel approaches for managing the supplier network and the value system as a whole.

Kongkiti Phusavat *et al.* analyze applications of benchmarking and the classification framework for supplier risk management. The authors use case study data from a Thai company to demonstrate how supplier risks may be assessed in real time based on criteria such as regional location, ownership, joint venture and company size.

Ilkka Sillanpää presents an empirical case study of key performance indicators for supply chain performance management. The proposed approach consists of elements of order book analysis, managerial analysis, profitability and time. This framework has been tested in a manufacturing company.

Chithambaranathan *et al.* present an innovation framework for the performance analysis of members of the supply chain. This quantitative paper proposes a toolbox for decisional support in the context of service and supply chains.

Conclusion

The special issue highlights best practices related to industrial service business. The theme is particularly relevant in these times of economic volatility and economic recession, where manufacturing firms' product sales are generally stabilized or even decreasing. In these times, industrial services, such as maintenance and spare parts, defend firm revenues, profits and market value. Moreover, as digitalization progresses, new service technologies provide greater opportunities for operational and outsourcing services, in addition to performance services. More empirical research on these new industrial service concepts is required to provide knowledge for companies on the mechanisms, processes and values of these services.

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