

Intra- and inter-organizational tensions of a digital servitization strategy. Evidence from the mechatronic sector in Italy

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Abstract

Purpose – This paper aims to analyze the digital servitization (DS) process with the paradox theory lens. The purpose is to catch how intra- and inter-organizational tensions generate complexity along a DS journey to find “where” and “when” industrial companies can intervene to face them.

Design/methodology/approach – The methodology is a qualitative, in-depth single case study, which longitudinally explores the DS strategy of a manufacturer along with three phases of development: design, implementation and assessment.

Findings – The analysis reveals six intra- and inter-organizational tensions in DS and provides insights on tensions’ origin and how to face them. A theoretical framework on DS complexity and an empirical framework on tensions’ origin is produced.

Originality/value – The research combines service and organizational paradox literature. Together with a longitudinal methodology, it results in a spatial and temporal analysis of DS, from which theoretical and managerial implications are drawn.

Keywords B2B, Complexity, Tensions, Paradox theory, Digital servitization

Paper type Research paper

1. Introduction

The business-to-business (B2B) context is experiencing a business model revolution toward the digital servitization strategy (DSS). B2B firms are massively engaged in digital servitization (DS) shifting. The 60% of industrial companies that have already undergone a digital transformation created new business models. In 10 years, 30% of revenues will come from digital projects, half of them involving new “outcomes/solutions” (Morgan, 2019; Wellener *et al.*, 2020).

A DSS generates complexity for industrial firms. Challenges are identified at the intra- and inter-organizational levels (Tronvoll *et al.*, 2020). Industrial companies chasing a DSS rethink the intra-organizational dynamics, adapt knowledge and capabilities, structure leadership and hierarchy. At the same time, they review the inter-organizational processes and reinforce network relationships by accessing service ecosystems, adjusting interdependencies in the supply chain and intensifying relationships with customers (Bustinza *et al.*, 2018; Ruiz-Alba *et al.*, 2019).

Intra- and inter-organizational impacts of a DSS can foster the development of paradoxical tensions (Vendrell-Herreo *et al.*, 2017; Harini and Thomas, 2020). Tensions as ambidexterity/ambivalence, territoriality or the risk of service paradox result from servitizing activities (Lenka *et al.*, 2018; Wagstaff *et al.*, 2021; Gebauer *et al.*, 2005). The paradox theory can help in capturing the complexity involved in

business strategies and it has recently been adopted to describe servitization dynamics (Kohtamäki *et al.*, 2020; Wagstaff *et al.*, 2021; Burton *et al.*, 2016).

Notwithstanding the growing interest toward a paradox perspective on servitization, few studies address it in the context of DS (Kohtamäki *et al.*, 2020; Altmann and Linder, 2019). The digital component of servitizing strategies needs further analysis as it has been acknowledged as facilitating or hindering some processes that require new skills and changes within the network actors (Matthyssens, 2019; Salo *et al.*, 2021).

Notably, the opportunity to further investigate DSS through a paradoxical perspective is twofold. It allows to fill a gap in academic DS studies and it provides a concrete tool to facilitate DS implementation by managers. Understanding the nature of intra- and inter-organizational tensions of a DSS and their implications constitutes critical sparks for firms investing in it. A paradox theory approach can provide managers with in-depth knowledge of DS challenges and possible ways to address them effectively and reach better performances.

For such reasons, this paper investigates how manufacturing firms face their transitioning toward a DSS, adopting the paradox theory lens to gain insights on intra- and

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inter-organizational tensions. Notably, the paper aims to answer the following research questions (RQs):

RQ1. How does the emergence of intra- and inter-organizational tensions generate complexity along a DSS?

RQ2. Where and when can manufacturing companies intervene to dissolve such complexity?

By answering the RQs, the paper contributes to building new knowledge on DS. Notably, the paper adds insights into the role of intra- and inter-organizational circumstances in increasing the complexity of the DS journey. In this respect, tensions and new challenges for companies aiming at developing a DSS emerge with respect to previous literature. Important managerial implications are drawn; remarkably, strategic approaches to DS are provided at every stage of the DSS. In general terms, findings reveal the relevance of analyzing DS taking a holistic overview of its tensions and of adopting an “iterative approach” in developing solutions.

The remainder of the paper is organized as follows. Section 2 addresses the literature background and introduces a theoretical framework to disentangle DS complexity. Section 3 concerns the applied methodology. Section 4 introduces the case study and the main findings of the research. Section 5 presents the critical discussions of results. Section 6 provides concluding remarks, managerial implications of the study, limitations and future research suggestions.

2. Literature review

2.1 A paradox theory approach to services

Paradoxes are “contradictory yet interrelated elements (dualities) that exist simultaneously and persist over time; such elements seem logical when considered in isolation, but irrational, inconsistent, and absurd when juxtaposed” (Smith and Lewis, 2011, p. 387). In the case of a paradox, every choice seems inappropriate.

Paradoxes appear in various contexts and phenomena; this study focuses on paradoxes emerging from managerial actions. The higher expectations of markets, the increased number and variety of stakeholders and the quick pace of change of the business environment are pushing B2B companies toward new managerial paradoxes, especially in case of scarce resources and intense competition (Heidrick and Struggles, 2015).

Paradoxical literature in management mainly focused on the organizational level of analysis, trying to conceptualize managerial issues as paradoxes or organizational tensions (Putnam *et al.*, 2016; Smith and Lewis, 2011). In these studies, a variety of levels has been explored, such as tensions in human resource management, leadership, identity, creativity, teams, gender and diversity, sustainability or innovation (Waldman *et al.*, 2019).

In the service field, paradoxes have been identified in relation to servitization strategies, which imply a service-oriented business model for manufacturers (Baines and Lightfoot, 2013). At the intra-organizational level, examples of paradoxes are the “service paradox” (Gebauer *et al.*, 2005), which is the risk of having servitization expenditures higher than returns or the organizational ambivalence between product and service

orientation (Lenka *et al.*, 2018; Ashforth *et al.*, 2014). Taking the inter-organizational layer, Burton *et al.* (2016) found empirical evidence for tensions in the service network, as servitizing firms try to appropriate value from other actors. The unpredictability deriving from servitization generates tensions in collaborating with external actors, sharing knowledge assets, balancing between proactivity and adaptation, managing different commitment levels and territorial behaviors (Colm *et al.*, 2020; Wagstaff *et al.*, 2021). Kohtamäki *et al.* (2020) identify paradoxes connected to customization levels and engineering efficiency, service organizational structure and innovation.

2.2 Digital servitization strategies

The digital wave experienced from 2013 on, renamed as Industry 4.0 revolution, involves manufacturers toward DSS (Coreynen *et al.*, 2017). Unlike servitization strategies, DSS exploits digitalization to introduce advanced, technology-based services (Bustinza *et al.*, 2018). A DSS implies a complex change for industrial firms, where a product-centric business model is redesigned through a digital service-centric approach (Tronvoll *et al.*, 2020). Manufacturers investing in DSS focus on digitalized customers solutions, with the aim of achieving higher returns and enlarging their customers’ portfolio (Matthyssens and Vandenbempt, 2008).

Notwithstanding the opportunities a DSS can offer for industrial firms, it implies difficulties (Martin-Peña *et al.*, 2019; Paiola and Gebauer, 2020; Coreynen *et al.*, 2017). From nearly 2010 on, literature about DS deeply explores such problems referring to intra- and inter-organizational challenges (Sjödin *et al.*, 2019; Frank *et al.*, 2019).

Intra-organizational implications of DS are challenges in the managerial, internal organization (Bustinza *et al.*, 2018); difficulties are identified in acquiring knowledge and capabilities to face a DSS, achieving convergence between digital and service innovation trajectories, as well as between the product and the service orientation, aligning the value system position and the sales model to the DSS (Bustinza *et al.*, 2018; Hasselblatt *et al.*, 2018; Frank *et al.*, 2019; Lenka *et al.*, 2018; Paiola and Gebauer, 2020).

DS also impacts the relationship with customers, suppliers and other stakeholders; the inter-organizational level of analysis assumes high relevance (Vargo and Lusch, 2011; Vendrell-Herreo *et al.*, 2017). Interorganizational challenges of a DSS include difficulties in managing relationships with old and new actors, elaborating value co-creation processes with customers, distinguishing customers interested in advanced services to invest financial and technological resources (Sjödin *et al.*, 2020; Reim *et al.*, 2018; Grandinetti *et al.*, 2020).

The combined analysis of the intra- and inter-organizational dynamics of a DSS is required to catch the complexity of the phenomenon. As argued by Coreynen *et al.* (2017), a DSS is made of two organizational perspectives: the back-end perspective, involving operational efficiency, availability of resources and decision-making processes and the front-end, about interactions with customers and network integration.

Paradoxes in DS have not been fully investigated yet, even though authors address the issue (Kohtamäki *et al.*, 2020). In our perspective, analyzing DSS through the paradox theory lens offers a deeper knowledge of DS complexity, as the digital

dimension can intricate the servitization journey in presence of specific external and internal conditions. This study aims at providing a theoretical model for the interpretation of tensions in DSS, which is introduced in the following section.

2.3 A theoretical framework for digital servitization tensions

DS is a complex journey, made of continuous challenges and timely choices with impacts at the intra- and inter-organizational level (Struyf et al., 2021). At the same time, paradoxes in management research need a multilevel analysis to be fully exploited (Waldman et al., 2019). Therefore, the proposed theoretical framework (Figure 1) for the investigation of DSS tensions is structured around a double level of analysis, intra- and inter-organizational, to provide a complete understanding of the phenomenon.

The framework combines intra- and inter-organizational challenges imposed by DS with firm-specific circumstances: such elements together potentially give rise to tensions. It is based on the idea that the complexity of the servitizing process is increased by the presence of double-level challenges and circumstances, which foster the creation of tensions throughout the entire strategy development. For instance, integrating product and service orientations (challenge) could generate organizational tensions about the leadership model and hierarchical structure needed to limit resistances, especially in the case of a strong product-centric identity (circumstance).

To verify the validity of the framework the paper adopts an original perspective. The study is based on the in-depth analysis of a firm involved in a DSS. The entire project is built around the industrial internet of things (IIoT) technology and its multifaceted applications. The adopted longitudinal perspective highlights time- and space-related elements of the DSS, while a dual perspective, intra- and inter-organizational, completes the investigation of the phenomenon.

3. Research methodology

3.1 Research design

The applied method is a longitudinal, in-depth single case study, with an abductive approach to code information and

elaborate results (Dubois and Gadde, 2002). A single case study is relevant to build knowledge on under-investigated phenomena and get the complexity levels involved in the inquired relationships (Halinen and Törnroos, 2005). The chosen methodology depends on the contemporary events and the “how” nature of the RQs. It is justified by the need to explore concepts, evaluate the role of context and history and achieve a greater level of detail of the phenomenon (Yin, 2009; Meyer, 2001; Lindgreen et al., 2020).

The case firm, Alpha, is a mechatronic manufacturer located in Italy. In 2016, the company invested in a five-year project of DS by implementing an IIoT-based platform called *Aura*. The project will be completed in one year and it is developed in partnership with the consultancy agency Innoconsulting [1].

Specific criteria explain the choice of the company:

- the firm operates in a B2B context;
- it is involved in a DSS – the ongoing status of the strategy helps to have accurate data as respondents’ information are not influenced by unperfected memories (Lindgreen et al., 2020); and
- the company extends the DSS to an international reference market.

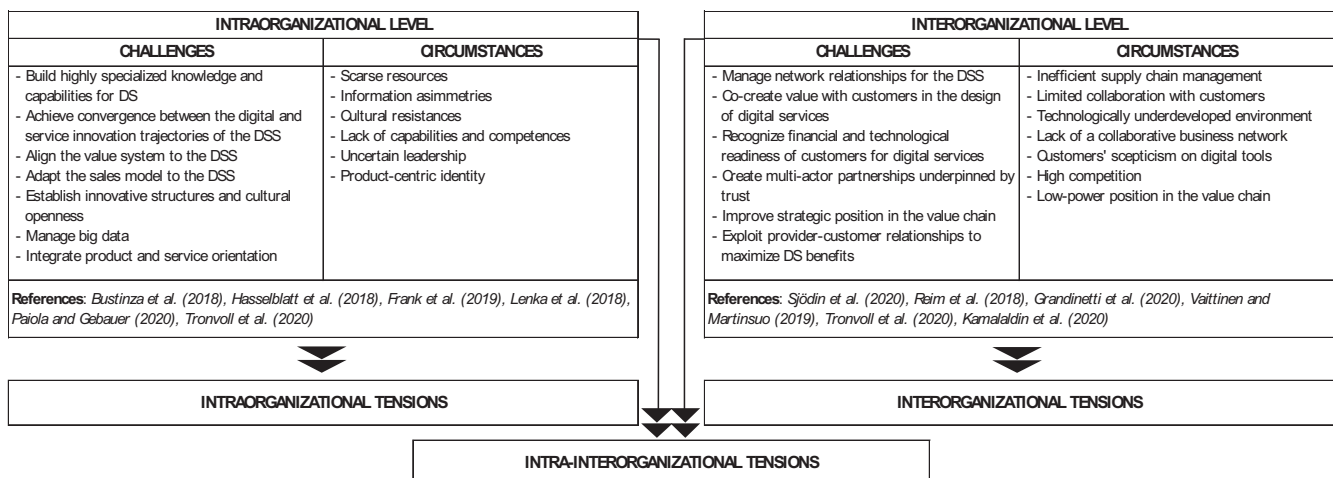
Given the research purpose, a sample “theoretical and purposeful [...] and guided by saturation” is relevant (Gummesson, 2003, p. 488): Alpha is a successful digital servitizing firm and other cases are likely to add similar information.

The empirical research has been guided by literature. The DSS theoretical framework is the starting point to design data collection and analysis. Data has been continuously compared with information collected in literature to evaluate the validity of the framework.

3.2 Data collection

The firm has been observed for five years. The active observation happened from January 2019 until December 2020, while preceding years have been observed retrospectively. Data collection relies on two sources: participating observations and semi-structured interviews. Participating observations amount to 193.5 h in the timeframe January 2019 – December 2020,

Figure 1 Theoretical framework for DSS tensions



distributed between 77 activities (see [Appendix, Table A1](#) for details). They include different activities involving the service function: meetings, presentations, conferences and others, mirroring in percentages their totality. As observations were causal in nature, no formal protocol has been elaborated ([Yin, 2009](#)); the collected field notes were consulted and confronted with interviews' transcriptions.

After the first year of observations, interviews started to integrate data collected through the observations, triangulate information, reduce biases and validate findings ([Jonsen and Jehn, 2009](#)). Interviews were semi-structured, to guide the direction of the discussed topics. An interview protocol was designed (see [Appendix, Table A2](#) for details) to collect focused data, standardize the interview approach and maintain flexibility ([Hunter, 2012](#)). The protocol is based on literature insights and on the RQs of the study. It revealed purposeful to identify respondents, retrace the DSS and recognize intra- and inter-organizational tensions. The protocol involves three thematic sets of questions: about the respondents, about the service area and the DSS and about the implications of the DSS. Similar questions were raised to all respondents, even though adapted for specific roles. Respondents were provided with total freedom to answer questions and no direct connection to paradoxes or tensions was prompted, to avoid "biased researcher's opinion" ([Thirsk and Clark, 2017](#)).

Interviews were conducted in the timeframe October 2019 – August 2020. Interviewees are significant persons in the DSS: they directly contributed to the deployment of the strategy and participated (nearly) from its beginning. They are more representative figures in the DS journey than the average ([Yin, 2009](#)). [Table 1](#) shows interviews details.

To delineate the case context and implications, secondary sources have been used: the company website – and the website of other actors involved in the project – sectorial magazines/editorials, press briefings and corporate reports. Results are described in temporal order, highlighting the

timeline in which the tensions emerged to guarantee clarity ([Sandelowski, 1999](#)).

3.3 Data analysis

To answer the RQs, the DS process was retraced iteratively. Findings are the outcome of a continuous interrelation and triangulation between the perspectives captured through interviews, observations and secondary sources ([Denzin, 1978](#)). Going back and forth between the analyzed literature and case findings provides a complete view of the DS and its context to build theoretical considerations ([Dubois and Gadde, 2002](#)).

Data analysis followed the theoretical framework: information was explored to identify DS challenges and intrinsic circumstances intriguing the DS path of Alpha. Attention was, thus, posed to distinguish the nature of challenges and circumstances if intra- or inter-organizational ([Figure 1](#)). In doing this, a coding process ([Figure 2](#)) was activated to structure data, elaborate the case tensions and identify their origins.

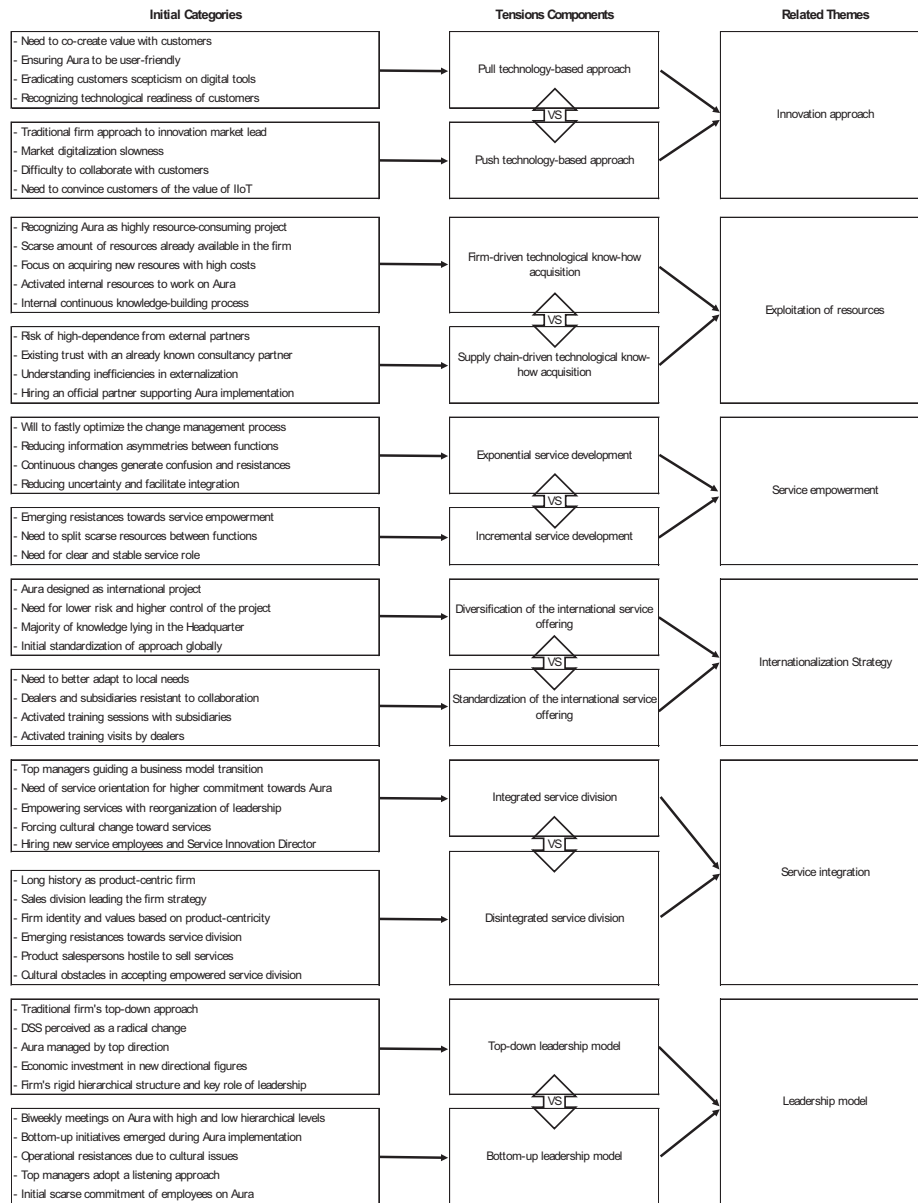
The first coding step was creating categories from data collected through participating observation notes. Categories were assigned labels in the form of short sentences, using as much as possible the lexicon adopted by the informants. Duplicates were removed; the resulting 53 categories include challenges and circumstances of the firm DSS. Afterward, categories were condensed into 12 tensions components. Finally, 6 themes have been identified that aggregate the components of the tensions. Every theme represents a tension and every tension component stands for its two alternative options. No software was needed to code information given the simplified data structure typical of single case studies ([Lindgreen et al., 2020](#)). This coding procedure allowed to detect intra- and inter-organizational connections and the emergence of tensions causing increasing complexity in DS, in line with the adopted theoretical approach.

Table 1 Interviews data

Respondent's information	Date	Duration of interview	Main research topic	Transcription length (# of pages) ^a
Service Innovation Director – Alpha Group Working in Alpha Group since 2017 (4 years)	29/10/2019	45'	Relevance of services and new investments	5
CEO Assistant for Innovation – Alpha Group Working in Alpha Group since 2012 (9 years)	08/11/2019	50'	Impacts of Service innovation process	5
Senior Project Manager – Innoconsulting Collaborating with Alpha Group since 2016 (5 years)	14/11/2019	50'	Idea, design and development of Aura	7
Aura Ambassador – Alpha Group Working in Alpha Group since 2019 (2 years)	22/11/2019	40'	Management of Aura renewal and contact with customers	4
Aura Project Manager – Alpha Group Working in Alpha Group since 2018 (3 years)	25/11/2019	55'	Issues and criticalities in the development of Aura	4
Marketing Official – Alpha Group Working in Alpha Group since 2007 (14 years)	10/12/2019	45'	Communication of Aura	4
CEO Assistant for Innovation – Alpha Group Working in Alpha Group since 2012 (9 years)	31/07/2020	40'	Organizational issues in Service innovation	3
Maintenance Manager – Alpha Group's Customer Collaborating with Alpha Group since 2017 (4 years)	05/08/2020	40'	Customer perspective about Aura	3

Note: ^aSingle space, Times New Roman, 12

Figure 2 Coding scheme



4. Findings

Alpha is a B2B company specialized in the production of industrial wood-working machinery in the furniture sector. Being a family-run company, Alpha experienced considerable growth. Today it operates worldwide with nearly 4,000 employees and its revenues amounted to over 900m euros in 2020.

In 2016, Alpha invested in a DSS by implementing sensors to the produced machineries, which monitor their activities by customers and generate real-time information. The IIoT project is called *Aura*, which indicates Alpha's service platform launched in collaboration with the consultancy partner Innoconsulting. *Aura* provides services as key performance indicator, preventive maintenance and error notifications, video remote assistance, maintenance calendar or contracts purchase.

The DSS of Alpha happened in three temporal phases: project design, implementation and assessment. The design stage involved shaping the DS idea and defining its technical features; the implementation stage was about technical and organizational developments at the international level; the assessment stage concerned adjustments on the platform and the development of additional features. The latter is not concluded yet.

4.1 Project design

At the beginning of 2016, Alpha decided to invest in a DSS. It aimed at responding to market dynamism and gaining competitive advantage by a first-mover strategy. To accomplish such an aim, recognizing the financial and technological readiness of customers for digital services was as relevant as

complex. Relevance concerned establishing the type of technology to make *Aura* valuable and user-friendly. Complexity was generated by the company's limited experience in co-creating value with customers and the digitalization slowness of many of them. Such situation triggered a tension:

T1: Pull vs Push technology-based innovation

A cooperative, pull innovation fosters the adoption of technologies, which are familiar and of value for customers, while answering the collaborative call of DS. A push technology-based approach, instead, embraces the core innovative modus operandi of Alpha, with apparently reduced complicity.

The need to engage customers collided with Alpha's approach, characterized by innovation market lead, with limited customer involvement. The firm adopted a push technology-based approach to innovation:

"Customers were not essential in deciding if to invest in digital servitization [...] they were totally in the dark about IIoT technology and its potentiality [...] maybe a few big customers were starting to consider new technologies, but nothing more [...]" [CEO Assistant for Innovation – Alpha].

They implemented a DSS based on the IIoT technology for the supply of product-service systems solutions via computer, smartphone and tablet applications.

Once the technology was established, its implementation required the planning of resources, competencies and actors. The choice of developing the technology internally rather than turning to external suppliers ended up being a tension:

T2: Firm-driven vs Supply chain-driven technological know-how acquisition

Alpha's challenge was achieving IIoT-specialized capabilities, as the ability to exploit big data, to protect the DS competitive advantage:

"A DS barrier for us is the development of competencies to analyze big data coming from machines and manage them through dedicated functions [...]" [Service Innovation Director – Alpha].

Specialized DS knowledge available inside the firm was limited, as well as human resources to commit to *Aura*. The necessity to cooperate along the supply chain emerged:

"Most parts of the required competencies to implement the project were to be found on the outside [...] Alpha needed to work on the integration of new competencies through innovation along the supply chain to guarantee the technological advancements of the entire industry" [Service Innovation Director – Alpha].

Frictions arose between top managers; they recognized a lack of resources in their teams but manifested some hesitancy in relying on external actors. The involvement of an external supplier meant directly accessing qualified competencies but also reducing process control and limiting the development of internal knowledge. Moreover, Alpha was operating in a highly competitive market, where multi-actor partnerships were not excited and collaborative approaches inhibited. Nevertheless, preceding collaborations with the consultancy agency Innoconsulting made it a trusted supplier. This relationship facilitated the solution of the tension: Alpha nominated Innoconsulting official partner for *Aura*:

"We had no doubt that a company of that size and capacity [Innoconsulting] would have accompanied us not only in the technical part but in the business and change management [...] and so it was" [CEO Assistant for Innovation – Alpha].

The participation of Innoconsulting in the project revealed paramount. However, Alpha engaged resources and spread knowledge capital between managers and employees inside the firm to reduce the risk of dependence from its partner.

4.2 Project implementation

In July 2016, a pilot session of *Aura* was performed; positive results pushed *Aura* implementation. For *Aura* to be launched in the market, a reorganization of Alpha's service function was required. The function was not structured enough to lead the DSS independently. The top management should decide whether to invest in the fast growth of the service function or to draw resources from other divisions and expand the service function gradually. This choice transmuted into a tension:

T3: Exponential vs Incremental service development

The firm strived for equal distribution of power between divisions and consequent service empowerment, with the optimized control of the change management process:

"What we tried to do was creating a new business model more oriented towards services, but in harmony with the firm identity" [Aura Project Manager – Alpha].

The limited willingness of resources called for incremental service development. It gives employees time to adapt to the revisited organizational structure. At the same time, swift service growth should facilitate the DSS implementation because of the application of stable roles and clear responsibilities.

The firm opted for incremental service empowerment. Unexpectedly, resistances emerged due to the continuous changes and adaptations of the service strategy. The slow, unsure extension of functionalities, professional figures, tools and procedures in service, generated confusion and resistances, revealing information asymmetries between functions.

In November 2016, *Aura* was delivered to customers in Italy. In nearly one year, it was distributed also worldwide through the group's network: subsidiaries and dealers. During *Aura*'s internationalization, technological advancements were settled and the international digital service offering was designed. A new tension emerged:

T4: Diversification vs Standardization of the international service offering

Alpha's challenge was to provide customers with a flexible service offering adaptable to local needs. Therefore, diversification was suitable. Some circumstances obstructed its realization. Limited resources, information asymmetries, subsidiaries and dealers' lack of DS knowledge entailed a standardized approach. Contextually, Italian customers showed hesitant responses to the service offering. Alpha missed the ability to collaborate with customers and eradicate skepticism on digital tools.

The first solution to T4 was standardization. The headquarter centralized decisions: it arranged tools and infrastructures, communication plans and the go-to-market strategies for every country. In 2019, issues with subsidiaries and dealers started. Subsidiaries perceived a lack of DS competencies, while dealers interpreted *Aura* as a threat of channel cannibalization. Moreover, *Aura* faltering performances internationally revealed customers' apathy about digital services:

“Many customers, especially the small ones, do not catch the potential of *Aura* and the advantages that it can bring in the long term [...] they perceive new services just as a cost [...]” [*Aura Ambassador – Alpha*].

Top managers were pushed toward a reconsideration of their choices. Flexibility to subsidiaries was enhanced by the design of local service packages and contracts. Local visits and training sessions with subsidiaries and dealers improved the collaboration:

“We need to achieve a higher level of flexibility for subsidiaries [...] we will intensify training sessions and transfer knowledge about *Aura* on subsidiaries [...]” [*Foreign Branch Manager – Alpha*].

4.3 Project assessment

From 2019 on, Alpha managed the *Aura* assessment. The firm promoted initiatives trying to solve issues raised by T3 and T4. Internal communication actions about *Aura* were implemented. A new organizational figure was introduced with the role of connector between sales, service and IT. Internal workgroups were established to facilitate cross-collaboration between sales, marketing and service. Ad-hoc rewards were introduced for service salespersons based on selling indicators. Marketing campaigns stimulated *Aura*'s discovery toward customers.

Concurrently, a tension emerged about the relationship between service and other functions:

T5: Integrated vs Disintegrated service function

Top management longed for the integration of the service function within the organization to stimulate efficiency and inter-functional synergies, especially on the commercial side. Vision, objectives and resources alignment between functions help reach customer engagement in the aftersales and before. Nevertheless, service integration is risky, as it partially destroys the group's values, residing in machines offering and product-centricity.

Top management strived for service integration. It helps reach a less product-oriented mindset, innovate the hierarchical structure and establish cultural openness in terms of (digital) services. Cultural resistances in the commercial area contrasted this vision:

“The fact that *Aura* is an intangible product means that the commercial network did not see its saleability [...] commercials are used to seeing, talking about, and selling just physical assets [...] this is a completely different business model” [*Aura Project Manager – Alpha*].

Resistances in the product function, which concentrated power and strategic relevance, extended to other functions. However, top management forced service integration, as underlined by the Service Innovation Director:

“[...] we work on the transversality of service as a value through business processes, integrating change into everyday life [...]”

Enhanced collaboration with customers and a deep customers analysis incited service integration: diminished market scepticism and improved *Aura* performances let the service function gain credibility. Integration efforts are not concluded yet:

“At a strategic level, Alpha does not intend to retreat in the development of the platform [...] we are experiencing an alignment of the platform with its competitors and a slow conversion of customers towards digital services [...] the effort we must make today for the healthy development of the project is to integrate *Aura* with the other solutions of the company” [*Service Innovation Director – Alpha*].

The role of top management was crucial in the assessment phase of *Aura*. However, internal conditions changed throughout the project: new directors arrived, an *Aura* department with new employees was created, digital services were offered and sold. A revision of the hierarchical and leadership structure became essential, shedding light on an additional tension:

T6: Top-down vs Bottom-up leadership model

At this point of *Aura*'s fulfillment, the organizational layout of Alpha was still quite rigid and related to an inflexible mindset. The product-centric identity of the firm was present, as well as a hierarchical framework:

“The organizational management of the platform is led at a high level by a formalized change management procedure...” [*Service Innovation Director – Alpha*].

The group could endure with the top-down approach to DS or converge toward a bottom-up model with strengthened responsibilities toward the lowest hierarchical levels.

Alpha's solution resided in a hybrid approach. Since its beginning, *Aura* was supervised by the top management. With time, employees struggling to modify routines and to catch the value of the DSS pushed the top direction toward a listening approach. A mix of top-down leadership and bottom-up initiatives was activated. The DSS was supported by a formalized change management approach, while commitment was stimulated. A series of bottom-up initiatives were provided:

“Different initiatives started [...] For example, we created an internal competition [...], because we wanted people to be stimulated and involved with *Aura* [...] everyone could share *Aura* implementation proposals... the best proposal won and was actually implemented” [*Marketing Official – Alpha*].

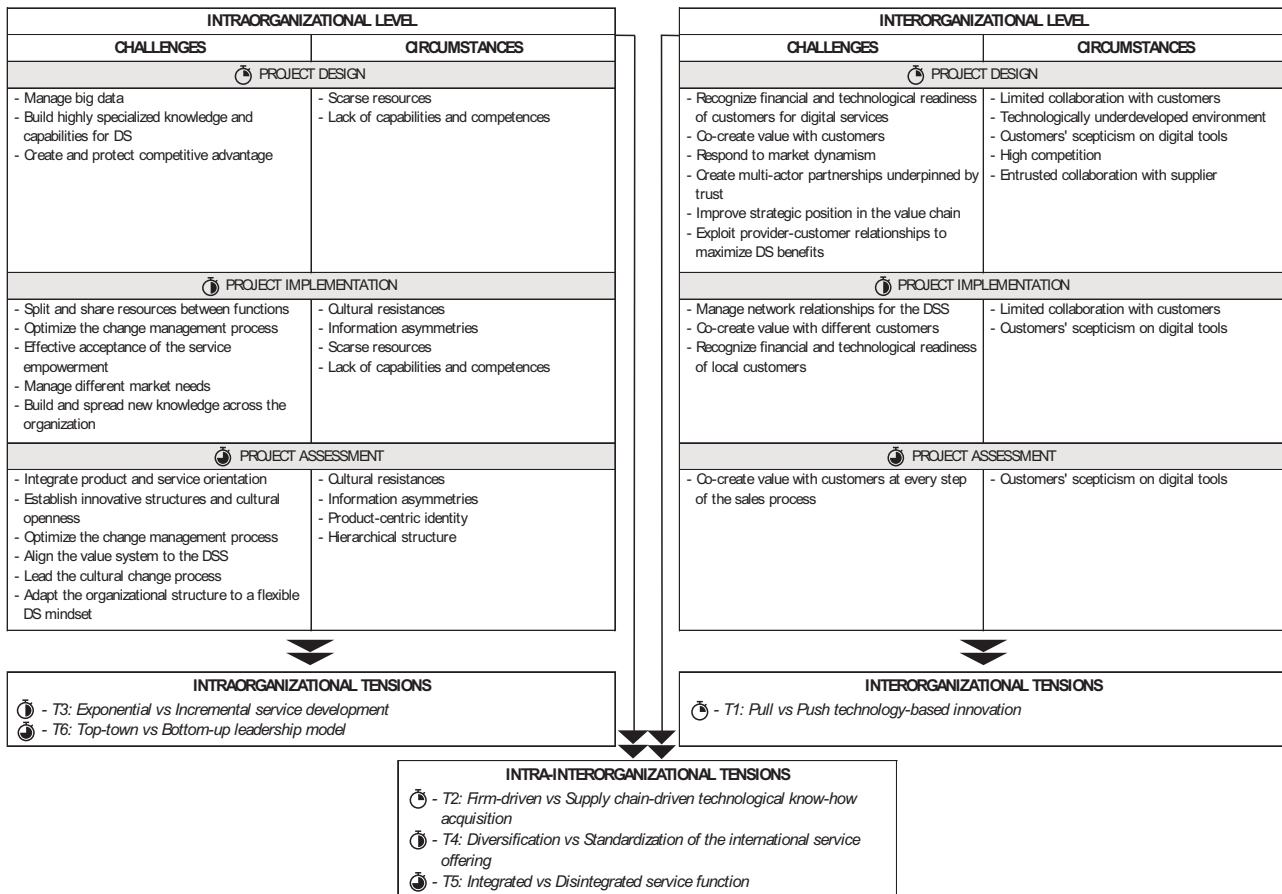
Between hybrid initiatives, the biweekly meeting with managers and employees to check the *Aura* status. Directors and employees share progress, doubts and difficulties and collaborate to solve issues. Innoconsulting is responsible for moderating the meetings. Its constant presence along with the project significantly helps Alpha in overcoming DS barriers and improving the implementation of *Aura*.

5. Discussions

Existing literature on DS explores its intra- and inter-organizational challenges in-depth, adopting fragmented approaches (Sjödin *et al.*, 2019; Frank *et al.*, 2019). Nevertheless, the reasons behind DS complexity for manufacturers are still unclear. This study approaches DS with an original perspective, adopting the paradox theory lens (Smith and Lewis, 2011) to explore DS tensions at the intra- and inter-organizational levels.

The study provides a theoretical model which explains the origin of complexity in DSS as the result of combined intra- and inter-organizational challenges and circumstances. The empirical analysis of Alpha highlights the emergence of six paradoxical tensions. Every tension is triggered by the collision between the firm's DS challenges and the arbitrary circumstances in which it operates. Starting from the conceptualization of the DS phenomenon and the empirical investigation of Alpha, an empirical framework figure is provided (Figure 3).

Figure 3 Empirical framework



The empirical framework depicts the tensions experienced by Alpha, which, in turn, validate concepts and structure of the theoretical framework. Compared to it, the empirical framework includes an additional dimension to space: time. Every tension comes from a specific temporal phase and organizational level: T1 and T2 emerged in the design phase; T3 and T4 belong to the implementation phase; T5 and T6 to the assessment phase. T1 is the only tension that originated purely at the inter-organizational level. Conversely, T3 and T6 arose as intra-organizational. T2, T4 and T5 are simultaneously intra- and inter-organizational in nature, as challenges and circumstances that determined them can be found at both levels.

Because of the time- and space-related focus of the framework, it is possible to observe elements of complexity in the DS path of Alpha. Findings reveal how one element of complexity resides in the multilevel component of tensions and in the presence of “hybrid” tensions. DS complexity arises from the combination of multiple, interrelated elements. Not only DSS is embedded in a multi-level perspective, which involves the network, organizational and micro-foundational levels (Struyf et al., 2021). Also, at every level paradoxes arise from the strategy, with implications that mix and switch between them.

Another element of complexity is the multiplicity of tensions appearing across time. In Alpha, tensions originating at one level in one phase are intertwined with other levels and phases.

Firms must deal with DS while preserving their business-as-usual; the significant and increasing number of DS challenges adds to the firm’s daily hurdles. Moreover, results show how inefficient choices in the first phases of the DSS enhance the risk of tensions accumulation over time: an action can be effective to solve one tension while it triggers inefficiency for others. Being DS a journey, time is crucial in leading the organizational change (Mento et al., 2002). If not properly managed, the risk of accumulating tensions increases.

The case study analysis confirms the relevance of the context for the success of DS; coordination is required among strategy, environment and organization (Feng et al., 2021). In addition, it underlines the importance of monitoring organizational changes caused by DS as a univocal process. In Alpha, intertwined tensions result from the lack of a holistic overview of all tensions. Missing the big picture on DS tensions leads to the development of individual solutions, effective for one tension but ineffective for others. This is what happened in T1, where the reduced customer orientation implied difficulties in conveying value to the market (T4), which in its turn led to internal resistances due to uncertain *Aura* performances (T5). Similarly, the acquisition of external know-how solved T2; however, it reflected resistances and scarce collaboration of employees, especially in the sales function, while solving T3. Imposing the service growth worked as a solution to T3, but it created internal frictions still visible when T6 emerged.

Summarizing the path of Alpha, relevant considerations can be drawn in terms of actions to limit DS complexity. Alpha adopted an iterative approach with the continuous reevaluation of choices, which demonstrated effectiveness. Each implemented action reduced part of the complexity; interventions during the implementation and assessment phases became key to dissolving issues accumulated from the project start. The service integration efforts and the hybrid leadership approach in the assessment phase solved organizational frictions that appeared in the design and implementation phases. Recent attempts to be more customer-oriented and less dependent on Innoconsulting solved previous inter-organizational issues. Research findings suggest the relevance of an iterative, continuous improvement approach to destroy DS complexity, together with the ability to establish a detecting system to promptly recognize new tensions. To facilitate manufacturers in achieving an overarching view on the DS journey, the empirical framework can be a valid tool. Creating and integrating an empirical framework with tensions encountered throughout the DSS empowers the awareness of firms on the DS process.

The research also facilitates the observation of elements of convergence and divergence between servitization and DS paradoxes. In general terms, our findings suggest that DS is more complex than servitization; its digital dimension hinders the entire process because of the required skills not only at the network level (Matthyssens, 2019; Kamalaldin *et al.*, 2020) but even at the organizational one. In relation to service integration, T5 can emerge in both servitization and DS (Lenka *et al.*, 2018; Kohtamäki *et al.*, 2020), as the tension is not directly linked to digital aspects. Conversely, the tension on the leadership model calls for further elucidation (Kowalkowski *et al.*, 2017; Kim and Toya, 2019). This study underlines how T6 becomes more complex in DSS. The digital dimension requires technological infrastructures and the service delivery system to be understood, internalized and diffused within and outside the firm. The relevance of the leadership model in guiding servitizing projects is confirmed for both strategies (Ahamed *et al.*, 2013). However, the inefficacy of an autocratic and autonomous leadership for DS is questioned (Kim and Toya, 2019). Findings reveal how a DSS needs a balance between autonomous and charismatic leadership models and how decisions involving service empowerment should be imposed before being accepted.

6. Conclusions

Firms involved in DSS face complexity at the intra- and inter-organizational level, which can take the shape of paradoxical tensions (Vendrell-Herreo *et al.*, 2017; Harini and Thomas, 2020). The inability to manage such complexity can undermine the success of the strategy. This study aims at pinpointing the origin of complexity in DSS to feel a gap in the literature. It answers the call of Kohtamäki *et al.* (2020) for further research on the topic while providing managerial implications. By answering the two RQs, this research advances knowledge on DSS through the combination of servitization literature with the paradox theory lens (Bustinza *et al.*, 2018; Smith and Lewis, 2011).

RQ1 investigates how the emergence of intra- and inter-organizational tensions generate complexity along a DSS. This

research confirms the high complexity of DSS (Tronvoll *et al.*, 2020). Moreover, it disentangles DS complexity into tensions at the intra- and inter-organizational levels. Six tensions result from the study: *Pull vs Push technology-based innovation*, *Firm-driven vs Supply-chain driven technological know-how acquisition*, *Exponential vs Incremental service development*, *Diversification vs Standardization of the international service offering*, *Integrated vs Disintegrated service function*, *Top-down vs Bottom-up leadership model*. Our findings emphasize how the multiplicity and interrelatedness of such tensions intricate the DS journey of manufacturers. Complexity reveals even enhanced by the digital component of the DSS, calling for specific organizational and network capabilities. Time becomes a determinant variable in the DS process: tensions accumulation across the DS phases seriously undermines the strategy efficacy.

RQ2 looks at where and when manufacturers can intervene to dissolve DS complexity. The interrelated analysis of tensions across space and time unveils DS criticalities (Paiola and Gebauer, 2020; Coreynen *et al.*, 2017). Specific actions emerge, which can support firms in unraveling DS complexity. In the DSS design, context analysis, networking exploitation and focus on customer needs and expectations are required. During the DSS implementation, attention should be devoted to the iterative adjustment of organizational issues, with an autonomous leadership style. In the assessment phase, external knowledge dependence and leadership rigidity are to be reduced.

6.1 Managerial implications

By disentangling where and when complexity originates in DSS, this research provides insights and practical solutions for managers investing in this path. Suggestions on how to approach a DSS appear for each phase of the DS journey.

In the DSS design, monitoring activity of the surrounding context reveals vital. Managing purposeful network interactions is functional to identify potential DS partners and detect the market's aptitude toward digital services. The type of technology to link to the DSS should be defined at this stage. A push technology-based approach is not mandatory, especially for SMEs with limited access to resources. A pull approach, better suiting customer infrastructures, can be more appropriate. However, it should go hand in hand with the early integration of human resources, development of specific skills and cultural change management. Managers should consider the best DS journey given the organizational circumstances, as well as the best balance between the service and the digital prevalence in the strategy (Ciasullo *et al.*, 2021).

At the implementation stage, two dimensions will need a particular focus: the customer perspective and organizational issues. An adaptive approach to the market is required to guarantee the dissemination of digital service value. At the same time, the continuous reevaluation and assessment of organizational circumstances, such as resistances, cultural obstacles or the leadership model, will guarantee effective DS development. Between the organizational capabilities required in a DSS, there is the ability to iterate within the process and make continuous adjustments, to make non-exclusive choices in front of paradoxes (Kohtamäki *et al.*, 2020) and to keep problems-detection systems active

throughout the process. In this sense, the proposed empirical framework can work as a monitoring tool of DSS complexity. Managers can fill in the framework skeleton with challenges and circumstances they meet along with the DSS. This helps identify DS tensions and their origin and design solutions, which are functional for all the encountered tensions. The empirical framework provides a wider perspective on the strategy and avoids unilateral, silo-thinking (Struyf *et al.*, 2021). A decisive and autonomous leadership style is suggested during the implementation phase.

In the assessment, the leadership model should experience a twist. A hybrid approach, combining top-down directives and bottom-up initiatives can be integrated. It helps reduce internal resistance and facilitates cultural openness toward digital services. Moreover, in the case of collaboration with external partners, it is crucial to internalize capabilities coming from the relationship. Managers could strengthen the internal know-how at this stage to better defend the competitive advantage in the future. However, the preservation of key relationships is still consistent to face market dynamism and improve knowledge acquisition (Runfola *et al.*, 2021).

6.2 Limitations and future research directions

This research is not without limitations. First, the longitudinal, in-depth single case study methodology restricts the area of investigation to a firm operating in one sector. Even if this allowed a detailed configuration of DSS complexity, future research could benefit from comparative case studies within multiple firms operating in different industrial branches. It could enrich knowledge on DS complexity and provide additional perspectives on the phenomenon. Moreover, quantitative studies can help test the framework for DS complexity, validate results and facilitate their generalizability.

Second, the influence of the external context can impact the strategic complexity: customers could not be ready to buy digital services and providers could not be collaborative on innovation dynamics (Vaittinen and Martinsuo, 2019; Vendrell-Herreo *et al.*, 2017). This aspect needs further exploration, which was not possible to achieve with the available data. Future research could address the objective of disentangling the role of external actors in the success of DSS. Interestingly, it could involve the investigation of customers' readiness for digital services, supplier-buyer relationships in DS or the impact of policies and institutional networks in the success of DSS.

Note

- 1 The name of the case study firm, as well as the name of its project and the name of the official partner, has been anonymized to ensure confidentiality.

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Appendix

Table A1 Participating observation data

Date	Place	Activity type	Area of interest	Topic faced	Functions involved	No. of participants	Duration (h)
15/01/2019	Service dept.	Meeting	Progress in Aura project	Go-to-market Aura in France	Marketing, Aura, Innoconsulting	5	2
16/01/2019	Service dept.	Presentation	Progress in Aura project	Aura project, main object and design	Aura, Innoconsulting	3	6
24/01/2019	Headquarter	Meeting	Progress in Aura project	Aura communication plan for the Ligna fair	Marketing, Aura, Innoconsulting	6	1.5
26/02/2019	Headquarter	Presentation	Implementation of service ICT	Introduction of new ERP section for service	IT, Sales Intelligence, Service	4	1.5
27/02/2019	Headquarter	Meeting	Subsidiaries performance on services	Definition of managerial guidelines to compare subsidiaries' service performance	Service, Foreign branch office, HR	5	2.5
04/03/2019	Headquarter	Meeting	Strategy for selling services	Definition of service sales force structure	Sales Intelligence, Service, Innovation	4	2
06/03/2019	Headquarter	Update	Clusterization of service customers	Evaluate progress and next steps in clusterization of service customers project	Service, Innoconsulting	3	2
29/03/2019	Service dept.	Presentation	Subsidiaries performance on services	Overview on service business review of subsidiaries	Service, Foreign branch office	4	2
03/04/2019	Headquarter	Meeting	Clusterization of service customers	Definition of a new project: clusterization of service customers	Service, Innoconsulting	5	3
18/04/2019	Headquarter	Update	Clusterization of service customers	Evaluate progress and next steps in clusterization of service customers project	Service, Innoconsulting	4	2
08/05/2019	Headquarter	Meeting	Clusterization of service customers	Evaluate progress and next steps in clusterization of service customers project	Service, Innoconsulting	5	2
17/05/2019	Headquarter	Update	Clusterization of service customers	Evaluate progress and next steps in clusterization of service customers project	Service, Innoconsulting	5	2
06/06/2019	Headquarter	Meeting	Management of service contracts	Definition of a new digital process to map active contracts in ERP	IT, Service	6	4
16/07/2019	Headquarter	Call conference	Clusterization of service customers	Debate with French subsidiary on clusterization of service customers	Service, Innoconsulting	6	2
22/07/2019	Headquarter	Presentation	Implementation of service ICT	Introduction of new CRM section for service customers	IT, Sales Intelligence, Service, Marketing	5	2.5
24/07/2019	Headquarter	Call conference	Clusterization of service customers	Debate with service sales force for clusterization of service customers – understanding salesforce needs	Service, Innoconsulting	8	3
31/07/2019	Headquarter	Call conference	Clusterization of service customers	Debate with service sales force for clusterization of service customers – identification of commercial drivers	Service, Innoconsulting	8	3
10/09/2019	Headquarter	Update	Clusterization of service customers	Evaluate progress and next steps in clusterization of service customers project	Service, Innoconsulting	5	2
08/10/2019	Service dept.	Workshop	Subsidiaries performance on services	Global service meeting – Aura and digital services	Service, Foreign branch office	25	8

(continued)

Table A1

Date	Place	Activity type	Area of interest	Topic faced	Functions involved	No. of participants	Duration (h)
09/10/2019	Service dept.	Workshop	Subsidiaries performance on services	Global service meeting – selling services and service product catalog	Service, Foreign branch office	25	8
03/12/2019	Headquarter	Meeting	Clusterization of service customers	How to introduce the clusterization of service customers project in the firm's CRM	Service, IT, Sales Intelligence, Immoconsulting	9	2.5
10/12/2019	Headquarter	Meeting	Strategy for selling services	Management of service visits in the firm's CRM	Service Intelligence, IT, Sales Intelligence, Immoconsulting	6	2
18/12/2019	Service dept.	Meeting	Clusterization of service customers	Mapping data fields to introduce in firm's CRM to add clusterization of service customers	Service, IT, Immoconsulting	6	2.5
07/01/2020	Headquarter	Presentation	Strategy for selling services	Overview on new service sales activities to map in the firm's CRM	IT, Sales Intelligence, Service	7	2.5
15/01/2020	Headquarter	Meeting	Clusterization of service customers	How to introduce the clusterization of service customers project in the firm's CRM	Service, IT, Sales Intelligence, Immoconsulting	9	2
23/01/2020	Headquarter	Meeting	Clusterization of service customers	How to introduce the clusterization of service customers project in the firm's CRM	Service, IT, Sales Intelligence, Immoconsulting	9	2
29/01/2020	Headquarter	Update	Progress in Aura project	Business work progress of Aura project	Service, Aura, IT, Immoconsulting	18	2
13/02/2020	Headquarter	Call conference	Clusterization of service customers	Debate with French subsidiary on clusterization of service customers	Service, Immoconsulting	6	1.5
13/03/2020	Online virtual meeting	Meeting	Clusterization of service customers	Definition of a specification file about clusterization of service customers	Service, IT, Immoconsulting	6	3
12/05/2020	Online virtual meeting	Update	Progress in Aura project	Business work progress of Aura project	Service, Aura, IT, Immoconsulting	15	1.5
04/06/2020	Online virtual meeting	Meeting	Service intelligence implementation	Definition of a new function in the firm: service intelligence	Innovation, Service, Sales Intelligence, Service Intelligence	4	1
23/06/2020	Online virtual meeting	Presentation	Service intelligence implementation	Introduction to service intelligence	Sales Intelligence	3	3
24/06/2020	Online virtual meeting	Presentation	Service intelligence implementation	Introduction to service intelligence	Sales Intelligence	3	3
25/06/2020	Online virtual meeting	Presentation	Service intelligence implementation	Introduction to service intelligence	Sales Intelligence	3	3
29/06/2020	Online virtual meeting	Presentation	Service intelligence implementation	Introduction to service intelligence	Sales Intelligence	3	2
30/06/2020	Online virtual meeting	Presentation	Service intelligence implementation	Introduction to service intelligence	Sales Intelligence	3	3
01/07/2020	Online virtual meeting	Presentation	Service intelligence implementation	Introduction to service intelligence	Sales Intelligence	3	3
02/07/2020	Online virtual meeting	Presentation	Service intelligence implementation	Introduction to service intelligence	Sales Intelligence	3	3

(continued)

Table A1

Date	Place	Activity type	Area of interest	Topic faced	Functions involved	No. of participants	Duration (h)
03/07/2020	Online virtual meeting	Presentation	Service intelligence implementation	Introduction to service intelligence	Sales Intelligence	3	2.5
15/07/2020	Online virtual meeting	Meeting	Service intelligence implementation	Definition of how to map service commercial activities in the firm's CRM	Sales Intelligence, Service Intelligence	4	3.5
17/07/2020	Online virtual meeting	Meeting	Strategy for selling services	Go-to-market service in Italy	Service, Marketing, Aura, Innoconsulting	8	3
23/07/2020	Online virtual meeting	Presentation	Clusterization of service customers	Brainstorming on clusterization of Service customers project	Service, Innoconsulting	4	2
24/07/2020	Online virtual meeting	Meeting	Strategy for selling services	Definition of reports about service sales performances	Sales Intelligence, Service Intelligence	3	2
31/07/2020	Online virtual meeting	Call conference	Service intelligence implementation	Introduction of new service sales performance reports to international service salesforce	Sales Intelligence, Service Intelligence	3	1.5
04/08/2020	Online virtual meeting	Call conference	Service intelligence implementation	Introduction of new service sales performance reports to Italian service salesforce	Sales Intelligence, Service Intelligence	3	2
23/09/2020	Online virtual meeting	Update	Service intelligence implementation	Work progress of service intelligence function	Sales Intelligence, Service Intelligence	5	2
29/09/2020	Online virtual meeting	Update	Service intelligence implementation	Work progress of service intelligence function	Sales Intelligence, Service Intelligence	5	2
06/10/2020	Online virtual meeting	Update	Service intelligence implementation	Work progress of service sales force performance monitoring	Service, Sales Intelligence, Service Intelligence	3	1.5
08/10/2020	Online virtual meeting	Meeting	Subsidiaries performance on services	Definition of a dashboard to show service performances of subsidiaries	Service, Foreign branch office, HR	6	2
12/10/2020	Online virtual meeting	Update	Service intelligence implementation	Work progress of service intelligence function	Sales Intelligence, Service Intelligence	5	2
13/10/2020	Online virtual meeting	Workshop	Strategy for selling services	Find eventual correlation in the sell of maintenance contracts and new spare parts	Service, Service Intelligence	4	3.5
14/10/2020	Online virtual meeting	Meeting	Clusterization of service customers	Evaluate progress and next steps in clusterization of service customers project	Service, Innoconsulting	5	3
14/10/2020	Online virtual meeting	Workshop	Strategy for selling services	Find eventual correlation in the sell of maintenance contracts and new spare parts	Service, Service Intelligence	4	3
22/10/2020	Online virtual meeting	Update	Service intelligence implementation	Work progress of service intelligence function	Sales Intelligence, Service Intelligence	5	2
22/10/2020	Online virtual meeting	Meeting	Service intelligence implementation	Definition of indicators to evaluate service sales performance	Sales Intelligence, Service Intelligence	3	2.5
22/10/2020	Online virtual meeting	Update	Clusterization of service customers	Evaluate progress and next steps in clusterization of service customers project	Service, Innoconsulting	3	2
27/10/2020	Online virtual meeting	Update	Progress in Aura project	Business work progress of Aura project	Service, Aura, IT, Innoconsulting	19	2

(continued)

Table A1

Date	Place	Activity type	Area of interest	Topic faced	Functions involved	No. of participants	Duration (h)
27/10/2020	Online virtual meeting	Workshop	Strategy for selling services	Definition of a formula to evaluate the service potential of each market	IT, Service, Innoconsulting	8	4
27/10/2020	Online virtual meeting	Update	Service intelligence implementation	Work progress of service sales force performance monitoring	Service, Sales Intelligence, Service Intelligence	3	2
28/10/2020	Online virtual meeting	Update	Service intelligence implementation	Work progress of service intelligence function	Sales Intelligence, Service Intelligence	5	2
02/11/2020	Online virtual meeting	Presentation	Implementation of service ICT	Introduction of new ERP section for service	IT, Sales Intelligence, Service	3	2
05/11/2020	Online virtual meeting	Call conference	Service intelligence implementation	Debate with Italian service sales force to improve reports on their service sales performance	Service Intelligence, Service	7	2
10/11/2020	Online virtual meeting	Update	Service intelligence implementation	Work progress of service intelligence function	Sales Intelligence, Service Intelligence	5	2
16/11/2020	Online virtual meeting	Update	Service intelligence implementation	Work progress of service intelligence function	Sales Intelligence, Service Intelligence	5	2
16/11/2020	Online virtual meeting	Workshop	Strategy for selling services	Definition of a formula to evaluate the service potential of each market	IT, Service, Innoconsulting	8	4
17/11/2020	Online virtual meeting	Workshop	Strategy for selling services	Definition of a formula to evaluate the service potential of each market	IT, Service, Innoconsulting	8	4
23/11/2020	Online virtual meeting	Update	Service intelligence implementation	Work progress of service intelligence function	Sales Intelligence, Service Intelligence	5	2
30/11/2020	Online virtual meeting	Update	Service intelligence implementation	Work progress of service intelligence function	Sales Intelligence, Service Intelligence	5	2
01/12/2020	Online virtual meeting	Update	Progress in Aura project	Business work progress of Aura project	Service, Aura, IT, Innoconsulting	18	2
02/12/2020	Online virtual meeting	Update	Service intelligence implementation	Work progress of service sales force performance monitoring	Service, Sales Intelligence, Service Intelligence	3	2
03/12/2020	Online virtual meeting	Workshop	Strategy for selling services	Definition of a formula to evaluate the service potential of each market	IT, Service, Innoconsulting	8	4
14/12/2020	Online virtual meeting	Call conference	Service intelligence implementation	Debate with Italian and French service sales force to evaluate their service sales performance	Service Intelligence, Service	12	1.5
15/12/2020	Online virtual meeting	Presentation	Implementation of service ICT	Introduction of data extensions for service marketing activities	IT, Sales Intelligence, Service, Marketing	4	1.5
16/12/2020	Online virtual meeting	Update	Service intelligence implementation	Work progress of service intelligence function	Sales Intelligence, Service Intelligence	5	2
16/12/2020	Online virtual meeting	Meeting	Service intelligence implementation	Presentation of CRM to map service activities to the German subsidiary	Sales Intelligence, Service Intelligence	7	1.5
16/12/2020	Online virtual meeting	Presentation	Implementation of service ICT	Introduction of data extensions for service marketing activities	IT, Sales Intelligence, Service, Marketing	4	1.5
17/12/2020	Online virtual meeting	Presentation	Implementation of service ICT	Introduction of data extensions for service marketing activities	IT, Sales Intelligence, Service, Marketing	4	2

Table A2 Interview protocol.

Section	Topic	Questions
1	Identification of the respondent	<ul style="list-style-type: none"> • What is your position inside the company today? • What are the main responsibilities connected to your working position? • Does your current working position include transversality between organizational functions? <ul style="list-style-type: none"> – If yes, which ones? • Does your current working position involve direct contact with external actors? <ul style="list-style-type: none"> – If yes, which ones? • Is this your first role in the company? <ul style="list-style-type: none"> – If not, which role(s) did you perform previously? • How long have you been working in the company? • Do you have working experience in other firms? <ul style="list-style-type: none"> – If yes, which ones?
2	Description of the DSS	<ul style="list-style-type: none"> • Can you describe the DSS of the firm? <ul style="list-style-type: none"> – What have been the main phases or stages, experienced along with the DSS? – In your opinion, what are the critical events characterizing the DSS? • In temporal terms, when did the firm start considering the option of a DSS? <ul style="list-style-type: none"> – When did the official implementation of the DSS start? – What are the main events that followed the official start? • Was the firm involved in service strategies before officially investing in the DSS? <ul style="list-style-type: none"> – If yes, how? • How would you define the service orientation of the firm before the DSS? <ul style="list-style-type: none"> – Would you define it differently today, after the initiation of the DSS? • Which stage of the DSS process do you think the firm is experiencing today? • What do you think will happen next? <ul style="list-style-type: none"> – What are your expectations about the future developments of the DSS?
3	Implications of the DSS and solutions	<ul style="list-style-type: none"> • Could you identify the conditions that triggered the idea of the DSS? • While evaluating the DSS idea, what were the main concerns and perceived barriers? <ul style="list-style-type: none"> – What were, instead, the facilitators in choosing to invest? • After the initial decision to invest, what were the main changes? <ul style="list-style-type: none"> – Internally, what happened at the organizational level? <ul style="list-style-type: none"> – What were the main organizational criticalities? – Did some resistances emerge? <ul style="list-style-type: none"> – If yes, of what kind? How have they been managed? – Which functions were mostly involved in the DSS at this stage? – What did you perceive as the main advantage of the DSS at this stage? – How was the leadership involved in this stage? – Did you need the support of external actors? <ul style="list-style-type: none"> – If yes, what actors? – For what purposes? – Did some existing relations with external actors modify because of the DSS? <ul style="list-style-type: none"> – If yes, which ones and why? – What were the main difficulties in the relationship with the external actors at this stage, if any? – How have they eventually been managed? • During the official launch of the DSS, what were the main changes? <ul style="list-style-type: none"> – Internally, were some changes in the organizational structure required? <ul style="list-style-type: none"> – If yes, of what type and why? – What were the main barriers that you perceived during this stage of the DSS? – How have they eventually been managed? – What advantages of the DSS did you perceive in this stage, if any? – What was the reaction of employees? – How was the leadership involved in this stage? – Toward the external actors, what happened? <ul style="list-style-type: none"> – Were new actors involved at this stage? – If yes, which ones and why? – What barriers did you perceive in the relation with external actors?

(continued)

Table A2

Section	Topic	Questions
		<ul style="list-style-type: none"> – If any, which ones and in relation to which actor? How have they eventually been managed? – How did customers react to the introduction of digital services? • What are the main activities led today in relation to the DSS? <ul style="list-style-type: none"> – Do you feel there are still internal criticalities related to the DSS? <ul style="list-style-type: none"> – If yes, which ones? – What strategies of the firm do you think we're the most effective to solve previous criticalities if any? – What is today the response of employees to the DSS? – What are the perceived advantages acquired from the DSS today? – How is the leadership involved in the DSS today? – How is now the responsibility of the external actors to the DSS? <ul style="list-style-type: none"> – How do customers react to the DSS today? – How is the relationship with suppliers managed? – What is the institutional and public response of the market to the DSS?

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