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From After-Sales to Advanced Services: A Network Analysis on the Impacts of Digital Servitization Evolution

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Abstract: The B2B context has experienced a push toward digital servitization (DS), i.e., the development of services by means of digital technologies. There are three levels of DS: (1) product provision, (2) after-sale servicing, and (3) advanced services taking after-sales to the next level. At level 3, DS evolves from a product and service-oriented strategy to a service-centric one. The literature has acknowledged the changes provoked by levels 1 and 2 of DS. Yet, further changes at level 3 still have not been explored. This research aims to understand the impact of DS's evolution after the DS setup, with an intra- and interorganizational focus. To reach this aim, the case of Beta, an Italian mechatronic manufacturer implementing IIoT-based DS, is analyzed. The adopted framework is the 'developing', 'producing', 'using' (DPU) framework, formulated within the industrial marketing and purchasing (IMP) approach. Results are summarized in three propositions, showing how: (1) DS complexity unfolds intra- and interorganizationally and is gradually embedded in the three settings of the framework; (2) integration of settings and resources becomes essential; and (3) processes of resource procurement, development, and integration allow the evolution toward a service platform. Theoretical and managerial implications are provided.

Keywords: digital servitization; Industry 4.0; network; DPU framework

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1. Introduction

The concept of servitization was first introduced by Vandermerwe and Rada in 1988 [1]. Servitization consists of the transformation of manufacturers' business models toward paid services [2]. Since then, this concept has significantly evolved, and, today, great attention is focused on servitization strategies, mainly thanks to the advent of Industry 4.0 technologies [3]. Indeed, through digitalization, technologies such as the industrial internet of things (IIoT), cloud computing, or virtual reality (VR) allow for the exploration of new services.

In recent years, the convergence of the two phenomena of servitization and digitalization has attracted increasing interest from policymakers and academia [4,5]. That is, the tendency of firms to turn toward and expand their service-oriented businesses, on the one hand, and the advent of Industry 4.0 technologies, on the other, have redesigned how services are conceived and distributed [3]. Therefore, servitization strategies are rapidly evolving into digital servitization (DS) ones [6], and several industrial companies are experiencing DS trajectories [7] conceived as "*the deployment of digital technologies to support the transformation from a product-centric to a service-centric business model*" [8] (p. 293). In particular, IIoT is one of the most applied technologies to this aim. Firms such as Rolls-Royce, Kone, John Deere, and ABB have witnessed the size and diffusion of the phenomenon.

DS can be defined as a multifaceted and incremental process [8,9]. Its actualization implies different layers of complexity, especially in relation to the type of service offered, if 'base', 'intermediate', or 'advanced', adopting the services classification proposed by

Baines and Lightfoot in 2014 [10]. DS complexity partly derives from DS being a path, a transition in the manufacturer's business model [8,11], which requires time to be accomplished. Literature on DS has so far been focused mainly on the analysis of DS adoption. The shift of manufacturers from product- to service-oriented firms is the main point of attention in recent years [8,12,13]. However, given that DS is a process, it implies a status of continuous evolution and change, which has not been investigated so far, with only rare exceptions (see [14]).

In addition, DS complexity is also heightened by its multilevel nature [15]. Indeed, the process of DS impacts the interorganizational level in terms of establishing new relationships with external actors to realize advanced digital solutions as crucial [16], and the intraorganizational one, as it requires changes in terms of resource configurations, new capabilities development, and a reconfiguration of the organizational structure [6,12]. Still, there is a gap in the existing literature concerning microinteraction processes and the network context in which DS is implemented.

Therefore, this study aims to discover the impacts of DS as a process, namely, not limiting to the exploration of the adoption phase but investigating the evolution happening after the DS setup. Moreover, as suggested by many authors, DS implications should be evaluated in parallel at the intra- and interorganizational levels of analysis [6,15,16]. For such reason, the research question (RQ) we formulated looks at the impacts of DS evolution on a double level of analysis:

> *RQ: How does the transition from the adoption to the evolution phase of DS affect the manufacturer's intraorganizational processes and its relationships with DS key actors?*

In line with the explorative nature of the RQ, we adopt a qualitative approach based on a processual case study. In particular, to discover the impacts of DS as a process after its setup, both at the inter- and intraorganizational level, we analyze the development of a DS project undertaken by an Italian mechatronic manufacturer, implementing an IIoT-based platform. To accomplish this aim, the study adopts a 'business networks' perspective, developed within the industrial marketing and purchasing (IMP) approach [17,18]. In particular, the resource interaction approach (RIA), which focuses on the relevance of resource development and resource combination, is the conceptual and analytical point of reference [19,20] and it will be employed in the three ever-changing and interrelated settings of 'developing', 'producing', and 'using' [21,22].

Adopting the IMP approach as the theoretical and analytical framework allows us to combine both a multilevel and a process perspective. Intra- and interorganizational studies developed so far lose focus on temporal evolution [16,23], while the few that examine later stages of development (e.g., [14,24]) prioritize intra- or inter- implications separately. The integration of resources by its nature takes place from a multilevel perspective and facilitates the observation of evolutions in resource use over time.

The remainder of this paper is structured as follows. Section 2 presents the theoretical background. We first explore the literature on the DS phenomenon, and we then adopt a network perspective to describe the implications of the DS evolution. The third section outlines the methodology adopted in the study. Section 4 is devoted to the case study description, focusing on the main findings of the IIoT-based DS project. The fifth section presents a critical discussion of the empirical results based on the literature addressed in Section 2. The final section highlights the main contribution of the research, draws managerial implications, and acknowledges the main limitations of the study, suggesting future research avenues.

2. Theoretical Background

2.1. From Servitization to DS

Servitization is an already well-known strategy between manufacturers. Vandermerwe and Rada referred to servitization already in 1988 [1], and since then, the phenomenon has largely been distributed in industrial markets and has experienced evolutionary trajectories. Numerous entrepreneurs have expanded their market offering with paid services [2].

In most cases, the developed services are strictly connected to the manufactured products, with variable complexity and value-added levels. Baines and Lightfoot [10] propose a classification of manufacturers' services. They distinguish between base services, which are related to product provision (i.e., warranties, spare parts, etc.), intermediate services, whose results concern product maintenance (i.e., repairs, overhauls, help-desk interventions, etc.), and advanced services, whose outcome is focused on product performance (i.e., customer support agreements, revenue-through-use contracts, etc.). An offering composed of products and product-related services has also been defined in the literature as product–service system (PSS—[25]).

Today, the evolution of servitization strategies is displaying two main directions: digitalization [11,26] and product dematerialization [27]. The latter concerns the attempt of manufacturers to not only increase the product offering with PSS but also to develop a self-standing service offering, which is no longer linked with the realized product. Services such as consultancies, training, or software managers are part of this offering trend. In some way, the PSS business model gives space to service platforms, in which a combination of PSSs, advanced services, and pure services can be offered to a higher audience, no longer limited to product owners [28].

A platform approach to service delivery would not be possible without the affirmation of digitalization. Indeed, the advent of Industry 4.0 technologies is redesigning how services are conceived and distributed [3,9]. In recent years, the literature has been converging toward the concept of DS [4]. DS is the "*development of new services and/or the improvement of existing ones through the use of digital technologies . . . to enable new (digital) business models, to find novel ways of (co)creating value, as well as to generate knowledge from data, improve the firm's operational and environmental performance and gain a competitive advantage*" [13] (p. 284).

DS is simultaneously enabled by and exploiting digital infrastructures and Industry 4.0 (I4.0) technologies. The link between the implementation of I4.0 enabling technologies and DS is straightforward [23]. On the one hand, digital technologies enable service development [29,30] and accelerate integrated PSS offerings to create new value and grow customer relationships [31]. On the other hand, DS exploits I4.0 technologies to offer customers a series of digital services [32].

One of the most spread technologies in the B2B context is the industrial internet of things (IIoT). The IIoT technology is an extension of the IoT; it further allows for the inclusion of digitization in manufacturing [33]. IIoT is making possible the design and implementation of advanced PSS that were not even conceivable before its advent. The connection status conferred to physical products allows the supply of services such as remote repair, diagnostics, and maintenance, which are becoming essential for customers [34,35]. Therefore, IIoT constitutes the main leveraging of I4.0 technology to adopt DS strategies [13,36]. It stands for a precondition to advanced services implementation, thanks to data collection and transmission and the possibility of remote monitoring products and systems [13,37,38].

The highlighted servitization trends, toward the integration of servitization and digitalization on the one side and of PSSs into a service platform configuration on the other, are reconfiguring the complexity involved in such strategy. First, digitalization intricates the DS journey of manufacturers, especially SMEs with limited resources and capabilities, by requiring highly specialized knowledge and access to complex infrastructures [31]. Second, the push of industrial firms to configure service platforms calls for the ability to manage connections between different partners, coordinate actors to achieve value cocreation, and design new front-end and back-end roles [28,39].

Therefore, an integrated perspective on DS is required to permit an in-depth analysis of its implications. A processual approach [8,40], considering the evolutions of DS by manufacturers from PSSs to service platforms, can help disentangle the complexity inherent in the strategy. While the literature has so far focused mainly on the adoption of DS [41], researchers are calling for in-depth research addressing "*how digital technologies enable advancing towards further stages of the service business or completely new forms of*

business" [13] (p. 288). In fact, since it implies continuous evolution, the transformation happening after the adoption can reveal critical advancements [14]. In parallel, a perspective integrating a network framework is needed to fully describe the DS evolutions' implications. The latter is the focus of the next paragraph.

2.2. A Network Perspective on DS

The incipient studies on DS adopted a firm-specific approach, predominantly embracing a manufacturer-centric manner and implying actions by manufacturers toward other actors rather than with other actors [42]. More recent studies have adopted a broader perspective on the phenomenon. This has particularly reflected in the increasing employment of an ecosystem lens, relying on service-dominant logic (SDL). SDL acknowledges the relevance of networks and interactions [43]. Yet, this development still rests on a macro perspective, referring to relationships among actors.

To avoid the limitations of the firm-, dyad-, and supply chain-level analysis, the latest research is moving toward a broader business network perspective [44], as the successful implementation of DS business models extends operations beyond the boundaries of a single firm [45]. In this sense, there has been a growing body of literature that acknowledges the importance of external networks and the relational aspects of the DS phenomenon; still, the network view of this strategy has attained only a little attention in the extant literature [42]. There is a need for an improved understanding of the microprocesses underlying this phenomenon [24], given the complex, holistic, and difficult-to-manage DS development [16].

The IMP approach appears as the most suitable lens to address this gap from a threefold perspective. First, it provides theoretical and analytical tools for depicting the impacts of the DS phenomenon as part of a dynamic and ongoing process [46]. Studies have shown how DS should be interpreted chronologically, accounting for the changes that unfold through continuous interaction not only in the adoption of DS strategy but rather in the transition from products to PSS and finally to product–service–software systems [24]. Second, it allows investigation of DS strategies within and outside the firm's boundaries, both at the intra- and interorganizational levels. Indeed, the shift toward DS requires internal organizing specifically for DS. Some studies [16] have shown the main organizational issues and changes required. DS might also require the development of specific capabilities, which comprise organizational solutions, procedures, and competencies at intra- and interorganizational levels [47]. At the same time, DS transforms value creation processes and subsequently affects relationships and power structures in supply chains [48]. Indeed, DS is expected to impact existing relationships and network dynamics and encourage the active exploration of new relationship equilibria [49]. Third, and finally, the core concepts of the IMP approach allow to include a fine-grained microlevel analysis of relational networks, which has been traditionally neglected in favor of a more firm-centric or macro perspective in turn.

Within IMP, technical development and innovations have traditionally been investigated by adopting a resource interaction approach (hereafter referred to as RIA), focusing on the network's layer of resources [20,22]. The development of resources is described as an interactive process in which existing resources are combined and recombined together and with new ones. The creation or development of innovations and technical solutions, as implied by DS, requires the combination and recombination of resources in the three embedded 'developing', 'producing', and 'using' (DPU) settings. Following Ingemansson and Waluszewski [21], the three settings can be defined as being governed by their own logic, actors, and goals. Yet, the interaction and connection between these contexts are required across the entire process for new technological solutions to become viable commercial products [22]. Such connection can be achieved thanks to the changing composition of the network and of resource configuration [50] around the development of an innovative and complex technological solution.

To sum up, the focus on physical and organizational resource combining in the three settings serves as a tool to investigate innovation processes from an interorganizational network perspective [51]. In this sense, the DPU framework allows addressing the gap identified in the literature concerning the processual perspective of DS and, thus, the variation and development of resources over time, as well as how they shape focal resources (the IIoT-based platform) and contextualize the resource interaction within each setting.

Comprehensively, DS investigation misses a broader perspective [13], which combines a longitudinal and processual view on the one side with a relational, microlevel network approach on the other. The combination of processual and relational perspectives helps to unveil DS impacts within the firm embarking on it and in the surrounding context over time. Table 1 shows that most studies on DS in the last few years have been limited to partial views, often focused on just the intra- or interorganizational level of analysis and rarely with a longitudinal approach. This study addresses this issue and embraces a wide perspective on DS.

Table 1. Adopted approaches for DS investigation.

Approach	Reference	Focus	DS Phase
Supply chain management (SCM)	[52]	Inter	Adoption
Dynamic resource-based view (DRBV)	[6]	Intra	Adoption
Dynamic capabilities	[12]	Intra	Adoption
Service ecosystems (SDL) + theories of the firm	[45]	Inter	Adoption
Service ecosystems (SDL)	[16]	Intra and inter	Adoption
Value cocreation and business model transformation	[53]	Intra	Adoption
Agile cocreation (SDL)	[54]	Inter	Adoption
Relational view	[55]	Inter	Adoption
Theories-in-use	[8]	Intra and inter	Adoption
Relationship quality	[56]	Inter	Adoption
Business model innovation	[11]	Intra	Adoption
Dynamic capabilities	[57]	Intra	Adoption
Intentional narratives (SDL)	[24]	Intra and inter	Adoption
Multilevel theory	[15]	Intra and inter	Adoption
Business model innovation	[14]	Intra and inter	Adoption and evolution
Product–service innovation (PSI), platform leverage and business model adaptation (BMA)	[58]	Intra	Adoption
Resource dependence theory	[48]	Inter	Adoption
Paradox theory	[59]	Intra and inter	Adoption

3. Methodological Notes

3.1. A Qualitative In-Depth Case Study Approach

This research applied an ongoing qualitative case study to explore the transition from the adoption to the evolution phase of DS and its impact at the inter- and intraorganizational levels. Given the exploratory nature of the RQ and the complex nature of DS strategies, a qualitative processual case study methodology [60,61] appeared the most appropriate.

A single case study is the focus of the analysis. The single case study approach [60] was chosen because it has the benefits of being able to capture detailed phenomena within their context, which is suitable when investigating complex organizations and relationships [62]. Particularly, the empirical setting under investigation is a mechatronic manufacturer, Beta (the name of the company, as well as the name of projects and other stakeholders, has been anonymized to ensure confidentiality), producing and distributing woodworking machinery worldwide. Pursuing a DS strategy, Beta invested in 2017 in the realization of BServ, an IIoT-based application proposing innovative services for customers.

The choice of this specific case study relied on different criteria: (i) Beta is a manufacturing company that experienced a switch from a product-oriented to a product- and service-oriented business model; (ii) the introduction of services is based on the develop-

ment of an IIoT application within the frame of a DS strategy; and (iii) a status of constant evolution and change characterizes the DS journey of Beta, which enables us to disentangle the impacts of the process from the adoption to the evolution stage.

The research was articulated in different steps. In the first step, we conducted the collection of data through semistructured interviews, active observation, and secondary sources. In the second step, we triangulated the collected data and proceeded to prepare the data for analysis. Third, we coded data by means of an Excel spreadsheet and analyzed them by adopting the developing, producing, using (DPU) lens. These steps are described in greater detail in the following paragraphs.

3.2. Data Collection

Data collection was based on a combination of primary and secondary sources of data. Primary data collection was based on eight semistructured interviews and active observation conducted by one of the coauthors. Secondary sources of data, including the company's website, sectorial magazines, editorials, press briefings, and corporate reports, were employed to obtain a comprehensive understanding of the context in which the company operates and its implications [63].

The first data source used were eight one-to-one semistructured interviews [64,65]. This typology of inquiry has been widely used within the IMP tradition, and it is considered an effective means of gathering data [66]. The interviews were conducted in the timeframe October 2019–August 2020. Interviewees were purposefully selected and sampled in light of their role within the firm, their involvement in the BServ project, or their unique perspective on its evolution. Interviewees were figures (belonging or not to the Beta organization) who had been constantly involved in the DS process; some actively participated in the decisional process about BServ, while others directly experienced its consequences. All the interviewees entirely observed the DS path of Beta from its beginning; therefore, they could describe the evolution that happened over time. A variety of professional figures were interviewed to catch multiple individual perspectives and grasp the DS impacts at the intra- and interorganizational levels of analysis, in line with the research objective. The interview questions were designed to deal with topics related to the origin and evolution of the DS project implemented since 2016, as well as with more specific aspects of the development of the DS strategy, such as phases, actors, competencies, and resources. An interview scheme composed of three sections—that is, interviewee profile, DS context, and DS evolution—was adopted to conduct interviews (see Appendix A). Each interview was recorded and transcribed verbatim. Each participant in the study was interviewed only with their agreement and were informed of the purpose of the study. Further, we detailed to each interviewed person that the data would be processed by the authors of the study, anonymizing their identity and ensuring that there would be no possibility of directly or indirectly bringing back to them the information provided. Table 2 provides a detailed overview of the interviews.

Table 2. Interviews' data.

Company	Interviewee	Number of Interviews	Duration	Date
Beta	Service innovation director	1	45′	October 2019
Beta	CEO assistant for innovation	2	50′ 40′	November 2019 July 2021
Beta	BServ ambassador	1	40′	November 2019
Beta	BServ project manager	1	55′	November 2019
Beta	Marketing official	1	45′	December 2019
CCA	Senior project manager	1	50′	November 2019
Beta	Spare parts and BServ manager	1	40′	August 2020

The second source of data was participating observation. Beta's DS process was longitudinally observed for 6 years, from the beginning of 2016 to the end of 2021. During

the timespan 2019–2021, observations happened actively, while the remaining years were observed retrospectively. Active observations happened inside Beta from January 2019 until December 2021. In total, participating observation hours amount to 305 and include both formal and informal events that occurred within Beta concerning BServ (see Table 3). A series of activities were purposefully selected and observed, such as workshops on service-selling strategies, BServ training for dealers and subsidiaries, or biweekly business meetings on BServ advancements. The observed activities include a mixture of decisional and functional meetings involving Beta's managers and employees at various hierarchical levels, sometimes with external actors such as consultancy agencies or technology providers. Between them, the coauthors participated in conferences and video conferences, briefings, updates, meetings, or workshops relevant to the DS path of Beta. Due to COVID-19 restrictions, some of the observed activities occurred online via video call platforms. Participating observations allowed for a deep understanding of Beta's approach to DS and its evolution over time, as well as of the intra- and interorganizational responses of employees (internally) and other stakeholders (externally) to DS evolution. The use of different sources of data helps triangulate information from multiple sources to confirm results emerging within the single case study [67].

Table 3. Participating observation details.

	Hours of Observation Per Year		
Activity Type	**2019**	**2020**	**2021**
Workshops	17.0	18.5	23.5
Internal meetings	32.5	23.0	45.5
Meetings with external actors	12.0	14.5	23.5
Updates	9.5	2.5	13.0
Conferences	6.0	5.5	9.0
Other	18.0	7.0	24.5
Total	95.0	71.0	139.0

3.3. Data Analysis

Primary and secondary data were analyzed using a systematic combining approach [68] to highlight the interplay between the research object, methodology, and theory. The data collected from interviews, participating approach, and secondary sources were coded into three main phases reflecting the development of the DS project undertaken by the company, that is: (i) from product to PSS, (ii) PSS spread, and (iii) from PSS to service platform. The adoption of the interview scheme revealed paramount to supporting the coding process. Addressing specific questions to interviewees about the adoption and the evolution stages of DS allowed us to identify the abovementioned phases, characterized not only by distinct temporal dimensions but also by main and exclusive events constituting them. The chronology of the events was mapped up for each of the identified phases.

The coding and analysis were based on (i) the processual dimension of DS and (ii) on relevant RIA concepts, such as the DPU framework, developed within IMP. In particular, the authors identified a series of 18 events in the development of the DS project. The events were collected in an Excel spreadsheet shared between the authors and analyzed jointly in terms of their content, actors involved, setting in focus, and implications, and each event was assigned a phase. In this way, each of the three phases of the development of the DS project and of the IIoT-based platform was analyzed in terms of the three settings of developing, producing, and using.

The developing setting involves actors whose goal is the creation of new solutions through the search for new resources and the use of existing ones. The closeness of the developing setting to the producer–user setting will also determine the embeddedness of the solution and the emergence of the new solution in interaction with the producer–user interfaces [21].

The producing setting concerns the focal producer but also "*suppliers, sub-suppliers and complementary companies and their existing material and immaterial investments*" [21] (p. 24). The main goal of these actors is to fit the new solution into existing ones and into the other interfaces characterizing the production structure [22].

The using setting is fundamental to determine whether or not the new solutions will reach widespread use and become commercial products [22]. To do so, the new solutions will need to overcome barriers and adaptations by users and their networks [69].

What characterizes the three heterogeneous settings is that, while they represent different economic logics that organizations engage in to produce and implement new products, they are interrelated across the entire developing, producing, and using process, and each shapes the economic feature of the resource. Analyzing the empirical setting, that is, the development of the IIoT-based platform through the lens of the DPU framework, allows us to capture the embeddedness of the resource interaction of the IIoT-based platform and existing resource structure in the three settings in all of the identified phases and to discuss the evolution phase of the DS project.

The resulting data analysis resulted in the formulation of three propositions that will be presented in the discussion section, which are related to the research objective.

3.4. Case Study Presentation

Beta is an Italian B2B company with great experience in manufacturing and distributing industrial machinery for the working of wood and other materials, mainly for furniture producers. Beta is now a multinational enterprise with multiple manufacturing sites, subsidiaries, and collaborations with local dealers. It experienced constant growth across the years, and it counts today more than 4000 employees, while revenues amounted to nearly 700 million euros in 2019. Beta is considered an innovation leader in its market thanks to the considerable size of the firm and its constant technological and innovation propensity.

One of the recent innovations of Beta is the realization of an application for smartphone, tablet, and desktop called BServ. BServ stands for the output of a DS path undertaken by Beta starting in 2016, and its main aim is to enable customers to access new services. The IIoT technology supports BServ; Beta machinery is equipped with sensors able to register its activities and monitor its technical needs. Beta can develop and offer customers a series of new and paid services by receiving data on the machinery. Examples include (but are not limited to) KPI indication, preventive maintenance and error notifications, remote video assistance, spare parts purchase, and technical documentation download.

Beta estimated a timespan of 5 years for the technical and business realization of BServ. The implementation of the application started in 2017, and it should have been concluded by the end of 2021. However, a continuous improvement of BServ happened, and Beta's evolving approach on DS allowed the project to remain in development.

In the following paragraph, the DS path of Beta is described in-depth via the identification of three key phases of the project, considering that the last one is ongoing: (i) from product to PSS, (ii) PSS spread, and (iii) from PSS to service platform.

4. Empirical Findings

4.1. From Product to PSSs (2016–2019)

The beginning of the DS journey of Beta is associated with the developing setting. In 2016, the top direction of Beta is involved in working travels in Europe across sectorial fairs and events. A general need for innovation emerges, also confirmed by the sectorial literature accessed at the same time. Cutting-edge sectors such as the automotive industry are moving in the direction of DS. The idea of a DS project starts configuring in the mind of Beta's managers. With solid experience in the product-oriented firm Beta, they unfold new knowledge in the service field. In the same year, Consultancy Agency A (CAA), an international consultant who previously collaborated with Beta on small business projects, contacts Beta for an informal meeting to apply for a DS partnership. Beta embraces the

idea, and they elaborate the business plan on an IIoT-based application to deliver advanced services, renamed BServ.

In the producing setting, in 2017, after the BServ partnership is signed, the pilot session starts in collaboration with the official partner, CAA, and with a new technology provider (TEC) supplying the IIoT data management and storage software. While Beta hires new figures and readdresses some internal ones to create a BServ business unit, CAA provides two teams working heavily on the project, a technical and a business support one. A selection of trusted, longstanding customers is involved in the BServ test and improvement, especially on the technical side. Physical resources are deployed at this stage, such as IIoT sensors, the BServ software, machines by customers to test the new technology, and consistent monetary investment to face the new project. At the end of the year, the pilot session concludes with positive results, and BServ is officially launched in the Italian market. The production process is revised accordingly to equip machinery produced and sold with the IIoT sensors. At this point, information asymmetries diffuse within Beta since only the top management has been involved in the project design, leading the project with a top-down style, and several employees are unaware of what BServ is. The marketing division activates a series of internal and external communication campaigns about BServ to smoothen the asymmetries, endorsed by CAA leading the cultural transformation of Beta from a product- to a service-oriented mindset.

4.2. Consolidating PSSs (2019–2021)

Further developments of BServ concern both the producing and using setting. At the producing level, from 2018 on, Beta manages the internationalization of BServ through local subsidiaries and dealers worldwide, as well as the design and offering of new service packages related to it. The BServ ambassador is hired to spread BServ-related information and knowledge in international markets. BServ contracts are delivered via digital and traditional formats (on paper). At the using level, in 2019, monetary results from BServ are lower than expected. Customers prove skeptical about the usefulness of digital services; prices are perceived as higher than the expected benefits. The producing setting is involved again. Beta experiences difficulties managing the international selling of BServ, mainly due to subsidiaries and dealers' resistance to cooperating. They perceive a lack of competencies in providing BServ. Training sessions from Beta toward subsidiaries and dealers start to strengthen their knowledge of BServ. Moreover, technical challenges in decoding error information from the IIoT sensors further intricate BServ diffusion. To solve this issue, Beta invests in the readdressing of technicians to exploit their skills in supporting the decoding process.

During the same year, Beta faces the first cases of BServ contract ends. The producing, using, and developing settings are all involved in Beta reacting to this event. In the producing setting, an already adopted ERP system is integrated with the contract object to manage and archive contract flows. In the using and producing settings, to push BServ contracts' renewal, Beta deploys a direct market approach. The firm settles a service salesforce composed of both readdressed internal figures and new ones. They are asked to execute service commercial visits to customers 1 month before the BServ expiry date. A customer portfolio segmentation project starts aimed to support the service salesforce in optimizing the management of visits by customers and providing them with unique and customized service offerings. It also involves the using setting since it is aimed at collecting knowledge on customers' purchasing behavior and necessities to identify customers with higher potential in service sales. Beta leads the project in cooperation with CAA, and it will be concluded only in 2021. BServ selling increases; smaller customers deploy trust in Beta and invest in digital services. Parallelly, in the developing setting, the collaboration with two local universities starts with the accomplishment of two PhD research projects related to BServ. Marketing communications continue intensively, resulting in customers buying self-standing IIoT contract packages, not linked to the purchase of new machines. In the

using setting, the need emerges to create tailor-made service packages in order to satisfy customers' needs and provide value-added to them.

Consequently, in 2021, in an attempt to gather a larger pool of customers and prospects, BServ is also extended to customers that do not have IIoT technologies using a new form of contract. This implies all three settings: in the developing setting, Beta and CAA start working on the new BServ contract and related contract packages; in the producing setting, such packages are added to the ERP system and internal digital workflow; while the using setting includes a new segment of clients.

4.3. Toward a Service Platform Conceptualization (2021–Ongoing)

In 2021, Beta faces a renovation of the Board of Directors; the new CEO reshapes the firm's organogram. In the developing setting, this implies that the composition of the existing departments is revised, new professional figures arrive while some are readdressed, and new departments are created. Between them, the Service Intelligence function is launched as part of the service department. It oversees service data analysis and reporting. The collaboration with a local university is exploited by a cofinanced research fellowship supporting the Service Intelligence Team. The service department is empowered with a higher financial budget, service projects shared during steering committee meetings, and a new service salesforce. The latter consists of both new commercial figures and readdressed ones (previous customer care managers).

In 2022, Beta further empowers the service department. An additional collaboration intensifies the relationship with TEC. Beta interacts with a business unit of TEC that provides data reporting tools to buy one. At the producing level, it implies purchasing and spreading the tool licenses, settling training sessions on how to use the tool (before from TEC to Beta's managers and then from Beta's managers to employees), and connecting it to the already-in-use storage system.

In the same year, the three settings are active when the customer portfolio segmentation project concludes. In the developing setting, starting from information derived from customers' segmentation, the team designs an algorithm based on service data about customers. The algorithm periodically identifies customers with a high 'service-selling potential' and supports service managers in defining the service commercial strategies. In the producing setting, if the prototype of the algorithm is developed and tested by Beta, its actualization happens with the support of Consultancy Agency B (CAB)—an already known technical consultant—currently building the technical structure. In the using setting, Beta defines and actualizes a market-oriented approach involving a combination of physical and virtual visits to customers suggested by the algorithm.

Parallelly, the developing setting is also involved in Beta's rebranding project, aimed at achieving homogeneity, coherence, and digitalization in the company's brand image. Indeed, Beta strives to leave the fragmented communication strategy made of multiple brands adopted so far and invests in the creation of a unified, digital brand image. The project, pursued by the marketing department, is realized with the cooperation of Consultancy Agency C (CAC), with whom a new partnership starts. CAC supports Beta in both the business and technical developments of the project. An internal website is created as a touchpoint between all Beta's employees to share opinions and ideas on rebuilding the image of the firm. At the producing level, the project implies launching a new professional figure, the digital marketing manager, and implementing a renewed communication strategy. As part of the project, a new digital communication tool is integrated into Beta in the using setting. It allows the company's salesforce to create customized video content and share them with customers by email. The tool is provided by a trusted technology provider already supplying Beta with Customer Relationship Management software.

Currently, after the implementation of BServ and a series of improvements, and the launch of new related services, Beta is working to realize a digital service platform as a univocal interface between the firm and its customers. At the developing level, considering the events that happened along with the BServ actualization, in particular the rebranding

project, Beta's top management begins to perceive a digital platform as a necessity to have a unified place to purchase products, services, and software, and access online training sessions, fairs, and events. A digital platform satisfies some of the goals perceived by Beta, such as the need for higher digitalization, a more integrated communication system, and closeness to market needs. A long internal discussion between several departments of Beta, such as service, IT, innovation, and sales, unrolls to conceptualize the digital platform and its main features. At the producing level, Beta is working to validate the technical and business features of the new platform and transfer them to the new Consultancy Agency D (CAD), which will sustain Beta in its technical development. So far, a prototype of the platform has been sketched using a simulating application on a local file. At the using level, the new platform will dramatically change how Beta will interact with its customers by offering an integrated platform with the role of e-commerce, customer care assistant, online academy, and virtual meeting point.

5. Discussion

The case of Beta allows drawing considerations on the impacts of DS, embracing a processual view on the phenomenon [8,40] and a simultaneously intra- and interorganizational investigative lens [15].

This section discusses the empirical findings to answer the addressed RQ: *How does the transition from the adoption to the evolution phase of DS affect the manufacturer's intraorganizational processes and its relationships with DS key actors?* An answer is provided in the form of three propositions, elaborated starting from the data analysis process. The three propositions are interlinked to each other and closely related to the objective of the research. Hopefully, they constitute practical insights supporting the transition toward DS of the whole industrial supply chain.

In line with recent contributions [45,54], the case of Beta shows how the evolution of the DS strategy, especially in the shift from the adoption to the evolution stage, is a highly complex process. DS complexity can derive from challenges in managing the IIoT project itself, therefore constituting technological complexity, as well as from the increasing establishment of synergies between the servitizing company and its network, leading to relational complexity [42,70].

The latter, in particular, causes growing intricacy along the DS process, finally placing servitizing firms in a situation that is, on the one side, challenging and insidious. Indeed, the risk of mistakes is high, especially due to the dynamism and speed of DS-related events. On the other side, it stands for the chance to concretely exploit available and accessible opportunities and make the most out of them. In order to accomplish DS evolution, servitizing companies are forced to face relational complexity along the three phases of the DS journey, as the case of Beta underlines. In fact, the rising complexity of the BServ project cannot be dealt with in isolation, as it requires the deployment of numerous resources, which are not always possessed by Beta. In this sense, Beta has to exploit existing relationships and establish new ones with external partners to realize advanced digital solutions [16]. In the first phase, Beta takes advantage of the already established relationship with CAA for the elaboration and implementation of BServ. At that time, it lacks the necessary resources to manage IIoT data and the storage software, and, to fill this gap, it establishes a new connection with the technology provider TEC. As soon as the company starts moving toward a service platform conceptualization, relationships are strengthened with TEC and new actors are involved in the project, as in the case of the new technical consultants CAB, CAC, and CAD. Moreover, the relationship with the local university evolves, from the accomplishment of two PhD research projects on the themes of DS to the cofinancing of a research fellow in the Service Intelligence Team.

At the same time, further intricacy in the DS journey is added by the rising technological complexity. At the intraorganizational level, it can manifest itself in terms of reconfiguration of organizational structures, new capabilities development, or access to new infrastructures [6,12,26]. The PSSs' consolidation phase includes the highest levels of

technological complexity, as in the case of Beta. Along this phase, indeed, the BServ project requires the development of new knowledge and competencies that Beta must acquire by training and readdressing technicians and by hiring new staff (as the BServ ambassador). Simultaneously, Beta needs to create the BServ business unit, upgrade the internal digital workflow and the existing ERP system, and integrate them within new routines. Thus, we propose the following:

Proposition 1. *The process of evolution from a product- to a service-centric DS strategy shows technological and relational complexity and implies changes for the manufacturer at the intraorganizational level and at the interorganizational one in parallel.*

Such complexity calls for an increasing number of resources as the DS process evolves from the adoption phase to the evolution one. Resources unfolded in the first phase of the DS strategy could reveal useful though insufficient to shift toward the evolution phase. The empirical observations collected provide insights in this sense. To highlight them, the following paragraphs first look at the resource development process in each of the three analyzed settings. Secondly, they embrace a processual view of the phenomenon to discuss the three settings together.

In terms of the resource development process, it is clear how DS pushes manufacturers to display an increasing number of resources over time, which is to be found at both the intra- and interorganizational levels. Furthermore, a constantly evolving process of integration between settings appears paramount to exploit the collected resources fully. The entity and variety of such resources, as well as the integration levels between settings, are evident when looking at Beta.

In the developing setting, Beta involves more and more resources from one temporal phase to the other while highlighting an early effort for settings integration. During the adoption phase, it develops several organizational resources, as a strengthened relationship with CAA, which proves crucial to building (previously latent) specialized knowledge and competencies [26]. The relationship with CAA links the producing and developing settings in this phase, with CAA's technical and business teams officially collaborating with Beta for the pilot session of BServ. At the same time, Beta rejuvenates the relationship with one local university to acquire new organizational resources in the form of PhD positions. Successively, new actors are involved in the DS implementation by combining the developing and producing settings. Indeed, Beta reorganizes its entire structure, new business units are created and assume new strategic roles, and professional staff is hired and/or upgraded [28]. Physical resources are also in place, such as an ad hoc budget for the Service Intelligence business unit, a new communication strategy, or redesigned spaces to host service-related activities. In terms of technology, a new algorithm has been developed to prioritize clients.

In the producing setting, the key role of technology providers arises. For manufacturers, accessing trusted and collaborative technology providers can smoothen the DS path, especially in smaller firms or firms with limited technological competencies. For Beta, the relationship with TEC is key in every phase of the DS strategy. In the first phase, physical resources such as route engines, machinery, facilities at customer sites, monetary investments, sensors, and service packages are developed. Some conditions trigger this development: the newly formed relationship with TEC, the exploitation of existing relationships with trusted clients, and access to solid organizational resources. In the second phase, the relationship with TEC is expanded to one of TEC's business units and generates important physical resources: the data reporting tool, the related licenses, and the cloud to use and store data. However, the new tool requires developing organizational resources such as the training sessions provided to the service and IT departments.

Finally, in the using setting, Beta demonstrates a substantial lack of embeddedness between the using and developing settings. In the first phase, the using setting, mainly composed of international clients and dealers, focuses on the development of organizational

resources in the form of direct relationships between the ambassadors, salespersons, and clients and the use and development of trust between Beta and clients. The second phase characterizes again the using setting as already existing relationships are employed to develop new digital and communication tools to be integrated into Beta and develop, in turn, organizational resources in terms of new ways to interact with customers remotely.

When looking at the whole DS process, it is possible to notice how manufacturers are compelled to unfold networking efforts already in the first phase of the process. However, DS calls for further networking strengthening in the second and third ones. Network integrations and a collaborative approach become increasingly essential and should consolidate along the DS path. This is exemplified by two key relationships in the case of Beta. First, evolution is observed in the relationship between Beta and a local university: it starts with the establishment of PhD research projects in the first phase and grows in the third one, leading to the integration of the PhD researcher into the Service Intelligence Team. Second, the key and evolving relationship is the one between Beta and CAA, which begins with a collaboration on the IIoT project and enriches with the segmentation project in the third phase. Notably, the two relationships require the activation of the three settings.

A networking attitude paves the way for resource combining in different ways and settings [71]. It assumes different shapes as the focal IIoT technology becomes embedded in the three contexts [22]. Thus, this research supports the idea that there is a strong interrelation between the phases characterizing the DS process. At the same time, not only does interrelatedness exist along DS, but also among the three settings: developing, producing, and using [69]. This is particularly evident within Beta, which faces the challenges of an initial lack of embeddedness. Indeed, the investigated firm progressively achieves synergies between the three settings, but only after an intricate journey and embracing a processual approach.

The adoption phase in Beta witnesses a great focus on the developing and producing settings, with two main shortcomings. On the one hand, the using setting is barely involved, leading to initial fluctuating results in selling solutions. On the other hand, the developing and producing settings are not close to each other but rather treated individually, following a silo-thinking approach. Building on Beta's experience, it is possible to see how a lack of integration and coherence between settings implies many difficulties in developing solutions [21]. If difficulties emerge in the first phase, such as internal information asymmetries, resistance at the international level, or customers' skepticism toward new solutions, they can be overcome via a higher level of integration during the successive phases.

Achieving settings integration implies increasing the number of resources in use from the adoption phase to the evolution one. For example, Beta displays resources such as new staff, new organizational roles and departments, new marketing strategies, new budget allocation, and new contracts. It follows that servitizing firms must pay attention to the increasing need for integration between the three settings to efficiently exploit resources, reach greater salability of solutions, and invest in future DS developments.

Proposition 2. *Progressive integration between the developing, producing, and using settings is necessary to shift from a product- to a service-centric DS strategy. As the DS process moves from the adoption phase to the evolution one, resources are developed within each setting and integrated.*

Interrelatedness between the three settings and an integrated vision to observe their joint implications before implementing the decision-making process is advantageous. Not only does it guarantee a higher capacity to resolve the complexity levels proposed by DS promptly, but it is also a key element in ensuring that the company overcomes the obstacles arising in the adoption phase and moves toward the evolution one. Settings embeddedness is purposeful since it contributes to dissolving complexity [50,69,72]. It is precisely the ability to dissolve complexity that allows the transition toward DS evolution. Without resolving the complexity inherent in the adoption phase, a servitizing company cannot be ready to think about DS evolution.

Embeddedness between the developing, producing, and using settings is not the only element facilitating firms toward the evolution phase of DS. In addition, triggering a process of research, acquisition, and accumulation of new resources and/or adaptation of existing resources reveals crucial. What happens during the DS adoption phase is the effort to align the manufacturing company with the new requirements revealed by DS [8,14]. This constitutes a considerable effort a company unfolds in redesigning its business model toward a service-centric perspective [11,45,53]. In the case of Beta, during the adoption and consolidation phases, it is possible to observe a series of complex intraorganizational efforts, such as overcoming information asymmetries, leaving a pre-existing product-oriented and deeply rooted cultural model, establishing new organizational routines, settling service training processes for dealers and subsidiaries, and so on. Such changes are made possible only by locating the necessary resources [6], as performed by Beta since the beginning of the DS path in 2017. In 2021, given the availability of numerous resources acquired during the adoption phase, Beta is able to rethink its service structure in a more integrated and complex way.

Activating a process of research and accumulation of resources during the adoption phase, although representing a complex challenge, can allow manufacturers to achieve the evolution phase in their DS paths. For example, Beta would not have been able to consider the evolution of services as an option without having the resources collected so far at its disposal. Moreover, thanks to the achieved embeddedness between the three settings and to the accumulation of key resources over time, Beta actually moves from DS adoption to evolution. A change of vision on services unfolds the transition to the last DS phase. This is particularly evident along Beta's servitization journey. During the adoption phase, Beta conceives services as a PSS and, therefore, as something strictly linked to the sold products [25,73]. However, along with the evolution phase, the company starts thinking of a 'pure' service system, unbounded from the product and fully integrated into the existing business processes. In general terms, the evolution in the firm's service system corresponds to implementing a product-centric DS strategy no longer based on the offering of both products and related services. It stands for building a service-centric strategy, which includes an offering made exclusively of services and/or servitized products [74]. In this perspective, the range of services a manufacturer can offer to customers expands considerably, flowing into a much broader service system represented by service platforms [28,58,70]. The identity of Beta is handed over to its service platform, in which customers will be able to access a direct communication system and its entire offering, ranging from physical products to product-related services and standalone services.

Although the evolution from a product- to a service-centric DS strategy is complex and articulated, it requires less effort than moving from a product- to a product- and service-centric company. That is, the initial effort of a servitizing company to establish a DS strategy (without a previous service orientation) is far more challenging than the evolution of a DS strategy from a PSS system toward 'pure' services. Consequently, the times for implementing the DS adoption phase are way longer than for accomplishing the evolution phase.

Proposition 3. *Along DS, the embeddedness between settings and the continuous process of resource procurement and accumulation drive the conceptualization of integrated service platforms and, therefore, the transition from the adoption to the evolution phase, allowing the latter to be faster and simpler.*

6. Conclusions

This research aims to explore the impacts of the transition from the adoption to the evolution phase of DS on the focal manufacturer's intra- and interorganizational processes. The study embraces a processual and longitudinal view of the DS process, adopting the DPU tool as an analytical framework. The case study is based on Beta, an Italian mechatronic manufacturer, implementing an IIoT-based platform, and it provides three main insights,

summarized in three propositions. First, the BServ project appears complex, both from a technological and a relational perspective. Such complexity progressively unfolds as the focal IIoT technology becomes embedded in the three settings of developing, producing, and using, and has implications at both the intra- and interorganizational levels. Second, the shift from a product- to a service-centric DS strategy requires the integration of the three settings and of the resources developed within each. Third, the study shows how the conceptualization of integrated service platforms is driven by such embeddedness and by the illustrated process of resource procurement, development, and integration, making the transition from the adoption to the evolution phase faster and simpler.

This research provides two main contributions at the conceptual level. First, it answers the call for research made by scholars to investigate how digital technologies enable advancing toward further stages of the service business [13] by adopting a processual approach to DS and by exploring the transition from PSSs to service platforms. In this sense, the study covers the DS process of Beta from its conception and establishment in 2016–2017 to the PSS consolidation phase in 2019 and to the ongoing shift toward a service platform, which started at the end of 2021.

Second, the study addresses the gap in the existing literature of investigation on DS's microprocesses [24], the importance of networks, and the relational aspect of DS. The literature reviewed in Section 2 has shown the existence of such gaps concerning a lacking broader perspective [13] on the phenomenon, which combines a longitudinal—matching the inter- and intraorganizational level—and processual view with a relational, microlevel network approach. Indeed, the study provides a fine-grained microlevel analysis of relational networks that Beta develops to face the complexity of the DS process with consultants, technology providers, and local universities. At the same time, microprocesses are also addressed in terms of intraorganizational changes required by the DS strategy.

Summing up, this study's original contribution is combining both a multilevel approach at the intra- and interorganizational level of analysis, and a processual perspective, highlighting the relational aspect of DS in the so far neglected phase of transition from PSS to service platforms.

From a methodological point of view, the adoption of a processual perspective over the DS strategy has been integrated by the DPU framework, which has represented a useful research tool to capture processes and dynamics in the context of the manufacturer's network evolution. Notably, the in-depth analysis of the three settings along the three identified DS phases allows to effectively highlight how the resources necessary for the successful implementation of DS overlap and interface with each other in the digital platform context and how digital tools help to integrate the three settings with a positive impact on resource use and optimization.

This study also allows highlighting managerial implications, which can be summarized into three main points. First, if a company with a deeply rooted product-centric culture strives to achieve a DS business model, it could start by adopting a product-centric DS strategy and evaluate the transition toward a service-centric DS successively. In this case, the adoption phase will certainly produce complexity, and it requires the managerial ability to achieve embeddedness between the developing, producing, and using settings, as well as the capacity to collect and internalize key resources. However, experience accumulated along this phase will clear the way for an eventual stage of evolution. Conversely, the strategy of implementing a service-centric DS for an unservitized company may be overly disruptive and complex. A product-centric DS is a deserved passage for some manufacturing companies, implying longer times of implementation, but it also increases the chances of succeeding.

Second, a DS strategy requires the optimized and focused management of a network of relationships with already known actors as well as with new ones. Among the already known actors, it is essential to select the proper contacts to rethink and redesign the business model and to find partners capable of providing both technological and business support. Likewise, among the new actors, it is important to look for partners able to provide concrete

support to specific needs and willing to codevelop a long and intricate project as DS. For this reason, managers and entrepreneurs involved in a DS process should obtain or exploit the ability to manage a dense network of relationships in an integrated and strategic manner and to valorize those contacts with key players throughout the entire process.

Third, the intraorganizational impacts of DS should not be underestimated. Attention should be devoted to avoiding the creation of informational asymmetries between individuals, business units, and branches. Misalignments regarding the service offering, structure, or knowledge can seriously endanger the strategy's success. Building an organizational routine finalized at the cyclical alignment of information between individuals belonging to all the departments within the firm can help reduce such risk. Furthermore, since DS requires consistent resources to be accomplished, especially in terms of human resources to face new jobs and skills, managers could evaluate the chance of readdressing internal figures before recruiting external ones. In this way, not only are costs reduced, but individuals can exploit their experience within the firm to empower services and possibly rejuvenate their working enthusiasm.

This study presents some limitations, which can constitute suggestions for future research. For what concerns the adopted methodology, a single case study allowed for the deep and detailed investigation of a recent and complex phenomenon. However, it limits the chances of results generalizability. Therefore, future studies could embrace a multisectoral analysis involving more companies, with both qualitative multiple case studies and quantitative analyses. The selected case study presents an ongoing DS process, which revealed precious information thanks to the processual and longitudinal analysis; future studies could investigate the DS path ex-post or after the conclusion of the evolution phase to detect possible differences. Finally, regarding the theoretical approach adopted, this study is innovative in applying the DPU framework to DS, and both theoretical and managerial contributions are traced. However, future research could benefit from additional studies adopting the same theoretical lens to allow comparisons and enrich contributions to DS.

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Appendix A

Table A1. Interview scheme.

Section 1: Interviewee profile
• Description of the relationship with Beta • List of professional roles invested in the last 10 years • Description of the level of involvement in the BServ project
Section 2: DS context
• Description of the BServ project longitudinally • Identification of key events along the BServ implementation • Perceived benefits and barriers encountered at the intra- and interorganizational level • Description of resources adopted along the project • Description of (Beta) internal and external actors active in the project

Table A1. *Cont.*

Section 3: DS evolution
• Identification of the main evolving patterns along the BServ project • Description of the evolutions of BServ designed and/or implemented in the last 2 years • Identification of resources and actors necessary for such evolutions • Description of competencies upgrade required for BServ evolutions • Description of future developments and vision of Beta future services

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