

# Unveiling value co-creation within the digital servitization business models: Empirical evidence from B2B industrial firms

*Ciasullo Maria Vincenza, Montera Raffaella, Douglas Alexander*

## Abstract

The paper aims to investigate the value co-creation emergence within business models (BMs) of B2B industrial organizations that have undertaken a digital servitization strategy. A survey is conducted on a sample of 350 Italian industrial firms, whose offering comprises services. Sample companies are grouped by digital servitization BMs, classified in three archetypes (product-, process-, and outcome-oriented). Value co-creation is then assessed for each digital servitization BM by adopting the DARTT (dialogue, access, risk assessment, transparency, and technology) model. The research findings support the close link between value co-creation and digital servitization, also suggesting that the potential for value co-creation increases in moving away from product-oriented digital servitization BMs. Despite value co-creation is encapsulated in all different archetypes of digital servitization BMs, the latter differ in the management of the DARTT dimensions. Finally, the paper proposes a practitioner-oriented tool which supports management to design and redesign the BMs of industrial firms to better respond to the strategic imperative of digital servitization, simultaneously exploiting the value co-creation in B2B setting.

**Key words** – Value co-creation; digital servitization business models; B2B industrial firms; DARTT model

**Paper type** - Research paper

## 1. Introduction

The digital transition to service sits at the top of the agenda for more and more industrial organizations committed to achieve growth and competitive advantages in an increasingly complex scenario (Kowalkowski et al., 2017; Gebauer et al., 2021). The interplay between digitization and servitization falls under the umbrella of digital servitization (Kohtamäki et al., 2020; Paschou et al., 2020; Coreynen et al., 2020). This term refers to how digital technologies enable the delivery of advanced services in innovative ways (Kohtamäki et al., 2019).

When providing solutions in place of products, the value creation process requires a careful consideration of its co-creative nature (Kohtamäki and Partanen, 2016; Martin et al., 2019) since it is argued that servitization strategies can succeed if industrial companies engage in different processes to create value for and with all the involved actors (Story et al., 2017). In particular, servitization is characterized by co-creation endeavors, in which customer/user plays a central role in the development of solutions (Carlborg et al., 2018). Accordingly, co-creation indicates the collaborative activities in the provider-customer interface, associated with the solution to be developed (Oertzen et al., 2018). The co-creation efforts are aimed to not only better meet demand needs and develop more customer-oriented solutions but also to enhance service innovativeness by integrating customers' skills and knowledge (Heirati and Siahtiri, 2019; Bakir et al., 2021).

Despite the customer centricity is acknowledged as a key constituent in servitization (Smith et al., 2012; Green et al., 2017), the literature provides yet little understanding of value co-creation in the context of companies undertaking the digital transition to service. Indeed, there is need to further investigate “how value co-creation can be better organized and managed in digital servitization” (Sjödin et al., 2020b, p. 479). This call can be answered by adopting the business

model (BM) perspective considered central to characterizing servitization (Baines et al., 2017; Forkmann et al., 2017; Suppatvech et al., 2019; Raddats et al., 2019), as it describes how value is created, delivered and captured (Teece, 2010). In this regard, empirical survey-based studies are called for investigating the relation among BM's types and contextual factors favouring the service transformation, such as the transformative role of technology (Adrodegari and Saccani, 2017; Akaka et al., 2019).

Similar research efforts are even more compelling in the business-to-business (B2B) setting. In the digital servitization field, B2B is studied less than business-to-customer (B2C) despite servitization is currently converging with digitalization particularly in B2B (Kamalaldin et al., 2020; Paschou et al., 2020). B2B remains under-investigated given the greater complexity of industrial markets in terms of resource heterogeneity, changes in contextual conditions, and misalignments among actors (Gebauer et al., 2020). As confirmation, the diffusion of the value in use logic deriving from servitization is particularly widespread in B2C, while in B2B is still emerging (Corsaro and Maggioni, 2021). Thus, further investigation is required from a practical and theoretical standpoint. However, it is increasingly difficult to set boundaries between B2B and B2C settings because customer co-creation is ever more depicted in an ecosystem view in which multiple and different actors from both marketplaces are involved in relationships rather than mere transactional exchanges (Gummesson and Polese, 2009; Polese et al., 2017; Peters et al., 2020; Mingione and Leone, 2020).

The present article aims to fill such research gaps by addressing the following research question: *RQ: How value co-creation is encapsulated in the digital servitization BMs of B2B industrial firms?*

With this in mind, a survey is conducted on a sample of Italian industrial firms whose value co-creation score is assessed through the DARTT (dialogue, access, risk assessment, transparency, technology) model (Pralhad and Ramaswamy, 2004a, 2004b; Schiavone et al., 2014). It is herein used for strategically understanding co-creation through its dimensions that shed light on how value co-creation takes place through collaborative dynamics (Payne et al., 2008; Solakis et al., 2017). Thus, the DARTT model is the suitable key to capture the relational logic that moves all markets. Sample firms are then grouped by different digital servitization BMs' archetypes (Paiola and Gebauer, 2020). By re-reading these archetypes through the DARTT model, a more complex interpretation of digital servitization is proposed in a systemic view. Instead of focusing only on the adaptations of the value proposition to the digitalization, we also considered the efforts of adjusting all the integrated components of BM to better fit the interlinked digital value drivers. The latter indeed puts tremendous pressure on industrial companies to adapt their BMs to stay competitive (Kiel et al., 2017).

As a result, the industrial marketing research is enriched by contributing to the knowledge on the emerging topic of value co-creation within the digital servitization BMs of industrial firms. Thus, while the servitization literature often describes the 'destination' to which digitalization leads, our study considers the different relational 'engines' of digital servitization. The main contribution lies in the elaboration of a map proposed to represent the value co-creation within the digital servitization BMs in B2B industrial firms. In doing so, important insights for managers are provided by developing a practitioner-oriented tool which supports a digitally-enabled service transformation.

The paper is structured as follows. To begin, the theoretical foundation of the value co-creation in digital contexts and digitally servitized business models are introduced. Next, the exploratory study is described, followed by the presentation of the findings and discussion of results. Finally, the paper concludes with implications, limitations, and future research.

## **2. Theoretical background**

### *2.1 Value creation in digital BtoB contexts*

The traditional view of marketing with its focus on creating and delivering value has been challenged by the service dominant (S-D) logic of marketing (Vargo and Lusch, 2004, 2008, 2016). It holds that value cannot be delivered to the customer. Rather, value is “determined by the customer on the basis of value in use” (Vargo and Lusch, 2004, p. 7). In particular, value is defined and cocreated by the customer (Vargo and Lusch, 2016), and co-creation only occurs if the customer is actively engaged in the service for service exchange through the ‘value-in-use’ concept (Grönroos and Voima, 2013). Under this perspective, value co-creation is intended as a complex, “joint, collaborative, concurrent, peer-like process of producing new value, both materially and symbolically” (Galvagno and Dalli, 2014, p. 644). In BtoB context, scholars have discussed value co-creation at different levels such as dyadic relationships, cross-functional teams or at the organizational level (Mingione and Leoni, 2020). Recently, researchers also focused on the relationship between actors in value co-creation processes and introduced the concepts of actor-to-actor (Gummesson and Mele, 2010; Nariswari and Vargo, 2015; Vargo and Lusch, 2011) and actor-for-actor (Polese et al., 2017). This approach suggests that multiple stakeholders, including provider and customers, can take on many roles and enact a multitude of practices that contribute to value co-creation. This has challenged the conventional perception that value is created through dyadic interactions between B2B provider and customer (Grönroos and Voima, 2013; Hohenschwert and Geiger, 2015). At the same time, due to the fast of digital technologies growth, value co-creation is evolving into a broad domain, including the study of dynamic interactions among technological and human systems which led to reconceptualize actors’ engagement and resource integration as well as driving managerial and organizational change in digitized value creation processes (Breidbach and Maglio, 2016). Digital technologies, such as social media, intelligent machines, video conferencing, marketing automation, virtual reality and CRM 4.0, have created new spaces for interactions also reshaping existing ones (Boyd and Koles, 2019). For example, virtual marketplaces allow new connections and collaborations, thus enhancing opportunities for resource combining to advance innovative services (Hunter and Perrault, 2007).

The dialogue, access, risk assessment, transparency (DART) model embraces the key components of value co-creation process (Pralhad and Ramaswamy, 2004a, 2004b). Specifically, dialogue implies interactivity, deep engagement, commitment, as well as the ability and willingness to change and adapt. The access refers to the opportunity for customer/user to co-create value with the provider by easily accessing to activities and resources used to create and deliver the service offerings. Risk assessment provides a full understanding of costs and benefits associated with the co-creation of the offering. Transparency is based on the information sharing to establish trust between the user and the provider. Of note, the DART components are interdependent since a genuine dialogue requires timely access and transparency that facilitate a more accurate assessment of the risk-benefits of value co-creation decisions and practices.

As stated previously, the emergence of digital technologies is significantly changing the process and characteristics of interaction between firms and users during co-creation. Service exchange traditionally occurred in-person between the customer and service provider as two primary actors. The rise of digitalization has implied the shift from dyadic relationships from interactions with a wide variety of actors, also non-humans (i.e., apps, social media, virtual reality and CRM 4.0, etc.), that affect value co-creation processes (Breidbach and Maglio, 2016; Caridà et al., 2019; Ciasullo et al., 2021). Digitalization has indeed generated new spaces for interaction among and between actors within business networks through an exponential growth of the number and type of touchpoints (Jaakkola and Alexander, 2014; Shams and Kaufmann, 2016). This abundance has affected the inter-firm relationships within the business ecosystem, generating relational complexity. The latter has blurred the structural boundaries of companies in favor of contextual one, also pushing to rethink the approach to collaboration and cooperation toward a stronger ecosystem and cross-channel interaction (Plouffe, 2018).

The diffusion of digitalization highlights a strong weakness of the traditional conceptualisation of the DART model. It indirectly assumed that technology is a mere infrastructure of communication among and between actors, while an effective exploitation of digital technologies

for co-creation requires companies to manage technology as a strategic asset. Under this perspective, drawing on the works of Prahalad and Ramaswamy (2004a, 2004b), Schiavone et al. (2014) extend the DART model with the technology dimension, introducing the DARTT model for co-creation. Thus, within the co-creation process, technology management requires a reconceptualization of the value creating activities, practices, and resources to attract users, encourage their active participation, and support their engagement.

## *2.2 Digitally servitized business models and archetypes*

The servitization literature has extensively discussed the strategic and operational challenges associated with the service transition of industrial companies (Baines et al., 2017; Kamal et al., 2020; Bigdeli et al., 2021). In this regard, it has established that servitization requires a strategic change toward the adoption of a service-centric approach according to which services represent the primary growth lever for meeting customer demand (Banoun et al., 2016; Payne et al., 2020).

Furthermore, prior research has acknowledged that servitization involves multi-level transformational challenges (Khanra et al., 2021). Being required service-centric capabilities to servitize (Jovanovic et al., 2019), they may be developed within firms and acquired through close partnerships with service providers, distributors and other firms specialized in knowledge-based know-how within a collaborative ecosystem (Bustinza et al., 2019; Reim et al., 2019). At the same time, the development of an organizational culture that facilitates the delivery of servitized offerings is also needed (Baik et al., 2019). Additionally, a service-driven reconfiguration of the existing BM represents a further crucial transformation for servitizing firms (Forkmann et al., 2017; Adrodegari and Sacconi, 2017). This entails fundamental changes in the way of aligning value distribution, creation and capture mechanisms with individual customer interests (Zhang and Banerji, 2017; Ciasullo and Montera, 2021). In general, a service BM calls for suppliers committed to increase customers' value in use, assuming greater responsibility for the entire value-creation process as compared to product-centric BMs (Kowalkowski et al., 2017). Accordingly, servitized BMs allow potential benefits, such as creation of higher barriers for competitors and guarantee of regular recurring revenue from a loyal customer base (Kamp and Parry, 2017; Kohtamäki et al., 2020).

In this picture, the role of last generation digital technologies (i.e., Internet of Things - IoT, 3D printing, big data and relating analytics, cloud platforms, virtual and augmented reality) is disruptive since their adoption could enhance industrial firms to redesign service-oriented BMs fostering the provision of servitized offerings (Bressanelli et al., 2018; Suppatvech et al., 2019). This has paved the way to the digital servitization defined as “the transformation in processes, capabilities, and offerings within industrial firms and their associated ecosystems to progressively create, deliver, and capture increased service value arising from a broad range of enabling digital technologies” (Sjödin et al., 2020, p. 479). As a specific research stream (Sklyar et al., 2019; Paschou et al., 2020), digital servitization is also referred to the adoption of digital tools for transformational processes whereby a company shifts from a product-centric to a service-centric business model and logic (Kowalkowski et al., 2017). From this perspective, digital servitization acts as a crucial driver for the radical transformation of manufacturers' BMs and BM innovation (Kohtamäki et al., 2019; Frank et al., 2019). In particular, digital servitization requires the shift from a transactional perspective to a relational one according to which value originates in relationships, instead of being incorporated into the products or services provided between buyers and sellers (Ulaga & Eggert, 2006; Kienzler et al., 2019). In this logic, providers' business processes need to be integrated into customers' business processes (Matthyssens and Vandenbempt, 2008) characterized by mutually profitable relationships and also by improving trust in the long-term (Kamalaldin et al., 2020).

Despite the scientific and managerial importance of this research field, few studies have been conducted on the relation between adoption of advanced digital technologies and service-based BMs in the industrial markets (Rymaszewska et al., 2017; Coreynen et al., 2017; Paiola and Gebauer, 2020).

Recently, the digital servitization literature discusses the impact of technologies on BM configurations, identifying various archetypes useful to classify the digitally servitized BMs according to the parameters considered. For instance, Kohtamaki et al. (2019) propose five types of BMs (product-oriented service provider, industrializer, customized integrated solution provider, platform provider, and outcome provider) given the different combinations of pricing, customization, and digitization. Suppatvech et al. (2019) identify four archetypes of servitized BMs via IoT (add-on, sharing, usage-based, solution-oriented) by considering their different value propositions. Paiola and Gebauer (2020) classify three digital servitization BMs based on a progressively intensive use of IoT technologies.

Our paper adopts the Paiola and Gebauer (2020)'s classification that we extend to the servitized BMs enabled by digital and smart artifacts. The configurations discussed by Paiola and Gebauer (2020) can be aligned with Tukker (2004)'s archetypes (product-, use-, and result-oriented) considered the most appropriate within the product-service system (PSS) BM (Yang and Evans, 2019). More specifically, the product-oriented digital servitization BM adopts digital technologies to add tailored services or additional functions to the existing offering. This archetype corresponds to product-oriented PSS where the efficiency of product-related services (i.e., maintenance, warranties, product training) is enhanced by digital technologies. Conversely, the process-oriented digital servitization BM, associated with use-oriented PSS, regards the adoption of digital technologies for delivering services to increase the efficiency of customers' business processes. Finally, the outcome-oriented digital servitization BM suits result-oriented PSS where there are long-term agreements between firms and customers to deliver specific results/outcomes relevant to the customers, also providing capabilities and know-how to satisfy mutually objectives.

### **3. Method**

#### *3.1 Study setting and sample selection*

Italy is chosen as research setting because few researches empirically analyses the adoption of servitization in the Italian case (i.e., Mastrogiacomo et al., 2017; Bonfanti et al., 2018, Leoni, 2019; Rapaccini et al., 2020). There is paucity of studies despite Italy is the second largest industrial manufacturing country in Europe, and its productivity can benefit considerably from a greater competition and efficiency of services (European Commission, 2018).

A qualitative research was designed by involving Italian small and medium-sized (SMEs) and large companies operating in the industrial sectors and drawn from the AIDA database. It includes personal, commercial and financial data of about 1,000,000 companies registered in Italy (Bureau Van Dijk, 2017). Data were downloaded by selecting B2B companies with a number of employees greater than 50, belonging to the NACE (Nomenclature statistique des Activités économiques dans la Communauté Européenne) sectors classified with codes 10-32 (European Community, 2002), and having invested on digital technologies for Industry 4.0 over the previous five years.

According to these parameters, 8.215 companies were identified. Since the AIDA database provides a textual overview of the core activities carried out by every indexed company, an automatic lexicographical search (i.e., technical support, maintenance, consultancy, training, etc.) within the textual overview has been implemented to discriminate industrial companies that provide service activities. These limitations resulted in a sample of 350 companies.

#### *3.2 Data collection*

One respondent per sample companies, in the positions of general manager, marketing manager, digital marketing manager, chief executive officer, or chief innovation officer, was involved in a survey lasted from November 2020 to April 2021. The questionnaire, created and managed within the SurveyMonkey platform, consisted of four sections and 34 close questions. The first section briefly described the survey purpose, the identity of the researchers, and the average time required

to complete the survey. How the collected data would be used and guarantees of the confidentiality of answers were also specified. The second section contained questions on the sample profile related to industrial sector, firm size, value system, service typologies offered, digital technologies used for servitization. The third section is aimed to identify which archetype, adapted by the Paiola and Gebauer (2020)'s classification, well fit the digitally servitized BMs of the sample companies. Finally, the fourth section investigated the DARTT dimensions of value co-creation process between sample companies and their customers. In details, dialogue, access, risk assessment and transparency were assessed through Albinsson et al. (2016)'s scale, while technology was measured by drawing on Schiavone et al. (2014)'s conceptualization.

Before the full-scale formal survey, a pilot test was conducted involving a convenience sample of 20 executives to assess the response latency and check for correct understanding of the questions (Lavrakas, 2008).

### 3.3 Data analysis

Two steps occurred to analyse the collected data. In the first step of analysis, sample companies were grouped by digitally servitized BMs. In the second step of analysis, a value co-creation score was assessed by adopting a scoring procedure proposed by Siano et al. (2017). The possible scores ranged from 0 to 100 and each DARTT dimension was a macro-item containing a specific number of micro-items. By dividing the maximum achievable score (100) by all micro-items of the DARTT dimensions (24), a base value was obtained (4.16). By multiplying the base value by the number of micro-items of each DARTT dimension, we obtained the ranges for each macro-item, such as: i) dialogue: 0-37.44; ii) access: 0-12.48; iii) risk: 0-24.96; iv) transparency: 0-16.64; and, v) technology: 0-8.32.

## 4. Results

A total of 104 responses were received, of which 6 were discarded because they were incomplete or had response set problems. Therefore, 98 valid responses were used, representing a 28% effective response rate.

Table 1 shows the general profile of the sample companies, grouping them by digital servitization BMs. Product-oriented digital servitization BM is adopted by 44% of the sample. It mainly embraces small firms (41%) that produce and sell machinery (33%). These companies provide protective services, which typically include customer helpdesk, product training, and product installation. They use basic digital technologies, such as corporate website and product remote control.

43% of the sample shows a process-oriented digital servitization BM that mostly characterizes medium-size organizations (56%) operating in industrial equipment and transportation industries in which forklift truck and earth moving machines represent the main core offering (39%). They adopt advanced digital technologies (big data and analytics, digital platforms, cloud computing) to linked to the development of reactive services (e.g., data valorisation, diagnostic and preventive maintenance, CRM 4.0, and ticketing and troubleshooting to provide remote assistance).

Outcome-oriented digital servitization BM concerns the minority of the sample (13%) consisting of large firms (54%) in the automotive and automation industries (44%). Their offering is based on proactive services such as interconnectivity between physical and virtual objects, accessibility to real-time data, virtual prototyping enabled by advanced technologies (e.g., Internet of Things, blockchain, Artificial Intelligence, augmented or virtual reality).

Table 1 – Outline of firms' characteristics

	Digital servitization BMs		
	Product-oriented	Process-oriented	Outcome-oriented
Industry	Machinery	Industrial equipment Transportation	Automotive Automation

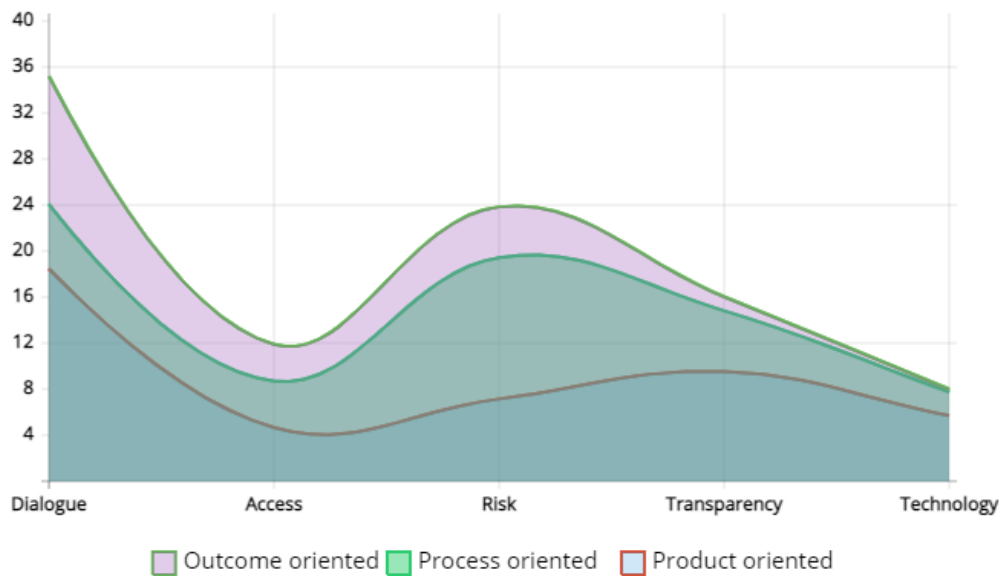
Firm size	Small	Medium	Large
Value system	OEM*	OEM*	OEM*
Service types	Protective	Reactive	Proactive
Digital technologies	Basic	Advanced	Advanced

\*Original Equipment Manufacturer

Source: Own elaboration

Moreover, outcome oriented digital servitization BM is distinguished from the other archetypes since the value co-creation herein achieves the highest scores that are also near to the maximum achievable score according to the ranges for each DARTT dimension (Dialogue: 35.21; Access: 11.90; Risk: 23.85; Transparency: 16.03; Technology: 8) (Fig. 1).

Figure 1 – DARTT scores by digital servitization BMs



Source: Own elaboration

## 5. Discussion

The analysis of value co-creation within BMs of industrial organizations that have undertaken digital servitization strategy allows us in the first place to underline the close link between value co-creation and servitization.

This evidence is in line with the servitization's view as essentially a co-creation endeavour that involves provider and user spheres (Carlborg et al., 2018). More in depth, value co-creation results encapsulated in all different archetypes considered, confirming that a sine qua non condition for the implementation of servitized BMs is the co-creation of design and delivery of the product-service combinations (Ruiz-Alba et al., 2019). In line with Ehret and Wirtz (2017), the shift from a transactional view to a relational one occurs since the value creation actualized in renovate value propositions is an element rather than only reason of the business relations (Kienzler et al., 2019; Ulaga and Eggert, 2006). Similar shift is fostered by the different contexts in which value is created. In particular, Original Equipment Manufacturers (OEMs) leverage the opportunities for value creation by integrating a set of advanced digital tools (i.e. virtual assistants, predictive and artificial intelligence) that allow listening, attracting, and engaging users. Then, in the actor network, each misalignment is reduced, information sharing is enhanced, and the various actors involved act and create value (Chandler and Vargo, 2011; Vargo et al., 2017).

The study also suggests that in moving away from product-oriented digital servitization BMs, the potential for value co-creation increases. The archetypes indeed differ in value co-creation scores, highlighting some differences in the management of DARTT dimensions.

In the product-oriented digital servitization BM, firms show a tactical approach to the value co-creation, as the lowest scores of the DARTT lead us to think. Due their small size, the companies face the paucity of essential resources (financial, behavioural, knowledge, temporal constrain), that hinders to evade the commoditization trap and induces a liability of smallness (Valaei et al., 2016). Under these conditions, reasonable ways for easing these internal constraints are the so-called “tactics of the weak” (Appiah et al., 2021). The DARTT dimensions are employed as tactics to create and exploit opportunities for users’ involvement and participation to access resource reservoirs outside organizational boundaries. However, this inside-out logic could create one-way benefits that generate tensions and value co-destruction in digitalized business relationships. Finally, digital technologies are managed as single and not interacting touchpoints supporting just temporary or instantaneous users-firm interactions.

In the process-oriented digital servitization BM, firms manage the common sphere of creating value with a sharing attitude, according to our interpretation of the DARTT’s medium scores. Companies adopting digital servitization strategies indeed address their efforts on assuring that the customers are improving their processes and developing their capabilities. In this sense, advanced technologies enable companies to integrate their processes with customers’ value processes, generating innovative solutions for competing in complex markets (Ulaga and Reinartz, 2011; Grandinetti et al., 2020). Thus, the reactive services are seen as highly differentiating value-adding properties of a product-service combination designed to fulfil mutual needs and create joint value. The DARTT dimensions are employed as strategies aimed to synergistically create modularity. Modularization in the servitization context allows high customization and operational adaptiveness to multi-actor contexts of use (Rajala et al., 2019; Ciasullo et al., 2021). Anyway, the process oriented digital servitization BM supports and facilitates the only customers in mixing and matching resources at one or another digital touchpoint (i.e, technologies, interfaces, artefacts enabling servitization), revealing a perspective still far from a digital service centrality. Then, in the process-oriented digital servitization BM, the main contribution is its focus on service delivery as an activity rather than as an output and the customer is seen to participate in the production process rather than just at the point of output.

In addition, both product- and process-oriented digital servitization BMs represent the dominant archetypes having an almost equally distributed presence of firms. This suggests that the Italian companies are experiencing an ‘initial’ servitization maturity stage in the analysed sectors, as previous studies highlighted (Adrodegari et al., 2018; Leoni, 2019). Anyway, the percentage of companies adopting process oriented digital servitization BMs is proof of a stronger awareness of service-centric logic’s importance in entrepreneurial scenario in Italia.

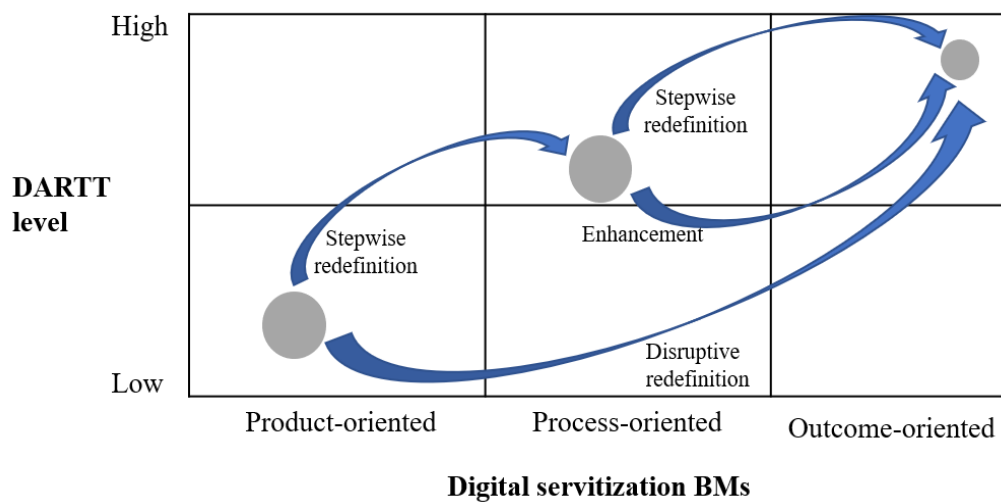
In the outcome-oriented digital servitization BM, firms show a transformational approach to the value co-creation, as the higher score of the DARTT suggest. The management of co-creation is aimed to the identity repositioning of the company shifting into a comprehensive service-oriented mindset and cultural openness to advanced digital technologies that are embedded in the firm’s decision-making. In this logic, the DARTT dimensions represent the levers to achieve a digitally servitized identity accommodating both service-centricity and technological innovation. These two facets, often difficult to reconcile (Perks et al., 2017; Tronvoll et al., 2020), could be merged by the agility as capacity to constantly reconfigure the firm in changing environments (Weber and Tarba, 2014; Bustinza et al., 2018). Agility is essential for sustaining value co-creation within long-term servitization plans. On this basis, outcome oriented digital servitization BM can be considered the archetype that best captures the role of co-creation in the implementation of servitization strategies in B2B context. This finding is coherent with the description of BMs through increasing complex configurations (ranging from products and add-on services to a certain outcome) corresponding to an ever-greater customer centrality (Kohtamäki et al., 2019; Suppatvech et al., 2019). In this direction, value co-creation is allowed to all the involved and committed ecosystem actors. They



can speed the interactions and the related processes, and nourish resource exchange, switching from one to another digital touchpoint (i.e, technologies, interfaces, artefacts enabling servitization). Thus, the several touchpoints act as multisided intermediaries of connection, which enhance access and engagement opportunities for the entire ecosystem. Then the main contribution of this archetype is its focus on resource integration by various actors in a service ecosystem (Barile et al., 2017).

Building on above-discussed findings, we propose a map to represent the value co-creation within the digitally servitized BMs in B2B industrial firms. Two variables are used to build the map (Fig. 2): on the one side, the low and high DARTT level due to the total value co-creation score of the sample firms grouped by BMs' archetypes; on the other, the different configurations of digital servitization BMs. The map contains the firms represented by circles having various sizes according to the percentage of companies included.

Figure 2 – Mapping value co-creation within the digitally servitized BMs



Source: Own elaboration

The map shows some strategic moves that can be undertaken to achieve the BM configuration which better combines digital servitization and value co-creation. As we have seen, outcome-oriented digital servitization BM is the most successful archetype because all DARTT dimensions are closely integrated in an organizational context characterized by both technological and market readiness. It implies compatible information flows (Jayashankar et al., 2018), well-established and well-communicated security procedures such as trust strategies emphasizing endpoint security, data privacy and transparency (Yucesoy, 2019). To seizing the opportunity to open to this archetype, firms adopting product-oriented digital servitization BM with low DARTT level may address their efforts towards a redefinition of mechanisms to create, deliver, and capture value through gradual steps (stepwise redefinition: from product- to process-oriented, and from process- to outcome-oriented) or direct move (disruptive redefinition: from product- to outcome-oriented). Instead, in the case of firms adopting process-oriented digital servitization BM with medium DARTT level may focus on the enhancement of interactions with ecosystem' actors, accumulating experience and learning knowledge valuable for making the transition to more complete BM.

## 6. Implications and limitations

The paper impacts both on theory and practice, shedding some light on a research stream that is still in its infancy. Regarding the theoretical implications, we contribute to expand the scientific evidence and to enhance the industrial marketing research on digital servitization in two directions. To begin, we fill the gap of an empirical investigation providing a sketch on the state of adoption of

digitally servitized BMs in B2B settings. Then, we contribute to the knowledge on the emerging topic of value co-creation within the digitally servitized BMs of industrial firms, assessing the different relational ‘engines’ of digital servitization in terms to DARTT dimensions.

The study is also interesting for practitioners. The map proposed to represent the value co-creation within the digitally servitized BMs in B2B industrial firms may have three different purposes: descriptive (diagnostic tool to assess the current position of a company), prescriptive (identify desirable DARTT levels and provide guidelines to achieve the most successful archetype of digital servitized BM) and comparative (internal or external benchmarking). Thus, the opportunities for effectively use this map in the organizational contexts are many and interesting because it works as a practitioner-oriented tool which supports management to design and redesign the BMs of industrial firms to better respond to the strategic imperative of digital servitization. This is true above all during the Covid age that has become crucial the abilities to navigate disruptive crises through service-led growth and to exploit the acceleration of digital transformation.

As with any research, the study comes with some limitations that outline directions for future research. First, it is acknowledged the limited generalizability of the research findings. Thus, the data collection can be further extended in terms of economic contexts and geographical areas to replicate findings from this study. Second, DARTT model allows assessing the presence of value co-creation dimensions at a given time while B2B relationships should be analysed in a dynamic way (Iansiti and Lakhani, 2014) by conducting, for example, longitudinal studies. Third, digital servitization BMs are not investigated at a fine granularity level because the paper does not shed light on the building blocks of each archetype that could be analysed in future.

## References

- Adrodegari, F., Sacconi, N. (2017). “Business models for the service transformation of industrial firms”. *The Service Industries Journal*, 37(1), 57-83.
- Adrodegari, F., Bacchetti, A., Sacconi, N., Arnaiz, A., Meiren, T. (2018). “The transition towards service-oriented business models: A European survey on capital goods manufacturers”. *International Journal of Engineering Business Management*, 10, 1-10.
- Akaka, M.A., Koskela-Huotari, K. and Vargo, S.L. (2019), “Further advancing service science with service-dominant logic: Service ecosystems, institutions, and their implications for innovation”, in Maglio, P.P., Kieliszewski, C.A., Spohrer, J.C., Lyons, K., Patricio, L. and Sawatani, Y. (Ed.), *Handbook of Service Science*, Vol. 2, Springer Nature Switzerland AG, Cham, pp. 641-659.
- Albinsson, P.A., Perera, B.Y., Sautter, P.T. (2016). DART scale development: Diagnosing a firm’s readiness for strategic value co-creation. *Journal of Marketing Theory and Practice*, 24(1), 42-58.
- Appiah, G., Bonsu, S.K., Sarpong, D. (2021), “The unpowered customer: Co-creation as tactics of the weak”, *Journal of Business Research*, 133, 317-326.
- Baik, K., Kim, K.Y., Patel, P.C. (2019). “The internal ecosystem of high performance work system and employee service-providing capability: A contingency approach for servitizing firms”. *Journal of Business Research*, 104, 402–410.
- Baines, T.S., Lightfoot, H.W., Benedettini, O., Kay, J.M. (2009). The servitization of manufacturing: A review of literature and reflection on future challenges. *Journal of Manufacturing Technology Management*, 20(5), 547–567.
- Baines, T., Bigdeli, A.Z., Bustinza, O.F., Shi, V.G., Baldwin, J., Ridgway, K. (2017), “Servitization: Revisiting the state-of-the-art and research priorities”, *International Journal of Operations & Production Management*, 37(2), 256-278.

- Bakir, L., Loohuis, R.P., Nieuwenhuis, L.J. (2021). "What drives service co-creation in B2B? The role of customers in co-creating servitized offerings" (pp. 97-103). In Ziaee Bigdeli, A., Baines, T., Rapaccini, M., Saccani, N., Adrodegari, F. (2021). *Servitization: a pathway towards a resilient, productive and sustainable future*, Proceedings of the Spring Servitization Conference, 10-12 May 2021.
- Banoun, A., Dufour, L., Andiappan, M. (2016), "Evolution of a service ecosystem: Longitudinal evidence from multiple shared services centers based on the economies of worth framework", *Journal of Business Research*, 69(8), 2990-2998.
- Barile, S., Ciasullo, M. V., Troisi, O., and Sarno, D. (2017), "The role of technology and institutions in tourism service ecosystems: Findings from a case study", *The TQM Journal*, 29, 811-833.
- Bigdeli, A.Z., Kapoor, K., Schroeder, A., Omidvar, O. (2021). "Exploring the root causes of servitization challenges: An organisational boundary perspective". *International Journal of Operations & Production Management*, 1-27.
- Bonfanti, A., Del Giudice, M., Papa, A. (2018), "Italian craft firms between digital manufacturing, open innovation, and servitization", *Journal of the Knowledge Economy*, Vol. 9 No. 1, pp. 136-149.
- Breidbach, C.F., Maglio P.P. (2016). Technology-enabled value co-creation: An empirical analysis of actors, resources, and practices. *Industrial Marketing Management*, 56, 73-85.
- Bressanelli, G., Adrodegari, F., Perona, M., Saccani, N. (2018). "Exploring how usage focused business models enable circular economy through digital technologies". *Sustainability*, 10(3), 639.
- Bureau Van Dijk (2017). AIDA. Available at <http://www.bvdinfo.com/en-gb/our-products/company-information/national-products/aida>.
- Bustinza, O.F., Gomes, E., Vendrell-Herrero, F., Tarba, S.Y. (2018), "An organizational change framework for digital servitization: Evidence from the Veneto region", *Strategic Change*, 27(2), 111-119.
- 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*, 104, 393-401.
- Caridà, A., Edvardsson, B., Colurcio, M. (2019). "Conceptualizing resource integration as an embedded process: matching, resourcing and valuing". *Marketing Theory*, 19(1), 65-84.
- Carlborg, P., Kindström, D., Kowalkowski, C. (2018). *Servitization practices: A co-creation taxonomy*. In Kohtamäki, M., Baines, T., Rabetino, R., & Bigdeli, A. Z. (2018). *Practices and Tools for Servitization* (pp. 309-321). Palgrave Macmillan, Cham.
- Chandler, J.D. and Vargo, S.L. (2011) "Contextualization and Value-in-context: How Context Frames Exchange", *Marketing Theory* 11(1): 35-49.
- Ciasullo M.V., Montera R. (2021). *Digital servitization in B2B manufacturing systems. Combining theory and practice for competitiveness enhancement*. Milano: Franco Angeli.

- Ciasullo, M.V., Polese, F., Montera, R., Carrubbo, L. (2021). "A digital servitization framework for viable manufacturing companies". *Journal of Business and Industrial Marketing*, forthcoming.
- 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.
- Coreynen, W., Matthyssens, P., Vanderstraeten, J., Witteloostuijn, A.V. (2020). "Unravelling the internal and external drivers of digital servitization: A dynamic capabilities and contingency perspective on firm strategy". *Industrial Marketing Management*, 89, 265-277.
- Corsaro, D., Maggioni, I. (2021). "Managing the sales transformation process in B2B: Between human and digital", *Italian Journal of Marketing*, 1, 25-56.
- 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.
- European Commission (2018), "European Commission Country Report – Italy", available at: <https://ec.europa.eu/info/sites/info/files/2018-european-semester-country-report-italy-en.pdf>.
- European Community (2002). Commission Regulation (EC). Gazzetta Ufficiale L 006, 10/01/2002, 3-34.
- Frank, A.G., Mendes, G.H., 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*, 141, 341-351.
- 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.
- Galvagno, M., Dalli, D. (2014). Theory of value co-creation: A systematic literature review. *Managing Service Quality*, 24 (6), 643-683.
- Gebauer, H., Fleisch, E., Lamprecht, C., Wortmann, F. (2020). "Growth paths for overcoming the digitization paradox", *Business Horizons*, 63(3), 313-323.
- Gebauer, H., Paiola, M., Sacconi, N., Rapaccini, M. (2021). "Digital servitization: Crossing the perspectives of digitization and servitization", *Industrial Marketing Management*, 93, 382-388.
- Grandinetti, R., Ciasullo, M.V., Paiola, M., Schiavone, F. (2020), "Fourth industrial revolution, digital servitization and relationship quality in Italian B2B manufacturing firms. An exploratory study", *The TQM Journal*, 32(4), 647-671.
- Green, M.H., Davies, P., Ng, I.C. (2017). "Two strands of servitization: A thematic analysis of traditional and customer co-created servitization and future research directions". *International Journal of Production Economics*, 192, 40-53.
- Grönroos, C., Voima, P. (2013). "Critical service logic: Making sense of value creation and co-creation". *Journal of the Academy of Marketing Science*, 41(2), 133–150.
- Gummesson, E. and Polese, F. (2009), "B2B is not an island!", *Journal of Business & Industrial Marketing*, Vol. 24 Nos 5/6, pp. 337-350.
- Heirati, N., Siahtiri, V. (2019). "Driving service innovativeness via collaboration with customers and suppliers: Evidence from business-to-business services", *Industrial Marketing Management*, 78, 6-16.

- Hohenschwert, L., Geiger S. (2015). "Interpersonal influence strategies in complex B2B sales and the socio-cognitive construction of relationship value". *Industrial Marketing Management* 49, 139-150.
- Iansiti, M., Lakhani, K.R. (2014). "Digital ubiquity: How connections, sensors, and data are revolutionizing business". *Harvard Business Review*, 92(11), 19.
- Jaakkola, E., Alexander, M. (2014). "The role of customer engagement behavior in value co-creation: A service system perspective". *Journal of Service Research*, 17(3), 247–261.
- Jayashankar, P., Nilakanta, S., Johnston, W. J., Gill, P., & Burres, R. (2018). "IoT adoption in agriculture: the role of trust, perceived value and risk". *Journal of Business & Industrial Marketing*, 33(6), 804-821.
- 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*, 104, 472–485.
- Khanra, S., Dhir, A., Parida, V., Kohtamäki, M. (2021). "Servitization research: A review and bibliometric analysis of past achievements and future promises". *Journal of Business Research*, 131, 151-166.
- Kienzler, M., Kindtrom, D., Brashear-Alejandro, T. (2019). Value-based selling: A multi-component exploration. *Journal of Business & Industrial Marketing*, 34(2), 360–373.
- Kamal, M.M., Sivarajah, U., Bigdeli, A.Z., Missi, F., Koliouisis, Y. (2020), "Servitization implementation in the manufacturing organisations: classification of strategies, definitions, benefits and challenges", *International Journal of Information Management*, 55, 102206.
- Kamalaldin, A., Linde, L., Sjödin, D., Parida, V. (2020). "Transforming provider-customer relationships in digital servitization: A relational view on digitalization", *Industrial Marketing Management*, 89, 306-325.
- Kamp, B., Parry, G. (2017). "Servitization and advanced business services as levers for competitiveness". *Industrial Marketing Management*, 60, 1-17.
- Kiel, D., Arnold, C., Voigt, K.I., (2017). "The influence of the Industrial Internet of Things on business models of established manufacturing companies – a business level perspective", *Technovation* 68, 4-19.
- Kienzler, M., Kindtrom, D., Brashear-Alejandro, T. (2019). "Value-based selling: A multi-component exploration". *Journal of Business & Industrial Marketing*, 34(2), 360–373.
- Kohtamäki, M., Parida, V., Oghazi, P., Gebauer, H., Baines, T. (2019). "Digital servitization business models in ecosystems: A theory of the firm". *Journal of Business Research*, 104, 380-392.
- Kohtamäki, M., Parida, V., Patel, P.C., Gebauer, H. (2020), "The relationship between digitization and servitization: The role of servitization in capturing the financial potential of digitization", *Technological Forecasting and Social Change*, 151, 1-9.
- Kohtamäki, M., Partanen, J. (2016). "Co-creating value from knowledge-intensive business services in manufacturing firms: The moderating role of relationship learning in supplier-customer interactions". *Journal of Business Research*, 69(7), 2498-2506.
- Kowalkowski, C., Gebauer, H., Kamp, B., Parry, G. (2017). "Servitization and deservitization: Overview, concepts, and definitions". *Industrial Marketing Management*, 60, 4-10.
- Kowalkowski, C., Gebauer, H., Oliva, R. (2017). "Service growth in product firms: Past, present, and future". *Industrial Marketing Management*, 60, 82-88.

- Kowalkowski, C., Ulaga, W. (2017). *Service strategy in action: A practical guide for growing your B2B service and solution business*. Scottsdale, AZ: Service Strategy Press.
- Lavrakas, P. J. (2008). *Encyclopedia of survey research methods*. Sage publications.
- Martin, P.C.G., Schroeder, A., Bigdeli, A. Z. (2019). “The value architecture of servitization: Expanding the research scope”, *Journal of Business Research*, 104, 438-449.
- Mastrogiacomo, L., Barravecchia, F. and Franceschini, F. (2017), “A general overview of manufacturing servitization in Italy”, *Procedia CIRP*, Vol. 64, pp. 121-126.
- Matthyssens, P., Vandenbempt, K. (2008). “Moving from basic offerings to value-added solutions: Strategies, barriers and alignment”. *Industrial Marketing Management*, 37(3), 316–328.
- Mingione, M., Leoni, L. (2020). “Blurring B2C and B2B boundaries: corporate brand value co-creation in B2B2C markets”. *Journal of Marketing Management*, 36(1/2), 72-99.
- Nariswari, A., Stephen L. Vargo (2015). “From B2C to B2B to A2A: A translation perspective on theory development.” *Kundenintegration und Leistungslehre*. Springer Gabler, Wiesbaden, 113-133.
- Oertzen, A.S., Odekerken-Schröder, G., Mager, B. (2020). Driving users’ behaviours and engagement in co-creating services. *Journal of Services Marketing*, 29(4), 641-679.
- Paiola, M., Gebauer, H. (2020). “Internet of things technologies, digital servitization and business model innovation in BtoB manufacturing firms”. *Industrial Marketing Management*, 89, 245-264.
- Paschou, T., Rapaccini, M., Adrodegari, F., Saccani, N. (2020). “Digital servitization in manufacturing: A systematic literature review and research agenda”. *Industrial Marketing Management*, 89, 278-292.
- Payne, E.H.M., Dahl, A.J., Peltier, J. (2021). “Digital servitization value co-creation framework for AI services: a research agenda for digital transformation in financial service ecosystems”. *Journal of Research in Interactive Marketing*, 2040-7122.
- Payne, A.F., Storbacka, K., Frow, P. (2008). “Managing the co-creation of value”. *Journal of the Academy of Marketing Science*, 36(1), 83-96.
- Perks, H., Kowalkowski, C., Witell, L., Gustafsson, A. (2017), “Network orchestration for value platform development”, *Industrial Marketing Management*, 67, 106-121.
- Peters, L. D., Nenonen, S., Polese, F., Frow, P., Payne, A. (2020), “Viability mechanisms in market systems: prerequisites for market shaping”. *Journal of Business & Industrial Marketing*, 35(9), 1403–1412.
- Plouffe, C.R. (2018). “Is it navigation, networking, coordination...or what? A multidisciplinary review of influences on the intraorganizational dimension of the sales role and performance”. *Journal of Personal Selling & Sales Management*, 38(2), 241–264.
- Polese, F., Pels, J., Tronvoll, B., Bruni, R. and Carrubbo, L. (2017), “A4A relationships”, *Journal of Service Theory and Practice*, Vol. 27 No. 5, pp. 1040-1056.

- Prahalad, C.K., Ramaswamy, V. (2004a). Co-creating unique value with customers. *Strategy & Leadership*, 32(3), 4-9.
- Prahalad, C.K., Ramaswamy, V. (2004b). "Cocreation experiences: The next practice in value creation". *Journal of Interactive Marketing*, 18(3), 5-14.
- Raddats, C., Kowalkowski, C., Benedettini, O., Burton, J., Gebauer, H. (2019), "Servitization: A contemporary thematic review of four major research streams", *Industrial Marketing Management*, 83, 207-223.
- Rajala, R., Brax, S.A., Virtanen, A., Salonen, A. (2019), "The next phase in servitization: transforming integrated solutions into modular solutions", *International Journal of Operations & Production Management*, 39 (5), 630-657.
- Rapaccini, M., Sacconi, N., Kowalkowski, C., Paiola, M., Adrodegari, F. (2020), "Navigating disruptive crises through service-led growth: The impact of COVID-19 on Italian manufacturing firms", *Industrial Marketing Management*, 88, 225-237.
- 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*, 104, 461-471.
- Ruiz-Alba, J.L., Soares, A., Rodríguez-Molina, M.A., Frías-Jamilena, D.M. (2019). "Servitization strategies from customers' perspective: The moderating role of co-creation". *Journal of Business & Industrial Marketing*, 34(3), 628-642.
- Rymaszewska, A., Helo, P., Gunasekaran, A. (2017). "IoT powered servitization of manufacturing. An exploratory case study". *International Journal of Production Economics*, 192, 92-105.
- Schiavone, F., Metallo C., Agrifoglio R. (2014). "Extending DART model for social media". *International Journal Technology Management*, 66 (4), 271-287.
- Shams, S.R., Kaufmann, H.R. (2016). "Entrepreneurial co-creation: A research vision to be materialised". *Management Decision*, 54(6), 1250-1268.
- Siano, A., Conte, F., Amabile, S., Vollero, A., Picciocchi, P. (2017). "Evaluating and improving digital communication for sustainability: an operating model for websites". *Sinergie Italian Journal of Management*, 35, 81-103.
- Sjödin, D., Parida, V., Jovanovic, M., Visnjic, I. (2020). "Value creation and value capture alignment in business model innovation: A process view on outcome-based business models". *Journal of Product Innovation Management*, 37(2), 158-183.
- Sjödin, D., Parida, V., Kohtamäki, M., Wincent, J. (2020b), "An agile co-creation process for digital servitization: A micro-service innovation approach", *Journal of Business Research*, 112, 478-491.
- Sklyar, A., Kowalkowski, C., Tronvoll, B., Sörhammar, D. (2019). "Organizing for digital servitization: A service ecosystem perspective", *Journal of Business Research*, 104, 450-460.
- Smith, L., Ng, I.C.L., Maull, R. (2012). "The three value proposition cycles of equipment based service. *Production Planning & Control*, 23(7), 553-570.

- Solakis, K., Peña-Vinces, J.C., López-Bonilla, J.M. (2017). "DART model from a customer's perspective: an exploratory study in the hospitality industry of Greece". *Problems and Perspectives in Management*, 15(2), 536-548.
- Story, V. M., Raddats, C., Burton, J., Zolkiewski, J., Baines, T. (2017). "Capabilities for advanced services: A multi-actor perspective". *Industrial Marketing Management*, 60, 54-68.
- Suppatvech, C., Godsell, J., Day, S. (2019). "The roles of internet of things technology in enabling servitized business models: A systematic literature review". *Industrial Marketing Management*, 82, 70-86.
- Teece, D.J. (2010). "Business models, business strategy and innovation". *Long Range Planning*, 43(2/3), 172-194.
- Tronvoll, B., Sklyar, A., Sörhammar, D., and Kowalkowski, C. (2020), "Transformational shifts through digital servitization", *Industrial Marketing Management*, 89, 293-305.
- Tukker, A. (2004). "Eight types of product-service system: eight ways to sustainability? experiences from SusProNet". *Business Strategy and the Environment*, 13(4), 246-260.
- Uлага, W., Eggert, A. (2006). "Relationship value and relationship quality". *European Journal of Marketing*, 40(3/4), 311-327.
- Uлага, W., Reinartz, W. J. (2011), "Hybrid offerings: How manufacturing firms combine goods and services successfully", *Journal of Marketing*, 75 (6), 5-23.
- Vargo, S. L. and Lusch, R. F. (2004) Evolving to a new dominant logic for marketing. *Journal of Marketing*, 68(January), 1-17.
- Vargo, S.L., Lusch, R.F. (2008). "Service-dominant logic: Continuing the evolution". *Journal of Academic Marketing*, 36, 1-10.
- Vargo, S.L. and Lusch, R.F. (2011) 'It's all B2B ... and Beyond: Toward a Systems Perspective of the Market', *Industrial Marketing Management* 40(2): 181-7.
- Vargo, S.L., Lusch, R.F. (2016). "Institutions and axioms: An extension and update of service-dominant logic". *Journal of the Academy of Marketing Science*, 44(1), 5-23.
- Vargo, S.L., Akaka, M.A. and Vaughan, C.M. (2017) 'Conceptualizing Value: A Service-ecosystem View', *Journal of Creating Value* 3(2): 117-24.
- Vargo, S.L., Lusch, R.F. (2017). "Service-dominant logic 2025". *International Journal of Research in Marketing*, 34(1), 46-67.
- Valaei, N., Rezaei, S., Ismail, W.K.W. (2016), "Examining learning strategies, creativity, and innovation at SMEs using fuzzy set qualitative comparative analysis and PLS path modelling", *Journal of Business Research*, 70, 224-233.
- Weber, Y., Tarba, S.Y. (2014), "Strategic agility: A state of the art introduction to the Special Section on strategic agility", *California Management Review*, 56(3), 5-12.
- Yang, M., Evans, S. (2019). Product-service system business model archetypes and sustainability. *Journal of Cleaner Production*, 220, 1156-1166.
- Yucesoy, M. (2019), "Georgian partners", available at: [https:// georgianpartners.com/what-iot-means-for-tech/](https://georgianpartners.com/what-iot-means-for-tech/) (accessed 13 January 2021).



Zhang, W., Banerji, S. (2017). "Challenges of servitization: A systematic literature review".  
*Industrial Marketing Management*, 65, 217-227.