Journal of Business Research xxx (xxxx) xxx–xxx

Contents lists available at ScienceDirect

Journal of Business Research

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

Digital servitization business models in ecosystems: A theory of the firm

Marko Kohtamäki[a,b,*], Vinit Parida[c,d], Pejvak Oghazi[e], Heiko Gebauer[f,g,h], Tim Baines[i]

[a] University of Vaasa, School of Management, PO Box 700, FI-65101 Vaasa, Finland
[b] University of South-Eastern Norway, USN Business School, Norway
[c] Luleå University of Technology, Entrepreneurship and Innovation, 97187 Luleå, Sweden
[d] University of Vaasa, School of Management, Finland
[e] School of Social Sciences, Sodertorn University, 141 89 Stockholm, Sweden
[f] Data Mining and Value Creation, Fraunhofer IMW, Neumarkt 9-19, 04109 Leipzig, Germany
[g] International and Strategic Management, Linköping University, Sweden
[h] Bosch IoT-Lab, University St. Gallen, Switzerland
[i] Operations Strategy, Advanced Services Group, Aston Business School, Aston University, Birmingham B4 7ET, UK

ARTICLE INFO

Keywords:
Digitalization
Industry 4.0
Ecosystems
Digital servitization
Product-service systems (PSS)
Firm boundaries
Business model innovation
Platforms and sustainability

ABSTRACT

This study extends the discussion of digital servitization business models by adopting the perspective of the theory of the firm. We use four theories of the firm (industrial organization, the resource-based view, organizational identity, and the transaction cost approach) to understand digital servitization business models of firms in the context of ecosystems. Digitalization transforms the business models of solution providers and shapes their firm boundary decisions as they develop digital solutions across organizational boundaries within ecosystems such as harbors, mines, and airports. Thus, digitalization not only affects individual firms' business models but also requires the alignment of the business models of other firms within the ecosystem. Hence, business models in digital servitization should be viewed from an ecosystem perspective. Based on a rigorous literature review, we provide suggestions for future research on digital servitization business models within ecosystems.

1. Introduction

Digitalization aids servitization in manufacturing companies, creating new opportunities for services, platforms, intelligent products, and novel business models. In servitization studies, digitalization is increasingly viewed as an enabler and driver of the business model, value creation, and value capture (Lerch & Gotsch, 2015; Parida, Sjödin, & Reim, 2019; Porter & Heppelmann, 2014). Digitalization and software have been inherently involved in servitization from its infancy (Rabetino, Harmsen, Kohtamäki, & Sihvonen, 2018), shaping servitization strategies and structures as well as macro- and micro-level activities. Companies, such as Rolls-Royce, Wärtsilä, and Caterpillar have used a variety of sensor-based technologies to enable product-service-software systems and smart solutions (Grubic, 2018; Rymaszewska, Helo, & Gunasekaran, 2017). However, software was underemphasized in the early servitization research (Coreynen, Matthyssens, & Van Bockhaven, 2017). It is now time to shed light on the role of digitalization in servitization and let digitalization rewrite the servitization narrative—a narrative that may diverge from the original servitization story (Luoto, Brax, & Kohtamäki, 2017).

Studies have started documenting multiple industrial cases of the transition toward digital servitization (Cenamor, Sjödin, & Parida, 2017). Business models for smart solutions entail the combination of various products, services, software, and analytics (Porter & Heppelmann, 2014). Companies are moving from remote monitoring to optimization, control, and, ultimately, autonomous systems with advanced functionalities based on artificial intelligence. While some companies are still overcoming the challenges of data collection, warehousing, analytics, and prediction, leading companies such as ABB, Volvo, and Wärtsilä are rapidly moving toward more autonomous solutions (Parida et al., 2019; Porter & Heppelmann, 2015). However, transition toward digital servitization seems far from easy, and the implementation of digital servitization and the related technologies, routines, and business models adds complexity and creates challenges. Smart solutions (e.g., smart product-service systems) entail changes in terms of business model configuration (i.e. the purchase of reliability, availability, or outcomes rather than a product and service agreement; Visnjic, Neely, & Jovanovic, 2018). Digitalization enables not only improved preventive and proactive maintenance but also more effective and efficient value creation and capture through a variety of software

* Corresponding author at: University of Vaasa, School of Management, PO Box 700, FI-65101 Vaasa, Finland.
E-mail addresses: marko.kohtamaki@uva.fi (M. Kohtamäki), Vinit.parida@ltu.se (V. Parida), heiko.gebauer@imw.fraunhofer.de (H. Gebauer).

https://doi.org/10.1016/j.jbusres.2019.06.027

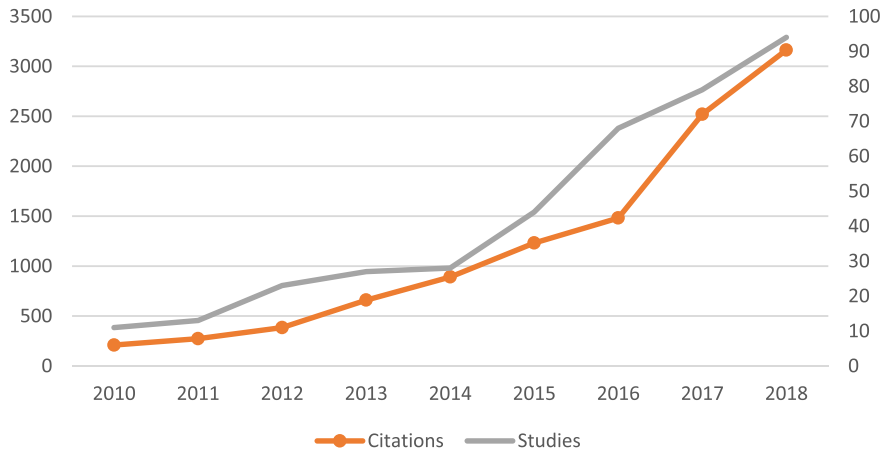

Fig. 1. Evolution of citations in servitization research (number of citations on the left-hand axis and number of studies on the right-hand axis).

components. Yet the typical challenges faced by many servitizing companies remain: Customers expect smart solutions to be customized to their needs, want to buy hardware instead of outcomes, and are reluctant to pilot truly novel smart solutions.

Moreover, digital servitization calls for collaboration across firm boundaries as smart solutions interact with product-service-software systems of other companies to implement smart autonomous ecosystems (Bustinza, Bigdeli, Baines, & Elliot, 2015; Kowalkowski, Gebauer, & Oliva, 2017; Rabetino & Kohtamäki, 2018; Salonen & Jaakkola, 2015; Sklyar, Kowalkowski, Tronvoll, & Sörhammar, 2019). Indeed, in the creation of autonomous products, as in the cases of Tesla, Rolls-Royce, Wärtsilä, Caterpillar, and many others, companies cannot operate separately from customers but must instead operate across firm boundaries. Smart solutions must be designed to operate and interact with the solutions offered by many other manufacturers, used by customers, delivered by distributors, maintained by different service partners, and operated by third parties. Therefore, the integration of smart solutions across firm boundaries is crucial. This rapid transformation requires technological innovation as well as business models and collaborative innovations when manufacturers struggle to configure their business models and practices to enable smooth collaboration.

The present study takes stock of the servitization literature and answers the following research questions: How does digital servitization shape business model configurations, and which research directions should be taken based on the interplay between digital servitization business models and theories of the firm within ecosystems and platforms? This study taps into the discussion of digital servitization business models from the perspective of the theory of the firm. This review establishes what types of business model configurations are discussed in the servitization literature and how the digital shapes servitization business models. This study contributes to both the servitization and the digital servitization literature.

We use four theories of the firm (industrial organization, the resource-based view, organizational identity, and the transaction cost approach) to understand digital servitization business models within ecosystems. We use these theories of the firm to understand configurations of the following five specific business models drawn from the literature: 1) product-oriented service provider, 2) industrializer, 3) customized integrated solution provider, 4) platform provider, and 5) outcome provider (Huikkola & Kohtamäki, 2018; Kowalkowski, Windahl, Kindström, & Gebauer, 2015). Digitalization transforms the business models of solution providers and shapes their firm boundary decisions as they develop digital solutions across firm boundaries within ecosystems such as harbors, mines, and airports. Through this conceptual essay and critical review, we address the digital transformation in manufacturing that is shaping business models, enabling new strategic configurations, and providing new opportunities for digital servitization research. This study therefore also makes a significant managerial contribution by highlighting the configurations of digital servitization business models, thereby enabling managers to design Internet-of-Things-related digital servitization business models and practices such as sayings and doings (Kohtamäki, Baines, Rabetino, & Bigdeli, 2018). Finally, we introduce the articles in this special issue.

2. Review method and data description

We used two search strings to retrieve the relevant literature to achieve our research aims. The first search string covered servitization-related keywords. The search was conducted based on article titles, keywords, and abstracts. The second search string filtered for AJG3- and AJG4-ranked journals (AJG is the ranking used by the UK Research Assessment Exercise) in strategic management, management, marketing, organization, innovation, operations, and supply chain management. The second search enabled us to narrow the focus to papers in high-impact journals in relevant research areas. We used the Scopus database to conduct the search. The first search without the journal filter returned 465 servitization-related studies in all journals. Of these, 161 studies were published in AJG3 and AJG4 journals. In terms of the evolution of citations of the 465 studies in all journals, Fig. 1 shows that the number of citations per year and the number of studies per year in servitization increased over the period 2010 to 2018 (Kowalkowski et al., 2017; Rabetino et al., 2018). Based on these yearly numbers, servitization research has experienced considerable growth.

Of the 465 servitization articles, we were interested in those that explicitly focused on digital servitization, theories of the firm (industrial organization, the resource-based view, organizational identity, or the transaction cost approach), or business models. We used multiple keywords to identify these areas in the 465 servitization studies. For instance, we used several keywords when searching the titles, abstracts, and keywords of the servitization articles to understand the presence of digitalization in the servitization literature. These keywords included the IoT, smart solutions, digitalization, and Industry 4.0. We separately performed a similar process with relevant keywords for each of the studied topics. Relevant alternative keywords for each topic were gathered from highly impactful studies. Table 1 shows the number of articles that had addressed the topics of interest in the servitization literature at the time of the search (early 2019).

One limitation is our decision not to conduct a general review of servitization because such extensive reviews already exist (Baines et al., 2016; Kowalkowski et al., 2017; Rabetino et al., 2018). Hence, we excluded studies that did not explicitly focus on servitization business models, any of the firm boundary theories, or the digital or software component in servitization. Table 1 shows the number of servitization studies using each of the four theories, reflecting the broad use of the

Table 1
Firm boundary theories, digitalization, and business models in the servitization literature.

Firm boundary theories	Number of studies
Servitization	465
Resource-based view	85
Industrial organization	5
Organizational identity	19
Transaction cost approach	4
Digital servitization (IoT in servitization)	43
Business model	96

resource-based view in the servitization literature (85 studies) and the multiple discussions related to servitization mindset, orientation, culture or identity (19 studies). Notably, very few studies actually used industrial organization (five studies) or the transaction cost approach (four studies). The data on servitization studies show that 43 studies focused on digital servitization or related concepts. In addition, 96 studies used the concept of business models. A key conclusion from this descriptive review is that servitization and digital servitization studies tend to underuse well-established theoretical perspectives.

3. The industrial ecosystem perspective in the digital era: delineating value systems, ecosystems, networks, and platforms

Successful implementation of digital servitization business models extends operations beyond the boundaries of a single firm. Hence, it is important to define the concepts in the context of a local industrial ecosystem (from the perspective of Wärtsilä, Rolls-Royce, Sandvik, or Caterpillar) such as harbors, airports, mines, and the like. The strategy literature uses a variety of concepts and labels to describe the interdependent system of companies. Such labels include the value system, ecosystem, interorganizational network, and sometimes even the platform, each with different meanings. Multiple synonymous concepts can be found for these terms. For a manufacturing company, it is typical to define the value system, understand one's position within it, and understand where, how, and why firm boundaries are determined and how digitalization affects business models in different positions within the value system and ecosystem. For example, Fig. 2 illustrates the value system flowing from raw material suppliers to component suppliers, system suppliers, solution providers, operators, and end-customers. Value systems with levels and denominators vary, and this description is from the context of moving vehicles where the operator level separates manufacturing from end-customers. This is only one description from a solution provider's perspective. Other business models are discussed in the next section. Firms vary in their degree of vertical integration—that is, how they define their firm boundaries. The value system as a concept refers to the system extending from raw material suppliers to end-customers (Porter, 1980). Ecosystems can exist within the value system. They operate using market or networked organizational forms. These systems are organized as hierarchies, markets, or networks (Kohtamäki, Rabetino, & Möller, 2018; Thorelli, 1986; Williamson, 1985). An interorganizational network is typically described as an organizational form between markets and hierarchies, suggesting that a network is more integrated than the market but less integrated than a hierarchy (Thorelli, 1986). This is important when business models are conceptualized within ecosystems, acknowledging the interdependency and alignment between a firm and ecosystem actors (Adner, 2016; Jacobides, Cennamo, Gawer, & Mgmt, 2018), particularly when developing smart solutions. Hence, make-or-buy decisions have been coined as make-or-collaborate-or-buy decisions to underline the intermediate organizational form between market and hierarchy. Newer concepts of ecosystems and platforms can be defined against the pre-existing concepts in the literature. The ecosystem as a concept emphasizes the value creation and capture between interrelated firms. The use of the concept in the literature varies, as does the empirical landscape of different studies, thereby hampering definition of the concept (Möller & Halinen, 2017). Business ecosystems are driven by a hub firm such as Apple or Google, which drives and develops its own business ecosystem. In this study, we use the concept of an ecosystem when we refer to a predominantly local context. To explain the context we seek to depict here, we use a harbor as an example of a local ecosystem, where technologies and business model configurations of multiple firms must combine to create an autonomous

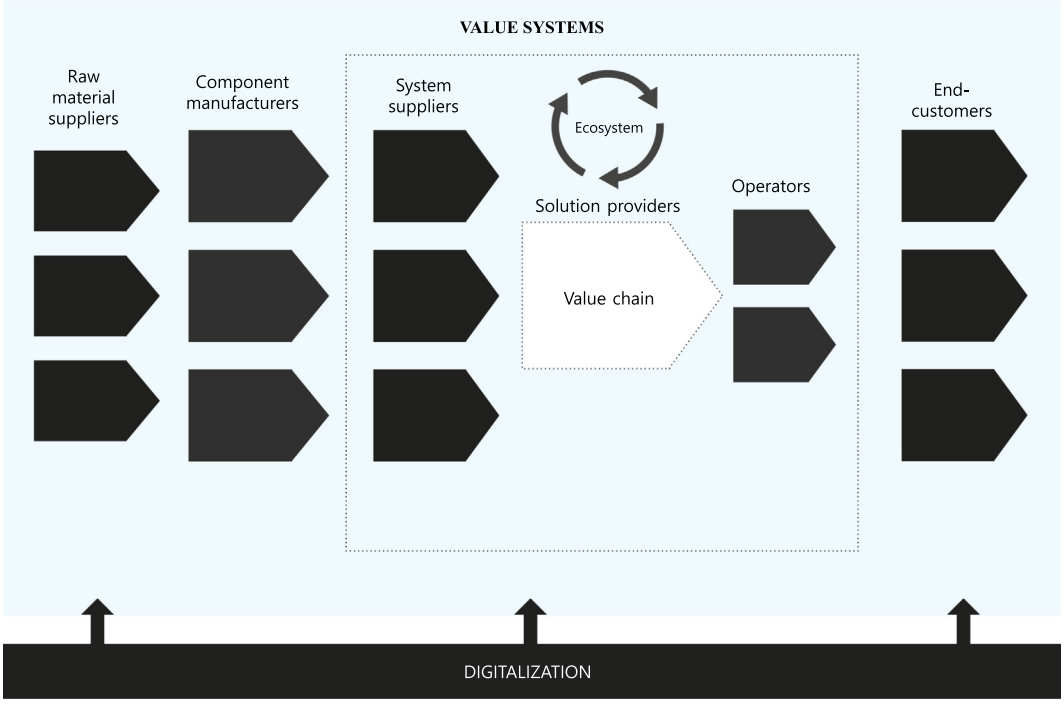

Fig. 2. Digitalization effects throughout value system/ecosystem (developed based on Rabetino & Kohtamäki, 2018).

harbor. This approach is to extend the use of the ecosystem concept in a localized, highly specific setting (in contrast to global settings, which are also relevant). Thus, an example is a harbor, where companies develop new autonomous operations. In contrast to the concept of an interorganizational network, the concept of an ecosystem is indifferent to whether exchanges are coordinated through markets or network-type mechanisms. This would at least separate ecosystems from interorganizational networks. This point is important because, in digital servitization, the development of smart solutions moves beyond single-firm boundaries. Hence, the development of, for example, autonomous or semi-autonomous harbors requires the development of smart solutions, technologies, and business model configurations that go beyond firm boundaries. When firms develop connected smart solutions and there is a shift toward the IoT, new ecosystems are likely to emerge. These new ecosystems are not necessarily organized as interorganizational networks; instead, assisted by smart technologies such as blockchain, they can be organized as markets. Hence, it is important to conceptually differentiate ecosystems and interorganizational networks. Otherwise, we risk mixing concepts.

Gawer and Cusumano (Gawer & Cusumano, 2014: 417; Iansiti & Levien, 2004) defined platforms as "products, services, or technologies that act as a foundation upon which external innovators, organized as an innovative business ecosystem, can develop their complementary products, technologies, or services." Hence, platforms enable connections between actors (e.g., multiple suppliers and customers) within an ecosystem. In practice, a platform can refer to a webstore that links multiple suppliers and customers (multi-sided markets) and that is managed by a manufacturer. Uber and Airbnb are prominent examples of platform business models. Hence, this type of platform is a business model.

When moving toward a digital servitization business model, firms must redefine their business model configurations. To do so, firms should understand the configurations of other firms within the ecosystem to create strategic fit between business models (e.g., technologies, routines, value propositions, and pricing logics). Because many potential activities depend on technologies and other capabilities of other companies, implementing strategies is always limited by collaboration with other actors within the ecosystem. Thus, the focus on ecosystems remains a key condition for digital servitization. We call for research from this ecosystem perspective in digital servitization.

4. Conceptualization of a digital servitization business model

In the last three decades, the servitization-related literature has grown through articles on servitization, product-service systems, service-dominant logic (SDL), service innovation, and service operations. Altogether, recent reviews have identified more than 1000 articles on servitization-related fields (Rabetino et al., 2018), with the core servitization literature accounting for approximately 465. Of these 465 articles, only 43 actually discuss digital servitization or related concepts, which form the core of this study. Digital servitization is still in its infancy, requiring thorough definition and conceptualization. We argue that digitalization is inherently embedded in servitization because servitization builds on integrated product-service-software systems. Thus, servitization is the transition from products and add-on services to integrated product-service-software systems. Because the digital servitization literature is in its infancy, a commonly accepted definition does not yet exist.

We define digital servitization as the transition toward smart product-service-software systems that enable value creation and capture through monitoring, control, optimization, and autonomous function. To gain value from digital servitization, firms must capitalize on three dimensions of digital offerings (i.e., products, services, and software), which should work together. Thus, the concept of digital servitization reshapes the conventional idea of products as standalone concepts, instead emphasizing the connectivity between products (IoT) and between companies (manufacturers, operators, and customers) (Frank, Mendes, Ayala, & Ghezzi, 2019).

Digital servitization is a multi-dimensional construct that comprises multiple equifinal business model configurations that lead to optimal outcomes (Sjödin, Parida, & Kohtamäki, 2019). Thus, there are various pathways to building a digital servitization business model, and one pressing issue is which dimensions should be used. There are several business model typologies. Examples include 1) equipment supplier, 2) solution provider, and 3) performance provider (Helander & Möller, 2008); 1) after sales service provider, 2) customer support service provider, 3) customer service strategy, 4) development partner, and 5) outsourcing partner (Gebauer, Edvardsson, Gustafsson, & Witell, 2010); 1) product business model, 2) service-agreement business model, 3) process-oriented business model, and 4) performance-oriented business model (Huikkola & Kohtamäki, 2018); and 1) industrializer, 2) availability provider, and 3) performance provider (Kowalkowski et al., 2015). The ideal types identified in previous studies exist in the empirical world and are hence viable. Thus, the equifinality assumption holds in servitization as well as digital servitization. In other words, several configurations can lead to optimal outcomes: There is no single path or trajectory to success (Fiss, 2007; Forkmann, Ramos, Henneberg, & Naudé, 2017; Sjödin, Parida, & Kohtamäki, 2016).

To conceptualize digital servitization business models, we start with the product-service-software offering that reflects well the company's solution strategy (Ehret & Wirtz, 2017; Kohtamäki, Partanen, Parida, & Wincent, 2013). This strategy is evident in the offerings, and the construction of the business model builds on the value proposition. A variety of dimensions can be used to construct offerings in digital servitization. We use three dimensions: 1) solution customization (from standardization to customization of offerings; Kowalkowski et al., 2015; Mathieu, 2001; Matthyssens & Vandenbempt, 2010), 2) solution pricing (from product-oriented to outcome-oriented; Gebauer, Saul, Haldimann, & Gustafsson, 2017; Parida, Sjödin, Wincent, & Kohtamäki, 2014), and 3) solution digitalization (from monitoring to autonomous solutions; Porter & Heppelmann, 2015; Fig. 3). These are the core characteristics of smart solutions that digital servitization business models are built on.

First, solution customization refers to the value created by tailoring the product-service-software solution to customer needs. The solution offerings of manufacturing companies vary by level of customization, and product, service, and software characteristics can be customized, modularized, or standardized. Solution customization plays a significant role in effectiveness (value creation) and efficiency (of value capture) of the business model, and the tension between effectiveness and efficiency may be paradoxical (Kohtamäki, Rabetino, & Einola, 2018).

Second, solution pricing represents the core of value capture. The levels of this dimension represent the archetypal characteristics of something that is often referred to as a servitization business model. However, at its core, it considers the pricing logic used in the product-service-software offering. Thus, the pricing of the offering may be product oriented, agreement oriented, availability oriented, or outcome oriented (Gebauer et al., 2017; Huikkola & Kohtamäki, 2018).

The third dimension is solution digitalization. From the early days of servitization, the digital or software dimension has been considered central. The digital servitization draws from previous research on remote diagnostics (Brax & Jonsson, 2009), remote monitoring technology (Davies, 2004; Grubic & Peppard, 2016) or smart technology (Ostrom et al., 2010), to name a few concepts used in previous studies. Whereas the early studies have focused mostly on technological aspects, the research on digital servitization intends to emphasize the interplay between technology and business model. A few studies have acknowledged the important role of software in product-service-software systems suggesting that software can enable product and service bundling, and therefore act as a catalyst (Kowalkowski, Kindström, & Gebauer, 2013; Töytäri et al., 2018). In particular, the latest servitization studies

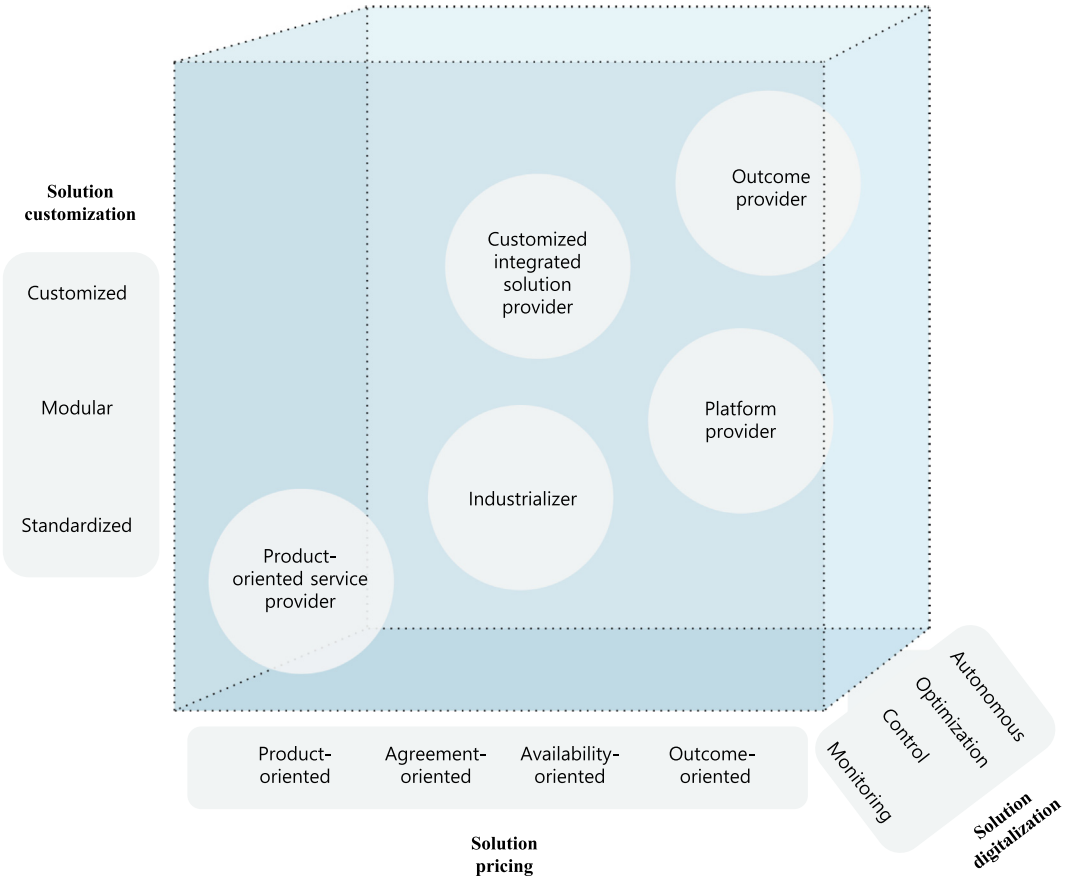

Fig. 3. Understanding the characteristics of solution offerings in digital servitization business models.

have emphasized the role of the IoT and software in smart solutions (Coreynen et al., 2017; Sklyar, Kowalkowski, Sörhammar, & Tronvoll, 2019). The levels of this dimension reflect the literature on digital servitization, the IoT, and smart products. They also include features such as monitoring, control, optimization, and autonomous function (Porter & Heppelmann, 2014). These are the core digital features in smart solutions today. The description of these characteristics is not conclusive, but it is parsimonious enough to separate digital servitization business models and is coherent, in contrast to the literature.

These three dimensions can be used to create a typology of digital servitization business models using the characteristics of solution offerings as a starting point. Fig. 3 simplifies the ideal typical business models based on the three dimensions that define the characteristics of solution offerings. Any individual firm may apply a variety of business models with different customer segments or business lines. The ideal or typical descriptions of business models based on these three dimensions provide a starting point for the analysis of business model configurations in digital servitization. Different business units may also follow different business models and strategic configurations. Thus, a business model is a collection of routines used by the company to create, deliver, and capture value (Osterwalder, Alexander & Pigneur, 2010; Teece, 2010). Hence, a manufacturing company's business model as a comprehensive concept can embed any variety of strategic configurations.

5. Theory of the firm and digital servitization

Digitalization enables the emergence of new business models, which then affect companies beyond firm boundaries within ecosystems, affecting component manufacturers, system suppliers, system integrators, solution providers, operators, distributors, and customers. Changes in one firm's business model can have a significant impact on other firms' operations. For example, when companies change their business models, value propositions, organizational structures, and IT-systems, changes in one firm affect others within the ecosystem. Thus, the concept of the business model should be understood as a dynamic one, something that is continuously constructed and reconstructed. Many of these changes take place at the micro-level when a firm changes its activities. Changes in micro activities often shape the macro-level ecosystem because the micro-level activities together constitute the macro-level environment (Kohtamäki, Baines, Rabetino, & Bigdeli, 2018; Seidl & Whittington, 2014). In this setting, changes to a firm's business model configuration may influence other firms' business models at the ecosystem level.

We use four theories to study the optimal digital servitization business model configurations within platforms and ecosystems and thus understand these configurations. We use the theory of the firm to craft the business model configurations of digital servitization (Santos & Eisenhardt, 2005). The theory of the firm provides four theoretical perspectives to analyze how digitalization affects servitization within platforms and ecosystems. Typically, strategy theory provides four theories to conceptualize the theory of the firm: industrial organization, the resource-based view, organizational identity, and the transaction cost approach (Santos & Eisenhardt, 2005).

We use these theories to provide insight into competitive advantage in digital servitization. How do companies use different business models to generate competitive advantage and increase power? Where in the ecosystem do firms create the highest profits and how? Who is our firm? What should the firm make or buy? These questions are relevant to any firm, but they are especially pertinent in times of digitalization and the IoT. At the micro level, changes in firm boundaries refer to make-or-buy decisions—so-called outsourcing or insourcing decisions. From the macro perspective, changes in firm boundaries

affect the organization of the value systems, roles, capabilities, and collaborative practices between actors (Rabetino & Kohtamäki, 2018). Over time, architectures within ecosystems, players, and firm boundaries change, as do the boundaries between strategic groups and industries. These changes shape industrial value systems, raising many pressing questions for future studies to address.

Servitization research has often used these theories separately when studying servitization or digital servitization. When used together, they create a powerful diagnostic tool to understand different business models. Prior studies tend to explain why these theories should be used together to focus on the interplay between them (e.g., Bäck & Kohtamäki, 2015) instead of analyzing their processes or impact separately. In servitization, few studies seem to have used these theories together to delimit firm boundaries (Salonen & Jaakkola, 2015). The selected theories provide grounds for advancing the discussion on the organization of ecosystems, value systems, relationships, and companies when firms change their business models. Business model changes shape firm boundary decisions, leading to outsourcing or insourcing upstream or downstream.

Research Direction 1a: The literature on digital servitization should study the interplay between servitization, the IoT, and different theories of the firm.

Research Direction 1b: The interplay between theories of the firm may shed light on the business model configurations in digital servitization and therefore deserve further attention in future studies.

5.1. The resource-based view

The resource-based view was developed to understand how combinations of valuable, rare, inimitable, nonsubstitutable, and organized resources (VRIN/O) can generate competitive advantages for a firm (Barney, 1991; Penrose, 1959). Competitive advantages emerge as combinations of VRIN/O resources and processes in servitization too (Baines, Lightfoot, Smart, & Fletcher, 2013; Lenka, Parida, Sjödin, & Wincent, 2017; Paiola, Saccani, Perona, & Gebauer, 2013; Ulaga & Reinartz, 2011). Resources should be reconfigured to seize new business opportunities such as digital servitization. On these occasions, companies should use dynamic capabilities of sensing, seizing, and reconfiguring (Huikkola, Kohtamäki, & Rabetino, 2016; Kindström, Kowalkowski, & Sandberg, 2013; Teece, 2007; Teece, Pisano, & Shuen, 1997).

The digital part of digital servitization may provide a means to develop processes and capabilities for better value creation and capture, increased customization efficiency, more efficient order delivery, and more effective resource reconfiguration when moving toward new business opportunities such as new customer markets (even blue oceans), novel projects, and smart solutions. The advantage is created through processes and activities, through which technology companies create value from competencies and resources located internally or externally (Ardolino et al., 2018; Coreynen et al., 2017; Huikkola & Kohtamäki, 2017; Visnjic et al., 2018).

To achieve the benefits of digital servitization, companies need software capabilities where their business models become dependent on the continuous acquisition, warehousing, analytics, and implementation of machine and fleet-level data (Hasselblatt, Huikkola, Kohtamäki, & Nickell, 2018). For instance, Lenka, Parida, and Wincent (2017) identified capabilities related to digitalization such as connect, intelligence, and analytic capabilities. Thus, digital servitization adds to the capability requirements of companies. Adding advanced service and software capabilities to the capability portfolio will not remove the need for product engineering and manufacturing capabilities as shown by previous servitization research. Ulaga and Reinartz (2011) identified unique resources such as 1) installed base product usage and process data, 2) product development and manufacturing assets, 3) product salesforce and distribution network, and 4) field service organization and distinctive capabilities. Such capabilities include 1) service related data processing and interpretation capability, 2) execution risk assessment and mitigation capability, 3) design-to-service capability, 4) hybrid offering sales capability, and 5) hybrid offering deployment capability, which could lead to advantages based on either differentiation or cost leadership. Huikkola and Kohtamäki (2017) identified critical resources and strategic processes that create strategic capabilities and competitive advantages for solution providers. They found seven strategic capabilities: 1) fleet management, 2) technology development, 3) mergers and acquisitions, 4) value quantification, 5) project management, 6) supplier network management, and 7) value co-creation. In their empirical study of 17 cases, Gebauer et al. (2017) identified the organizational capabilities required for pay-per-use services. These include capabilities related to 1) financing, 2) aligning costs with equipment usage, and 3) customer collaboration. Hasselblatt et al. (2018) studied manufacturers' capabilities in the IoT and found five bundles of strategic IoT capabilities: 1) digital business model development, 2) scalable solution platform building, 3) value selling, 4) value delivery, and 5) business intelligence and measurement. The IoT seems to transform capability requirements of manufacturers significantly, and further research is needed to define manufacturers' capabilities in digital servitization.

Research direction 2a: The literature on digital servitization should explain how digital capabilities in servitization generate competitive advantage and what types of configurations of resources and processes they require. We call for studies on strategic capabilities in digital servitization.

Research direction 2a: Research is needed on the role of dynamic capabilities in resource reconfiguration for digital servitization.

5.2. Organizational identity

Building on the cognitive perspective of strategy, organizational identity is concerned with who we are as an organization. Hence, organizational identity as a theory highlights the role of identity and culture of the organization: How do the actors in different levels perceive the organization, and how do the other actors within the ecosystem conceptualize the role and identity of the servitizing solution provider? These are the key questions when the firm intends to make sense of its existence, boundaries, identity, and mindset. Identity informs strategic and organizational decisions and both vertical and horizontal boundaries. As a theory, organizational identity builds on managerial and strategic cognition as well as sensemaking (Gioia, Patvardhan, Hamilton, & Corley, 2013).

Our analysis of the servitization and digital servitization literature shows that few studies have directly used the identity approach. In the servitization literature, 19 studies have used related concepts such as service culture, mindset, and service orientation, but studies have mainly used service culture as one of many concepts without actually focusing on identity as such or the micro processes or underlying mechanisms of solution provider identity—that is, *servitization identity*. In terms of digital servitization, we found very little research on the shift from a manufacturing firm to a software company. Töytäri et al. (2018) study was one of the rare studying the role of mindset and capabilities in adoption of smart services. This is a meaningful shift beyond pure servitization, combining manufacturing, service, and software engineering identities. An interesting and potentially paradoxical question is how can manufacturing, service, and hacker identities be combined to create solution providers in the age of digitalization (Kohtamäki, Rabetino, & Einola, 2018).

Research direction 3a: Research on digital servitization should explain how digital servitization transforms the identity of a manufacturing company. We call for research on the profound effect of digital servitization on the organizational identity and culture of

Table 2
Firm boundary theories in servitization.

	Resource-based view	Power-dependency approach	Organizational identity	Transaction cost approach
Central object of analysis	Competitive advantage	Power position	Strategic cognition	Make-or-buy decision
Core logic	Build on capabilities Firm builds competitive advantage by reconfiguring resources and processes for VRIO(N) combination	Control the exchange relationship Firms should adjust position through boundary adjustment for improved bargaining power	Focus on the core Firms should define the boundaries to align the organizational mindset and activities	Minimize costs If outsourcing creates cost advantages, firms should outsource activities as opposed to own production.
Core topics	- Critical resources - Strategic processes - Strategic capabilities	- Bargaining power toward upstream and downstream - Dependency between buyer and supplier - Threat of entrants and complementarities	- Service-oriented vs. engineering-oriented organizational identity - Organizational strategy - Organizational culture - Organizational structure	- Opportunism - Bounded rationality - Environmental uncertainty - Relationship-specific investments - Number of transactions
Tools, or criteria to identify	VRIN/O	Description of the value system Five forces	Cognitive maps Discourses, narratives	Environmental uncertainty Relationship-specific investments Number of transactions
Central question for the firm	What constitutes your firm's core capability?	How can we improve our influence?	Who are we as an organization?	Will the sum of production cost and transaction cost achieved after outsourcing be less than the total costs achieved within the firm before outsourcing?
Central questions in servitization	Which factors constitute our competitive advantage when we move toward digital servitization? How can resources and capabilities be reconfigured for digital servitization?	How does digital servitization influence our bargaining power? How does digitalization change power positions within our industry and across industries?	If/when we move toward digital servitization, who will we become as an organization?	How does digital servitization influence our make-or-buy decisions? How does digitalization affect transaction costs across customer and supplier relationships?
The effect of digitalization on firm boundary delineation	Manufacturing technology companies become more like software companies. Capability requirements change significantly with emphasis on data acquisition, warehousing, analytics, and implementation.	Digitalization enables information search on alternative options, decreasing information asymmetries. Digital economy requires new ways of differentiation.	Identities change from product manufacturing to servitization, advanced services, and software. From pure production and engineering to customer and service orientation.	Digitalization and IoT enables more effective data acquisition, analytics, and implementation, decreasing transactions costs.
Number of studies in servitization	85	5	19	4
Number of studies in digital servitization	13	2	1	1
Authors in strategy	Barney, Peteraf, Wernefelt	Porter	Weick, Gioia,	Coase, Williamson
Authors in servitization	Visnjic, Baines, Kowalkowski, Gebauer, Parida, Kohtamäki, Kowalkowski, Kindström	Neely, Martinez, Baines, Rabetino	Bowen, Kowalkowski, Gebauer	Bustinza, Bigdeli, Rabetino, Sjödin, Parida, Kohtamäki

manufacturing companies.

Research direction 3b: Research is needed on the paradoxical tensions between product, service, and software organizations and organizational identities in solution providers.

5.3. Power approach

Drawing on industrial organization theory (Porter, 1980) and the resource-dependency approach (Pfeffer & Salancik, 1978), the power approach builds on the long tradition of studies that explore the impact of positioning on bargaining power, competitive advantage, and performance. Thus, the roots of the power approach are in the realist, objectivist approach of industrial economics, where rational actors seek the highest profits (Ezzamel & Willmott, 2004). Under this approach, the theory and operational criteria are used to determine how a firm can build an optimal position within the industry, strategic group, or value system, where this position should be optimized for growth and bargaining power. To operationalize the approach, Porter (1980) developed five forces to define an optimal market position. Porter's Five Forces have since been used in a variety of contexts to describe and determine the attractiveness of a market position with respect to other positions. Competitive advantage is sought through low cost, differentiation, or competitive scope (Porter, 1991). Strategy may be determined as a configuration of sources of competitive advantage and competitive scope. The theory and its main conceptual tools are still relevant today when considering competitive advantage in the age of digitalization (Porter, 2001; Porter & Heppelmann, 2014).

The analysis of the literature reveals a lack of empirical studies that have used industrial economics in servitization. Few studies have employed industrial organization and related models. In a single case study, Rabetino and Kohtamäki (2018) presented a case in point, arguing that, in some cases, such as the propulsion industry, servitization requires repositioning and direct engagement with the operator to sell and deliver integrated solutions. They used Porter's Five Forces to analyze positioning in the propulsion industry. Davies, Brady, and Hobday (Davies, Brady, & Hobday, 2007) defined two options for implementing servitization to provide integrated solutions: system integration and vertically integrated system selling. In their study on servitization, organizational structure, and value chain position, Bustinza et al. (2015) found that manufacturing firms in the UK use servitization to differentiate and move upstream to improve control and enhance performance. Hence, value chain position plays an important role in service performance. Visnjic, Jovanovic, Neely, and Engwall (2017) identified five value drivers of outcome business models, referring to their framework as CLEAN (Complementarities, Lock-in, Efficiency, Accountability, Novelty). The use of and interplay between value drivers should improve a firm's position when using the outcome business model. Hou and Neely (2018) cited dependency as a critical factor that increases commercial risk in outcome-based services. Thus, some studies have applied the power approach to servitization, but none have actually focused on the interplay between digitalization, the ecosystem architecture, and positioning. Further research is needed to study the effect of digitalization on firms' power position in different parts of the ecosystem, also acknowledging Rabetino and Kohtamäki's (2018) observation that manufacturers need some bargaining power to sell integrated solutions and enable data acquisition, analytics, and implementation (i.e., digital servitization). Moreover, power positions play an important role in shaping ecosystems for autonomous operations. Collaborative efforts are often needed when seeking a balance between different players within the ecosystem. Further research on these topics is needed.

Research direction 4a: Digital servitization studies should examine how digitalization transforms bargaining power in different sections of value systems and ecosystems and how manufacturers increase their power using digitalization.

Research direction 4b: Future research is needed to explore not only how digitalization enables value creation but also how manufacturers shift their value capture from product-centric, to service-centric, and further to data-centric.

Table 2 summarizes the four different theories of the firm and builds on the strategy, servitization and digital servitization literatures (Santos & Eisenhardt, 2005, 2009).

5.4. Transaction cost approach

Since its infancy, the transaction cost approach has been used to develop a theory on make-or-buy decisions and the conditions that determine the emergence of transaction costs (Coase, 1937; Williamson, 1985). While the theory acknowledges opportunism and bounded rationality as important preliminary assumptions, it defines environmental uncertainty, relationship-specific investments, and number of transactions as important decision-making criteria. According to the theory, environmental uncertainty, relationship-specific investments and a large number of transactions generate conditions where manufacturing firms' transaction costs tend to increase, wiping out the benefits of the lower production costs that would result from the use of market mechanisms (i.e., outsourcing activity to markets). Accordingly, in conditions of high environmental uncertainty, relationship-specific investments, and a large number of transactions, a company should make instead of buy because buying products or services under ex-ante uncertainties would increase the sum of resulting production and transactions costs over the overall costs of producing the same outputs within the organization (Williamson, 1985). Williamson's generic model emphasizes pure governance models instead of intermediate ones, whereas some scholars claim that, as intermediate hybrid forms exist anyway, firms need capabilities to collaborate within ecosystems. Hence, networks or hybrid governance forms are defined as intermediate forms between markets and hierarchies (Powell, 1990).

In the provision of product-service-software systems, transaction costs can be significant because of the sales and delivery of highly complex, customized smart solutions. Delivering smart solutions also incurs significant transaction costs because of upstream interactions with the service supply chain in addition to product supply. Digitalization may potentially increase visibility in the exchange relationship and, because of this visibility, decrease transaction costs. However, scarce empirical research has examined the role of transaction costs in servitization or digital servitization. Accordingly, any considerations are based on general transaction cost theory. In their configurational study, Sjödin et al. (2019) identified governance configurations used in governing advanced service partnerships. They discuss the management of partnerships in the context of advanced service innovation, identifying three relational or network governance tactics: innovation governance strategy, relational governance strategy, and market-based governance strategy. Bigdeli, Bustinza, Vendrell-Herrero, and Baines (2018) identified the key role of supply chain collaboration in mitigating the risk of implementing advanced services. Kamp, Ochoa, and Diaz (2017) emphasized the importance of trust building between users and producers to share data. So far, no studies have focused on the effect of digitalization on transaction costs, so empirical research from this perspective is needed.

Research direction 5a: The servitization literature lacks studies of the role of transaction costs in servitization. The digital servitization literature has so far neglected the effect of digitalization on transaction costs in downstream and upstream interactions. We call for studies that explore how digitalization transforms collaboration in servitization ecosystems.

Research direction 5b: The creation of ecosystems for autonomous smart solutions entails significant transaction costs as developers must configure and integrate technologies, routines, and business

Table 3
Connecting business models and firm boundaries in digital ecosystem.

	Product provider	Industrializer	Integrated solutions provider	Outcome provider	Platform provider
Description of the business model	Emphasis on standardized products and add-on services	Modular product offerings and service agreements	Customized/modular product-service systems with some performance guarantees or operational services Provision of availability	Customized/modular product-service systems owned by the manufacturer, predominantly performance pricing	Service-dominant business model where the platform provider enables provider-customer interactions and sharing services
The role of digitalization	Some smart features based on remote diagnostics	Efficient use of some remote diagnostics features, typically related to monitoring, diagnostics, and proactive maintenance	Remote diagnostics enabling provision of availability requiring effective monitoring, control, and optimization	Remote diagnostics enabling monitor, control, optimization, and autonomous operation (in some highly advanced cases such as moving vehicles)	Digital platform enabling effective interactions. Operator may monitor, control, optimize, and provide ecosystem enabling autonomous products (e.g., vehicles)
Resource-based view	Capabilities related to product selling, manufacturing, distribution, and delivery as well as brand management.	Capabilities to mass customize while maintaining high production capacity. Particular emphasis on modularity-based efficiencies.	Solutions sales and delivery, remote diagnostic, preventive maintenance, advanced services, IoT. Increasing emphasis on project management capabilities	Value-based selling, delivery of outcome-based services, IoT, AI solutions	Digital platform, user interface, and large number of providers and customers. Brand development. IoT to enable monitoring, control, optimization and autonomous products
Power approach	Product differentiation or cost-advantage	Product-service strategy relies on cost-advantage and scale economies	Customized product-service system, advanced services, customer lock-in	Ease of buying and use, customer lock-in	Strong provider holds significant power generated by knowledge about actors and the ecosystem
Organizational identity	Product manufacturing	Technology and Manufacturing orientation	Solution provider, customer orientation, balancing between technology and customer orientation	Performance provider Fully customer oriented, yet also evolving technology orientation	Interest in platform and true service-dominant logic. "Saves the world" through sharing business model and waste reduction
Transaction cost approach	Low relationship-specific investments More stable and simple business environment	Intermediate relationship-specific investments Dynamic and complex business environment	High relationship-specific investments Very dynamic and complex business environment	High relationship-specific investments Very dynamic and complex business environment	Digital platform enabling creation of sharing services. Digital platform saves transaction costs

models between multiple firms within the ecosystem. More research is needed on the role of transaction costs in these collaborations and on appropriate governance structures for these collaborations.

6. Digital servitization business models and the theory of the firm

Table 3 shows the five business models and their configurations based on the four theories discussed in this paper. We distinguish between five separate business models: product-oriented service provider, industrializer, customized integrated solution provider, platform provider, and outcome provider. Table 3 compares the business models through the different lenses, identifying the central characteristics of the business model configurations.

Product-oriented service provider reflects the business model of a firm that provides products and add-on services. The role of remote diagnostics depends on the company technology strategy, but, in this definition, it does not affect product or add-on service pricing, which is still based on sold units. Accordingly, this could be thought of as a traditional product business model. Regarding capabilities, product manufacturers need the processes required for efficient design, manufacturing, and delivery. The service portfolio is mainly based on basic offerings—so-called add-on services (Parida et al., 2014). Product-oriented service providers have faced the commoditization trap that they often try to evade through improved service offerings and new digital services. Often, power is on the customer side, particularly in the case of simpler products and services where the manufacturer switching cost is low. Product manufacturers build on product and manufacturing identity. Transaction costs are reduced by offering standard products and add-on services that are fairly easy to sell and purchase.

Research direction 6a: Because the digital servitization research domain lacks empirical studies of smart solutions and advanced services, digital servitization scholars should analyze the role of digitalization in developing these companies, their offerings, and capabilities, as well as the role of digitalization in developing these companies.
Research direction 6b: Considering the product-oriented focus of these companies, studies should focus on how IoT applications can shape future business models and how the IoT affects the role of services in the future.

Industrializer emphasizes product and service modularity to improve efficiency despite increasing demands by customers to customize offerings to their needs. Hence, in this business model, the company emphasizes modularity to increase efficiency of product-service delivery and cope with the paradox of effective provision of customized solutions (Cenamor et al., 2017) versus efficient delivery of solutions—the so-called paradox of performance in servitization (Kohtamäki, Rabetino, & Einola, 2018). In terms of strategic capabilities, the emphasis is on combining effective solution customization with efficient order delivery. To achieve this goal, an industrializer should develop capabilities in modularity. Prior studies have predominantly examined modularity in terms of product or service modules. In the age of digitalization, however, the importance of software should also be considered. Digitalization builds on offerings and capabilities that can be integrated into modular offerings. The bargaining power of industrializers is based on relatively low prices with some capacity for efficient modular customization. The identity of an industrializer still builds on manufacturing with an emphasis on efficiency rather than effectiveness and customization. Moreover, in many of these companies, engineering plays an important role in company culture. Effective modularity can reduce transaction costs in downstream and upstream interactions.

Research direction 7a: The digital servitization literature fails to provide detailed micro-level empirical evidence of the role of

modularity in digital servitization or servitization in general. Future research should provide more detailed empirical findings on modularity and related routines in digital servitization, particularly concerning industrializers.

Research direction 7b: The configuration of the product, service, and software modules to ensure better service and digital content needs clarifying. What should constitute a core module and how is it possible to benefit from such a modular approach?

Customized integrated solution provider refers to companies that offer integrated product-service solutions. Under this model, provision of availability may play a significant role, and, particularly in large integrated solutions, the model often entails relatively high levels of solution customization (Windahl & Lakemond, 2010). Provision of availability sets relatively high standards of remote diagnostics, requiring accurate data acquisition, analytics, and implementation. However, the customers of companies that apply this business model may still want to purchase integrated solutions with performance guarantees and availability instead of pure outcomes (e.g., cost-per-ton-contracts; Rabetino, Kohtamäki, Lehtonen, & Kostama, 2015). Some companies using this business model may move toward autonomous features in their solutions by providing monitoring, control, optimization and crewless autonomy as a service. This requires the development of capabilities in digitalization (e.g., capabilities in monitoring, control, optimization, and autonomous vehicles). These capabilities build on sales, design, and delivery of integrated lifecycle solutions. Development of integrated solutions requires in-depth knowledge of not only customers but also other partner company equipment and processes, as well as the integration of technologies (e.g., software beyond firm boundaries). Hence, in many ways, the bargaining power of these companies is increasingly based on knowledge integration to create and capture value from customers or customers' customers. Organizational identity of an integrated solution provider is based on a paradoxical combination of engineering and customer orientations (Kohtamäki, Rabetino, & Einola, 2018). Customization and delivery of complex solutions increase transaction costs that heighten the importance of project management capabilities.

Research direction 8a: The digital servitization literature broadly neglects changes in business model configurations of customized integrated solution providers. More empirical evidence is required to understand how digitalization shapes the ability of customized integrated solution providers to engage with other ecosystem actors to deliver higher value to customers.

Research direction 8b: A related issue has to do with how to co-develop business models with ecosystem partners. How is it possible to co-create and capture value over extended contracted duration of the solution?

Outcome provision refers to solution providers that sell outcomes instead of products or services (Visnjic et al., 2017). Thus, instead of selling products, providers retain ownership and sell the value created by the product. Examples are the power generated by engines, as in Rolls-Royce's iconic power-by-the-hour concept (Ng, Parry, Smith, Maull, & Briscoe, 2012; Smith, 2013). Offering such solutions requires the capability of accurately measuring the generated performance, often entailing accurate monitoring and control of the product or fleet of products. Being able to continuously measure and optimize the equipment or processes is a critical underlying requirement of outcome providers. The company needs strategic capabilities to sell and implement outcome-based contracts, suggesting capabilities in detailed monitoring, control and optimization of even autonomous solutions. Implementation of these systems, require also in-depth collaboration between ecosystem actors. Thus, the outcome-based business model sets very high capability-requirements for solution providers. The organizational identity of these types of companies centers on the customer as well as the value of engineering and technology, creating a paradoxical tension between the customer and the technology mindset (Kohtamäki, Rabetino, & Einola, 2018). In many ways, these companies must maintain technological development to provide performance in the future too. Provision of performance can potentially decrease transaction costs at the fleet level, but this decrease is related to factors such as technological uncertainty, relationship-specific investments, and information asymmetry between provider and customer.

Regarding outcome provision, very little research exist demonstrating pure ideal typical models of outcome provision in customized integrated solutions (Grubic & Jennions, 2018). Currently, descriptions of outcome-based contracts may be ideal-typical, while in the empirical world, different hybrid-models prevail. This conclusion of course holds to any conceptual business model description, and description of business model configurations. More empirical evidence is needed on outcome-based business models, with detailed empirical data.

Research direction 9a: The literature on outcome-based business models is still relatively scarce, and the role of digitalization in these models seems to be understudied. Thus, more empirical research on the role of digitalization in outcome-based business models is needed. There is a need for further research on outcomes in these business models (e.g., energy savings) and the increasing role of sustainability in these business models.

Research direction 9b: A key challenge for outcome solution providers is to deliver the promised performance over time (e.g., three or more years of contracts). There is currently a poor understanding of how to manage digitalization-enabled governance mechanisms during this implementation phase.

Platform provider refers to a fully-fledged digitally enabled service business model where the company is a platform provider that connects various providers and customers. For instance, consider a car manufacturer that transforms its business model to a car-sharing platform business model. This transformation entails a full transition from car manufacturer to provision of car sharing services and may require a software platform for multiple different providers and customers. Similar models may take place and disrupt multiple industries. These business models are related to sustainability and waste reduction. Thus, instead of only providing performance (e.g., moving from A to B), these models may combine sustainability and energy saving arguments. People support the sustainability movement by not owning a vehicle and instead using ride-sharing services when required. Thus, platform business models may be aligned with sustainability arguments by reducing energy consumption and waste by effectively using economies of scope. Platform providers need the digital platform, numerous providers and customers, and, to achieve this, a strong brand name. A digital platform is needed not only to share information and facilitate exchanges but also to monitor, control, and optimize services and products. The power position of platform providers is potentially strong because of the data they collect on the usage of services. Platform providers can use the data to generate a variety of new business opportunities, but need capabilities that enable creation and implementation of a platform (Eloranta & Turunen, 2016). In terms of organizational identity, platform providers are likely to have a service-dominant identity, as the core operational model builds on interaction between potentially large number of customers and providers. The platform reduces transaction costs involved in the exchanges by using effective applications. Existing platforms provide good example of how digital technologies hold potential to minimize transaction costs through automation. Yet, the literature on digital servitization and servitization provide very little detailed empirical evidence on platform business models. The study from Eloranta and Turunen (2016) is one of the rare examples of platform studies in servitization. In the near future, we may see these types of models to emerge also in manufacturing and integrated solutions. Perhaps the digital servitization literature can

provide necessary conceptual models and tools to develop platform business models in companies.

Research direction 10a: The literature on platform-based business models is modest or almost nonexistent in the digital servitization literature. Thus, we call for the digital servitization literature to tap into platform business models. Further research is also needed on the role of sustainability in the provision of platform-based business models.

Research direction 10b: The management or orchestration of multi-actor business models needs further investigation. We also call for empirical studies that capture process insights into how providers transition toward becoming platform providers.

7. Conclusions

7.1. Theoretical conclusions

The four theories of the firm used in this study provide opportunities to create novel insights into digital servitization business model configurations and offer a good starting point for strategizing in the era of digitalization. When crafting the concept of digital servitization, the heritage of the servitization literature should be acknowledged. Since its infancy, software has been included in the research on servitization and product-service-software systems (e.g., smart solutions). The current review explores how the servitization literature acknowledges digitalization, what types of business model configurations are discussed in the servitization literature, how the digital component shapes servitization business models, and how digital servitization is defined and constructed in the servitization literature. To craft a series of business model configurations, we use four theories of the firm. This study contributes to both the servitization and the digital servitization literature.

Our first contribution is the review of the servitization literature. Drawing on previous studies (Kowalkowski et al., 2015), we provide a definition and conceptualization of digital servitization. We define digital servitization as the transition toward smart product-service-software systems that enable value creation and capture through monitoring, control, optimization, and autonomous function (For other definitions, see e.g., Lerch & Gotsch, 2015; Sklyar, Kowalkowski, Sörhammar, & Tronvoll, 2019). Unlike previous servitization research, this study conceptualizes and highlights the effects of digitalization. Although the digitalization has been part of the servitization literature since its infancy, its role has been undermined (Coreynen et al., 2017). We present some key characteristics of digital servitization in relation to the need to consider the digital dimension, which is an inherent component of product-service-software systems and digital servitization.

Second, we extend the dialogue on digital servitization by presenting a typology of five business models (Huikkola & Kohtamäki, 2018; Kowalkowski et al., 2015). The goal is to describe digital servitization business model configurations within ecosystems. We craft a three-dimensional model consisting of the dimensions of solution customization (standardized, modular, or customized), pricing (product-, agreement-, availability-, or outcome-oriented pricing), and digitalization (monitoring, control, optimization, or autonomous). These dimensions are then used to define five business models: 1) the product business model, 2) industrializer, 3) integrated solution provider, 4) outcome provider, and 5) platform provider. A key message of this study is that companies may choose between the digital servitization business models and that each of them could provide performance gains for the company. We also contribute to the digital servitization research by listing numerous avenues for further research as a result of using the theory-of-the-firm to conceptualize digital servitization business model configurations.

The third and perhaps most important contribution is the use of four theories of the firm (industrial organization, the resource-based view, organizational identity, and the transaction cost approach) to understand the configurations of the five identified digital servitization business models. Table 3 shows the five business model configurations interpreted using the four theories of the firm. These theories provide a basis to theorize about business model configurations in digital servitization. A key finding aligned with previous reviews of servitization (Rabetino et al., 2018) is that researchers continue to underuse established theoretical perspectives. The most dominant theoretical perspective is still the resource-based view. To address the proposed challenge, we provide numerous suggestions for how the theoretical perspectives can be adopted in future studies of digital servitization.

Finally, as the number of studies of digital servitization increase in the coming years, we call for more studies to adopt an ecosystem or value system perspective. Most studies are firm centric, and few studies have taken a dyadic view of servitization (Forkmann, Henneberg, Witell, & Kindström, 2017) and digital servitization. However, as firms mature in their ability to combine servitization with digitalization, they advance in their monitoring, control, optimization, and automation capabilities. This would imply that digital servitization business models will require value system actors' involvement and that this platform and ecosystem would be critical.

In conclusion, a core argument throughout this study and the entire special issue is the effect of digitalization on solution providers' business models and firms' boundary decisions as companies develop digital solutions across firm boundaries to monitor and operate a fleet. The evolution of digitalization requires increasing emphasis beyond the boundaries of a single firm to align the business models and technologies of different firms within the ecosystem. Hence, the business models in digital servitization should be considered in the context of a value system or ecosystem. Based on this discussion, we provide suggestions for future research.

From a practical perspective, this paper sheds light on how digital servitization can emerge within an ecosystem from the perspective of a firm boundary. This could be of significance as digitalization becomes more and more central to success within industries and markets. More specifically, we provide three key contributions to managers responsible for digitalization and servitization initiatives within manufacturing companies. First, we recommend that managers recognize the linkages between servitization and digitalization because they work best together. We foresee challenges and missed opportunities for value creation and value capturing if firms overlook the use of these concepts together. For example, service delivery benefits from digitalization capabilities for logistic management. Similarly, remote monitoring technology would need service contacts to capture the value it generates for customers. Second, we present five digital servitization business models. These business models are unique in relation to the level of offer configuration, servitization, and digitalization. We recommend that managers critically evaluate which business model best fits their internal capabilities and external market environment because all these business models have the potential to generate revenue and growth. However, for long-term competitiveness, we foresee the need to move toward a more advanced offering with customization, outcome-oriented, and autonomous characteristics. Finally, we urge companies to recognize that, in increasingly competitive and turbulent market environments, they must work and experiment with multiple business models. Being locked into a single business model, no matter how profitable, can create deep-rooted rigidity. Thus, continuously exploring business model innovation, such as through servitization and digitalization, is critical for survival.

The final section presents the papers included in this special issue. In addition to this introductory article, the special issue comprises 10 studies of servitization and product-service offerings in ecosystems, many of which embrace theories of the firm, digital servitization, service transformation, and ecosystems.

Introduction to the special issue

Bustinza, Lafuente, Rabetino, Vaillant, and Vendrell-Herrero (2019) study firm boundary configurations (e.g., make-or-buy decisions) in manufacturing companies. Using fuzzy-set qualitative comparative analysis, they show that optimal performance is achieved by collaborating with value-added service providers for basic and intermediate services (buying) while developing advanced services within the company (making).

Baik, Kim, and Patel (2019) analyze the role of human resource practices, namely high performance work systems, and environmental effects such as industry dynamism and industry complexity as drivers of employees' service-providing capability. According to their longitudinal study, high performance work systems have a positive effect on the service-providing capability of the workforce. This effect is stronger when influenced by environmental complexity and dynamism.

Hedvall, Jagstedt, and Dubois (2019) combine interorganizational perspectives with a process view of solutions, studying the provision of solutions in business networks. Their case study provides insight into how firms are involved in solution provision and how firms play various roles in the process and engage in interdependencies, creating what the authors refer to as “networks of solutions.”

Hullova, Laczko, and Frishammar (2019) study independent distributors in transition toward advanced services. Their study presents problems experienced by companies under service transformation such as conflicting interests, misalignment of strategy and managerial attention, and ineffective knowledge management across firm boundaries. The study provides a servitization-readiness decision tree to identify the factors that hamper the servitization journey.

Garcia Martin, Schroeder, and Bigdeli (2019) conduct a systematic review to analyze how value is understood in the servitization literature. They create a value architecture model to conceptualize value at the triadic, network and system levels in the servitization research.

Sklyar, Kowalkowski, Tronvoll, and Sörhammar (2019) focus on the transition toward digital servitization and the role of the service ecosystem. Their study presents the organizational change processes, highlighting the key role of organizational integration, centralization, and service-centricity in implementing digital servitization.

Reim, Sjödin, and Parida (2019) analyze servitization and the required transition in the manufacturers' service network. The study provides insight into how service network actors approach servitization in various conditions. Identifying major capability- and market-related challenges, their analysis reveals four servitization strategies (service extension, service benchmarking, digitalization, and customer co-creation). The authors suggest a contingency model to fit matching strategies to achieve servitization of the service network.

Jovanovic, Raja, Visnjic, and Wiengarten (2019) study 10 cases to identify three paths for capability development: 1) sequential development, 2) the challenge of capability replication, and 3) retrenchment and service dilution. They argue the need to create an enabling internal ecosystem.

Palo, Åkesson, and Löfberg (2019) take a practice theoretical perspective to study the servitization process as a contestation of business models. According to their research, such contestations may provide insight into how to develop practices to support servitization. The study adds to the discussion about servitization as an emergent process.

Morgan, Anokhin, and Wincent (2019) bridge the strategy, innovation, servitization, and new service development literature. Their results emphasize the importance of customer participation in new service development, particularly in contexts of complex customer needs and low competition.

Lütjen, Schultz, Tietze, and Urmetzer (2019) use a survey and interviews from eight energy utilities to understand ecosystem-related dynamic capabilities. According to their results, a high level of service innovation is linked to ecosystem-related capabilities. Dynamic capabilities enable effective reconfiguration of ecosystems.

References

Adner, R. (2016). Ecosystem as structure: An actionable construct for strategy. *Journal of Management, 43*(1), 39–58.
Ardolino, M., Rapaccini, M., Saccani, N., Gaiardelli, P., Crespi, G., & Ruggeri, C. (2018). The role of digital technologies for the service transformation of industrial companies. *International Journal of Production Research, 56*(6), 2116–2132.
Bäck, I., & Kohtamäki, M. (2015). Boundaries of R&D collaboration. *Technovation, 45–46*(November–December), 15–28.
Baik, K., Kim, K. Y., & Patel, P. C. (2019). The internal ecosystem of high performance work systems and employee service-providing capability: A contingency approach for servitizing firms. *Journal of Business Research* (in press).
Baines, T. S., Bigdeli, A. Z., Bustinza, O. F., Guang Shi, V., Baldwin, J., & Ridgway, K. (2016). Servitization: Revisiting the state-of-the-art and research priorities. *International Journal of Operations & Production Management, 37*(July), 1–28.
Baines, T. S., Lightfoot, H., Smart, P., & Fletcher, S. (2013). Servitization of manufacture: Exploring the deployment and skills of people critical to the delivery of advanced services. *Journal of Manufacturing Technology Management, 24*(4), 637–646.
Barney, J. B. (1991). Firm resources and sustained competitive advantage. *Journal of Management, 17*(1), 99–120.
Bigdeli, A. Z., Bustinza, O. F., Vendrell-Herrero, F., & Baines, T. (2018). Network positioning and risk perception in servitization: Evidence from the UK road transport industry. *International Journal of Production Research, 56*(6), 2169–2183.
Brax, S. A., & Jonsson, K. (2009). Developing integrated solution offerings for remote diagnostics: A comparative case study of two manufacturers. *International Journal of Operations & Production Management, 29*(5), 539–560.
Bustinza, O. F., Bigdeli, A. Z., Baines, T. S., & Elliot, C. (2015). Servitization and competitive advantage: The importance of organizational structure and value chain position. *Research-Technology Management, 58*(5), 53–60.
Bustinza, O. F., Lafuente, E., Rabetino, R., Vaillant, Y., & Vendrell-Herrero, F. (2019). Make-or-buy configurational approaches in product-service ecosystems and performance. *Journal of Business Research* (in press).
Cenamor, J., Sjödin, D. R., & Parida, V. (2017). Adopting a platform approach in servitization: Leveraging the value of digitalization. *International Journal of Production Economics, 192*(October), 54–65.
Coase, R. H. (1937). The nature of the firm. *Economica, 4*(16), 386–405.
Coreynen, W., Matthyssens, P., & Van Bockhaven, W. (2017). Boosting servitization through digitization: Pathways and dynamic resource configurations for manufacturers. *Industrial Marketing Management, 60*(42–53), 42–53.
Davies, A. (2004). Moving base into high-value integrated solutions: A value stream approach. *Industrial and Corporate Change, 13*(5), 727–756.
Davies, A., Brady, T., & Hobday, M. (2007). Organizing for solutions: Systems seller vs. systems integrator. *Industrial Marketing Management, 36*(2), 183–193.
Ehret, M., & Wirtz, J. (2017). Unlocking value from machines: Business models and the industrial internet of things. *Journal of Marketing Management, 33*(1–2), 111–130.
Eloranta, V., & Turunen, T. (2016). Platforms in service-driven manufacturing: Leveraging complexity by connecting, sharing, and integrating. *Industrial Marketing Management, 55*, 178–186.
Ezzamel, M., & Willmott, H. (2004). Rethinking strategy: Contemporary perspectives and debates. *European Management Review, 1*(1), 43–48.
Fiss, P. C. (2007). A set-theoretic approach to organizational configurations. *The Academy of Management Journal, 32*(4), 1180–1198.
Forkmann, S., Henneberg, S. C., Witell, L., & Kindström, D. (2017). Driver configurations for successful service infusion. *Journal of Service Research, 20*(3), 275–291.
Forkmann, S., Ramos, C., Henneberg, S. C., & Naudé, P. (2017). Understanding the service infusion process as a business model reconfiguration. *Industrial Marketing Management, 60*, 151–166.
Frank, A. G., Mendes, G. H. S., Ayala, N. F., & Ghezzi, A. (2019). Servitization and Industry 4.0 convergence in the digital transformation of product firms: A business model innovation perspective. *Technological Forecasting and Social Change, 1–0*.
Garcia Martin, P. C., Schroeder, A., & Bigdeli, A. Z. (2019). The value architecture of servitization: Expanding the research scope. *Journal of Business Research* (in press).
Gawer, A., & Cusumano, M. A. (2014). Industry platforms and ecosystem innovation. *Journal of Product Innovation Management, 31*(3), 417–433.
Gebauer, H., Edvardsson, B., Gustafsson, A., & Witell, L. (2010). Match or mismatch: Strategy-structure configurations in the service business of manufacturing companies. *Journal of Service Research, 13*(2), 198–215.
Gebauer, H., Saul, C. J., Haldimann, M., & Gustafsson, A. (2017). Organizational capabilities for pay-per-use services in product-oriented companies. *International Journal of Production Economics, 192*(November), 157–168.
Gioia, D.a., Patvardhan, S. D., Hamilton, A. L., & Corley, K. G. (2013). Organizational identity formation and change. *The Academy of Management Annals, 7*(1), 123–193.
Grubic, T. (2018). Remote monitoring technology and servitization: Exploring the relationship. *Computers in Industry, 100*(December 2017), 148–158. https://doi.org/10.1016/j.compind.2018.05.002.
Grubic, T., & Jennions, I. (2018). Do outcome-based contracts exist? The investigation of power-by-the-hour and similar result-oriented cases. *International Journal of Production Economics, 206*(December), 209–219.
Grubic, T., & Peppard, J. (2016). Servitized manufacturing firms competing through remote monitoring technology. *Journal of Manufacturing Technology Management, 27*(2), 154–184.
Hasselblatt, M., Huikkola, T., Kohtamäki, M., & Nickell, D. (2018). Modeling manufacturer's capabilities for the internet of things. *Journal of Business & Industrial Marketing, 33*(6), 822–836.
Hedvall, K., Jagstedt, S., & Dubois, A. (2019). Solutions in business networks:

Implications of an interorganizational perspective. *Journal of Business Research* (in press).
Helander, A., & Möller, K. (2008). How to become solution provider: System supplier's strategic tools. *Journal of Business-to-Business Marketing, 15*(3), 247–289.
Hou, J., & Neely, A. (2018). Investigating risks of outcome-based service contracts from a provider's perspective. *International Journal of Production Research, 56*(6), 2103–2115.
Huikkola, T., & Kohtamäki, M. (2017). Solution providers' strategic capabilities. *Journal of Business & Industrial Marketing, 32*(5), 752–770.
Huikkola, T., & Kohtamäki, M. (2018). In M. Kohtamäki, T. S. Baines, R. Rabetino, & A. Z. Bigdeli (Eds.). *Practices and tools for servitization: Managing service transition* (pp. 61–81). London: Palgrave McMillan Business models in servitization.
Huikkola, T., Kohtamäki, M., & Rabetino, R. (2016). Resource realignment in servitization. *Research-Technology Management, 59*(4), 30–39.
Hullova, D., Laczko, P., & Frishammar, J. (2019). Independent distributors in servitization: An assessment of key internal and ecosystem-related problems. *Journal of Business Research* (in press).
Iansiti, M., & Levien, R. (2004). Strategy as ecology. *Harvard Business Review, 82*(March), 68–78.
Jacobides, M. G., Cennamo, C., Gawer, A., & Mgmt, S. (2018). Towards a theory of ecosystems. *Strategic Management Journal, 39*, 2255–2276.
Jovanovic, M., Raja, J. Z., Visnjic, I., & Wiengarten, F. (2019). Paths to service capability development for servitization: Examining an internal service ecosystem. *Journal of Business Research* (in press).
Kamp, B., Ochoa, A., & Diaz, J. (2017). Smart servitization within the context of industrial user–supplier relationships: Contingencies according to a machine tool manufacturer. *International Journal on Interactive Design and Manufacturing, 11*(3), 651–663.
Kindström, D., Kowalkowski, C., & Sandberg, E. (2013). Enabling service innovation: A dynamic capabilities approach. *Journal of Business Research, 66*(8), 1063–1073.
Kohtamäki, M., Baines, T., Rabetino, R., & Bigdeli, A. Z. (2018). In M. Kohtamäki, T. Baines, R. Rabetino, & A. Bigdeli (Eds.). *Practices and tools for servitization: Managing service transition* (pp. 1–21). London: Springer International Publishing Practices in servitization.
Kohtamäki, M., Partanen, J., Parida, V., & Wincent, J. (2013). Non-linear relationship between industrial service offering and sales growth: The moderating role of network capabilities. *Industrial Marketing Management, 42*(8), 1374–1385.
Kohtamäki, M., Rabetino, R., & Einola, S. (2018). In M. Kohtamäki, T. S. Baines, R. Rabetino, & A. Z. Bigdeli (Eds.). *Practices and tools for servitization: Managing service transition* (pp. 185–199). London: Springer International Publishing Paradoxes in servitization.
Kohtamäki, M., Rabetino, R., & Möller, K. (2018). Alliance capabilities: A systematic review and future research directions. *Industrial Marketing Management, 68*(1), 188–201.
Kowalkowski, C., Gebauer, H., & Oliva, R. (2017). Service growth in product firms: Past, present, and future. *Industrial Marketing Management, 60*(1), 82–88.
Kowalkowski, C., Kindström, D., & Gebauer, H. (2013). ICT as a catalyst for service business orientation. *Journal of Business & Industrial Marketing, 28*(6), 506–513.
Kowalkowski, C., Windahl, C., Kindström, D., & Gebauer, H. (2015). What service transition? Rethinking established assumptions about manufacturers' service-led growth strategies. *Industrial Marketing Management, 45*(1), 59–69.
Lenka, S., Parida, V., Sjödin, D. R., & Wincent, J. (2017). Exploring the microfoundations of servitization: How individual actions overcome organizational resistance. *Journal of Business Research, 88*(November 2017), 328–336.
Lenka, S., Parida, V., & Wincent, J. (2017). Digitalization capabilities as enablers of value co-creation in servitizing firms. *Psychology & Marketing, 30*(6), 461–469.
Lerch, C., & Gotsch, M. (2015). Digitalized product-service systems in manufacturing firms: A case study analysis. *Research-Technology Management, 58*(5), 45–52.
Luoto, S., Brax, S. A., & Kohtamäki, M. (2017). Critical meta-analysis of servitization research: Constructing a model-narrative to reveal paradigmatic assumptions. *Industrial Marketing Management, 60*(1), 89–100.
Lütjen, H., Schultz, C., Tietze, F., & Urmetzer, F. (2019). Managing ecosystems for service innovation: A dynamic capability view. *Journal of Business Research* (in press).
Mathieu, V. (2001). Product services: From a service supporting the product to a service supporting the client. *Journal of Business & Industrial Marketing, 16*(1), 39–53.
Matthyssens, P., & Vandenbempt, K. (2010). Service addition as business market strategy: Identification of transition trajectories. *Journal of Service Management, 21*(5), 693–714.
Möller, K., & Halinen, A. (2017). Managing business and innovation networks—From strategic nets to business fields and ecosystems. *Industrial Marketing Management, 67*(November), 5–22.
Morgan, T., Anokhin, S., & Wincent, J. (2019). New service development by manufacturing firms: Effects of customer participation under environmental contingencies. *Journal of Business Research* (in press).
Ng, I., Parry, G., Smith, L., Maull, R., & Briscoe, G. (2012). Transitioning from a goods-dominant to a service-dominant logic: Visualising the value proposition of Rolls-Royce. *Journal of Service Management, 23*(3), 416–439.
Ostrom, A. L., Bitner, M. J., Brown, S. W., Burkhard, K. A., Goul, M., Smith-Daniels, V., ... Rabinovich, E. (2010). Moving forward and making a difference: Research priorities for the science of service. *Journal of Service Research, 13*(1), 4–36.
Paiola, M., Saccani, N., Perona, M., & Gebauer, H. (2013). Moving from products to solutions: Strategic approaches for developing capabilities. *European Management Journal, 31*(4), 390–409.
Palo, T., Åkesson, M., & Löfberg, N. (2019). Servitization as business model contestation: A practice approach. *Journal of Business Research* (in press).
Parida, V., Sjödin, D. R., & Reim, W. (2019). Reviewing literature on digitalization, business model innovation, and sustainable industry: Past achievements and future promises. *Sustainability (Switzerland), 11*(2).
Parida, V., Sjödin, D. R., Wincent, J., & Kohtamäki, M. (2014). Mastering the transition to product-service provision: Insights into business models, learning activities, and capabilities. *Research-Technology Management, 57*(3), 44–52.
Penrose, E. T. (1959). *The theory of the growth of the firm.* New York: John Wiley.
Pfeffer, J., & Salancik, G. R. (1978). *The external control of organizations: A resource dependence perspective.* New York: Harper & Row.
Osterwalder, Alexander & Pigneur, Y. (2010). Business model generation. New Jersey: John Wiley & Sons.
Porter, M. (1980). *Competitive strategy.* New York: Free Press.
Porter, M. (1991). Towards a dynamic theory of strategy. *Strategic Management Journal, 12*(Winter special issue), 95–117.
Porter, M. (2001). Strategy and the internet. *Harvard Business Review, 79*(2), 62–78.
Porter, M., & Heppelmann, J. (2014). How smart, connected products are transforming competition. *Harvard Business Review, 92*(11), 66–68.
Porter, M., & Heppelmann, J. (2015). How smart, connected products are transforming companies. Harvard Business Review, (October), 96–112.
Powell, W. (1990). Neither market nor hierarchy: Network forms of organization. *Research in Organizational Behavior, 12*(3), 295–336.
Rabetino, R., Harmsen, W., Kohtamäki, M., & Sihvonen, J. (2018). Structuring servitization related research. *International Journal of Operations & Production Management, 38*(2), 350–371.
Rabetino, R., & Kohtamäki, M. (2018). In M. Kohtamäki, T. Baines, R. Rabetino, & A. Z. Bigdeli (Eds.). *To servitize is to reposition: Utilizing a Porterian view to understand servitization and value systems* (pp. 325–341). London: Palgrave McMillan Practices and tools for servitization: Managing service transition.
Rabetino, R., Kohtamäki, M., Lehtonen, H., & Kostama, H. (2015). Developing the concept of life-cycle service offering. *Industrial Marketing Management, 49*(August), 53–66.
Reim, W., Sjödin, D. R., & Parida, V. (2019). Servitization of global service network actors – A contingency framework for matching challenges and strategies in service transition. *Journal of Business Research* (in press).
Rymaszewska, A., Helo, P., & Gunasekaran, A. (2017). IoT powered servitization of manufacturing – An exploratory case study. *International Journal of Production Economics, 192*(October), 92–105.
Salonen, A., & Jaakkola, E. (2015). Firm boundary decisions in solution business: Examining internal vs. external resource integration. Industrial Marketing Management.
Santos, F. M., & Eisenhardt, K. M. (2005). Organizational boundaries and theories of organization. *Organization Science, 16*(5), 491–508.
Santos, F. M., & Eisenhardt, K. M. (2009). Constructing markets and shaping boundaries: Entrepreneurial power in nascent fields. *The Academy of Management Journal, 52*(4), 643–671.
Seidl, D., & Whittington, R. (2014). Enlarging the strategy-as-practice research agenda: Towards taller and flatter ontologies. *Organization Studies, 35*(10), 1407–1421.
Sjödin, D. R., Parida, V., & Kohtamäki, M. (2016). Capability configurations for advanced service offerings in manufacturing firms: Using fuzzy set qualitative comparative analysis. *Journal of Business Research, 69*(11), 5330–5335.
Sjödin, D. R., Parida, V., & Kohtamäki, M. (2019). Relational governance strategies for advanced service provision: Multiple paths to superior financial performance in servitization. *Journal of Business Research, 101*, 906–915 (August).
Sklyar, A., Kowalkowski, C., Sörhammar, D., & Tronvoll, B. (2019). Resource integration through digitalisation: A service ecosystem perspective. *Journal of Marketing Management* (In press).
Sklyar, A., Kowalkowski, C., Tronvoll, B., & Sörhammar, D. (2019). Organizing for digital servitization: A service ecosystem perspective. *Journal of Business Research.* https://doi.org/10.1016/j.jbusres.2019.02.012 (in press).
Smith, D. J. (2013). Power-by-the-hour: The role of technology in reshaping business strategy at Rolls-Royce. *Technology Analysis & Strategic Management, 25*(8), 987–1007.
Teece, D. J. (2007). Explicating dynamic capabilities: The nature and microfoundations of (sustainable) enterprise performance. *Strategic Management Journal, 28*(13), 1319–1350.
Teece, D. J. (2010). Business models, business strategy and innovation. *Long Range Planning, 43*(2–3), 172–194.
Teece, D. J., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic Management Journal, 18*(7), 509–533.
Thorelli, H. B. (1986). Network: Between markets and hierarchies. *Strategic Management Journal, 7*(1), 37–51.
Töytäri, P., Turunen, T., Klein, M., Eloranta, V., Biehl, S., & Rajala, R. (2018). Aligning the mindset and capabilities within a business network for successful adoption of smart services. *Journal of Product Innovation Management, 35*(5), 763–779.
Ulaga, W., & Reinartz, W. J. (2011). Hybrid offerings: How manufacturing firms combine goods and services successfully. *Journal of Marketing, 75*(November), 5–23.
Visnjic, I., Jovanovic, M., Neely, A., & Engwall, M. (2017). What brings the value to outcome-based contract providers? Value drivers in outcome business models. *International Journal of Production Economics, 192*(October), 169–181.
Visnjic, I., Neely, A., & Jovanovic, M. (2018). *The path to outcome delivery: Interplay of service market strategy and open business models.* Technovationin press1–14.
Williamson, O. E. (1985). *The economic institutions of capitalism.* New York: The Free Press.
Windahl, C., & Lakemond, N. (2010). Integrated solutions from a service-centered perspective: Applicability and limitations in the capital goods industry. *Industrial Marketing Management, 39*(8), 1278–1290.