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Digital service orientation: unlocking servitization in service operations and service sales

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Abstract

Purpose – Manufacturers increasingly harness digital technologies in their servitization efforts. However, the research has mainly focused on higher-level aspects of servitization, often overlooking the role of organizational routines at the firm-customer interface. This especially concerns two key customer-facing functions, service operations and service sales. This study explores how digital service orientation can be induced within these units' organizational routines.

Design/methodology/approach – Survey data from 534 respondents (270 in service operations and 264 in service sales) from a market-leading manufacturing corporation implementing a digital service strategy were analyzed with a fuzzy-set qualitative comparative analysis (fsQCA).

Findings – The analysis uncovers alternative configurations of routine elements that induce digital service orientation in customer-facing units. These configurations combine four core routine elements: technology foresight, adaptability, agility, and rule-bending. Notably, distinct cross-functional patterns—assertive, responsive, and nimble—emerge across service operations and sales.

Practical implications – For managers, the cross-functional patterns offer a useful tool for inducing digital service orientation across customer-facing functions.

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Originality/value – This exploratory study advances servitization research by identifying cross-functional patterns that induce digital service orientation. The findings reveal a surprising degree of homogeneity between service operations and sales, with greater alignment than previously assumed. This study also highlights the role of rule-bending in managing the often-overlooked tensions inherent in digital service strategies. Additionally, it points to a more limited role of customer focus, particularly in the context of intermediate services.

Keywords Servitization, Digital service strategy, Organizational routines, Service operations, Service sales, fsQCA

Paper type Research paper

1. Introduction

Manufacturing firms increasingly harness digital technologies—combinations of information, computing, communication, and connectivity technologies (Bharadwaj *et al.*, 2013)—to support their servitization efforts (Fang *et al.*, 2025; Hsuan *et al.*, 2021; Momeni *et al.*, 2023; Struyf *et al.*, 2021). This shift places new demands on customer-facing units (CFUs) like service and sales, which act as the primary interface between business-to-business (B2B) manufacturers and their customers (Baines and Lightfoot, 2014; Karatzas *et al.*, 2023; Raja *et al.*, 2018). Being more idiosyncratic and reliant on data exchange, digital services change how traditional field service organizations structure their operations and perform tasks (Kowalkowski *et al.*, 2024) and require a different approach to selling (Guenzi and Nijssen, 2023, 2024).

Central to these new ways of working is the establishment and evolution of organizational routines—"repetitive, recognizable patterns of interdependent actions, carried out by multiple actors" (Feldman and Pentland, 2003, p. 95)—which enable CFUs to deliver consistent, high-quality outcomes in line with firm- and customer-specific requirements. However, existing research has primarily focused on higher-level strategic and technological aspects of servitization (e.g. Hsuan *et al.*, 2021; Tronvoll *et al.*, 2020), often overlooking the critical role of organizational routines in operationalizing these strategies at the interface between firms and their customers. This gap is significant, as the dynamic nature of digital service strategies requires CFUs to strike a balance between stability and adaptability in their routines (Gross, 2014), necessitating their continuous refinement through digital tools and data analytics.

Against this backdrop, our study aims to explore how *digital service orientation* can be induced within service operations and sales units' organizational routines. The combined responses of these two CFU types determine service success, even though service operations and sales differ in their core functions and customer interactions. Sales focus on securing agreements and shaping service expectations, whereas operations manage service execution and ongoing value delivery (Ulaga and Reinartz, 2011). While this distinction is crucial for understanding their differential impact on outcomes, prior research often focuses on one or the other (e.g. Baines and Lightfoot, 2014; Gebauer *et al.*, 2010; Guenzi and Nijssen, 2023; Reinartz and Ulaga, 2008; Salonen *et al.*, 2021a). To address our aim, we draw on insights from the research on organizational routines, which emphasizes the interplay between their ostensive aspects—shared principles and understandings shaped by norms and formal or informal rules (Dionysiou and Tsoukas, 2013)—and their performative aspects—the actions employees take in their daily work (Feldman and Orlikowski, 2011; Feldman and Pentland, 2003).

Survey data was gathered at a market-leading multinational corporation's service operations and service sales units and was then analyzed through fuzzy-set qualitative comparative analysis (fsQCA). This method is increasingly employed in servitization and operations research, where calls for its wider utilization (e.g. Chen *et al.*, 2021; Rabetino *et al.*, 2021; Salonen *et al.*, 2021b) have coincided with the rise in its empirical applications (e.g. Fang *et al.*, 2025; Heirati *et al.*, 2025; Salonen *et al.*, 2021a). It reveals how multiple conditions, combined in complex ways, may induce an outcome such as digital service

orientation. This method has also proven useful for studying routinized behavior (e.g. Song *et al.*, 2022), hence enabling the examination of interconnected routine patterns (Pentland and Feldman, 2008).

Our study focuses on interdependent routine elements and their distinct configurations that induce digital service orientation. We thus seek to provide insights into how digital service orientation can be induced within field service and service sales units' routines, hence advancing servitization efforts in view of the evolving demands of digital technologies. Our findings offer three main contributions. First, we identify three cross-functional patterns—assertive, responsive, and nimble—emphasizing the homogeneity between CFU types (service operations and service sales). Each pattern represents possible managerial pathways of actions through which routine adjustments (cf. Pentland *et al.*, 2020) can unfold toward digital service orientation in CFUs. Second, our findings nuance the traditional view of customer focus by showing that, in the context of intermediate digital services, technology foresight plays a more critical role in inducing digital service orientation. While customer focus remains important, especially in advanced services, firms should tailor customer- and technology-related routines in CFUs based on the type of digital service provided. Third, the findings suggest introducing loosely defined standards (ostensive aspects of routines) that enable CFUs to navigate conflicting requirements of digital service strategies with greater flexibility and effectiveness, rather than enforcing strictly codified routines (cf. autonomy; Andersen and Bering, 2023; Kalra *et al.*, 2021; Karatzas *et al.*, 2023).

Next, informed by extant research, we present the study's theoretical background. We then describe our empirical setting and research method before presenting the findings. The study concludes with theoretical and managerial implications and offers suggestions for further research.

2. Theoretical background

2.1 Servitization and organizational routines

Servitization has emerged as a key strategy for companies aiming to move beyond traditional product-focused operations by incorporating services that address evolving customer needs and strengthen their competitive position. While it is now widely recognized as a strategic imperative for manufacturers in B2B industries, research on such strategies has become increasingly focused on digital services (Table 1). However, even well-established and resourceful firms often struggle to capitalize on the opportunities at the intersection of digital and service domains (Favoretto *et al.*, 2022). This may seem surprising, considering that incumbent manufacturers have invested in electronic data interchange, expert systems, and other digital technologies to support their servitization efforts for decades (e.g. Anderson and Narus, 1998). Yet this may be explained by the fact that only more recently has the application of digital technologies brought about fundamental changes in many B2B firms and industries (Ritter and Pedersen, 2020). This phenomenon has led to the rapidly growing stream of literature on digital servitization, focusing specifically on the challenges and opportunities of leveraging digital technologies for increased service productivity and growth (Chen *et al.*, 2021; Fang *et al.*, 2025; Hsuan *et al.*, 2021; Momeni *et al.*, 2023; Struyf *et al.*, 2021).

The challenges manufacturers face when pursuing such a digital service strategy stem from the fact that these services demand not just technological advancements but also more profound higher-level shifts in business models and operating approaches, as well as micro-level changes in organizational routines (cf., Kowalkowski and Ulaga, 2024; Momeni *et al.*, 2023; Struyf *et al.*, 2021). While traditional industrial services (e.g. maintenance, repair, and overhaul) rely more on human interaction and manual processes to meet customer needs, digital services integrate and depend on digital technologies to provide value in ways that are often real-time, data-driven, and scalable. Hence, digital services represent a transformation in how value is created, emphasizing automation, connectivity, and data (Wirtz *et al.*, 2023).

Table 1. Selected studies on (digital) service strategies

Source	Service	Digital	Studied phenomenon	Focal construct	Type of outcome	Main sample
Davies *et al.* (2006)	X		Organizational capabilities and structures necessary when transitioning toward integrated solutions	Firm's structures and capabilities	–	Manufacturing and service, case study, five cases/firms
Tuli *et al.* (2007)	X		Relational process view on customer solutions; supplier and customer variables affecting solution effectiveness	Relational processes constituting a solution	–	Manufacturing and other industries, interviews and focus groups, $N = 29$ supplier firms and 25 customer firms
Antioco *et al.* (2008)	X		Organizational parameters and service business orientations that explain relative product sales and service volume	Service business orientation	Firm performance (sales; service ratio)	Manufacturing, survey, $N = 137$ respondents (service managers, directors, and vice presidents)
Brax and Jonsson (2009)	X		Establishing integrated solution offerings	Integrated solution offerings	–	Manufacturing, case study, two cases/firms
Gebauer *et al.* (2010)	X		Different service strategies in manufacturing firms, and org. designs for each strategy	Service strategies and org. design factors	Firm performance (service differentiation)	Manufacturing, survey, $N = 106$ firms and 89 strategic business units
Ulaga and Reinartz (2011)	X		Key success factors for designing and delivering combinations of goods and services	Firm's resources and capabilities	Firm performance (assessed qualitatively)	Manufacturing, interviews, respondents from 22 firms
Baines and Lightfoot (2014)	X		Practices and technologies employed in the delivery of advanced services	Operations configuring	–	Manufacturing, case study, four cases/firms
Macdonald *et al.* (2016)	X		Customers' assessment of solution quality as antecedent to value; value in use resulting from the solution	Solution quality and value in use	–	Manufacturing, interviews, $N = 36$ respondents
Worm *et al.* (2017)	X		The relationship between a customer solutions offering and profitability, the conditions affecting it, and the underlying mechanisms	Customer solutions offering	Firm performance (return on sales growth)	Manufacturing, survey and secondary data, $N = 175$ firms
Raja *et al.* (2018)	X		Servitization design decisions in terms of customer contact, decoupling of activities and grouping of employees	Organizational design for servitization	–	Manufacturing, case study, three embedded cases in a single firm
Colm *et al.* (2020)	X		Governance tensions associated with and varying over the course of solution development, and matching mechanisms to those tensions	Governance matching	–	Manufacturing, single case study
Bigdeli *et al.* (2021)	X		Root causes of various servitization-related challenges	A firm's internal and external boundaries	–	Manufacturing, case study, 10 cases/firms

(*continued*)

Table 1. Continued

Source	Service	Digital	Studied phenomenon	Focal construct	Type of outcome	Main sample
Salonen *et al.* (2021a)	X		The interplay of individual and org. conditions for salespeople's engagement in solution selling	Salespeople's solution selling engagement	Alternative outcome (employees' engagement)	Manufacturing, survey, $N = 233$ respondents from a single firm
Andersen and Bering (2023)	X		Integration oriented servitization and dimensions of effective structures, coordination and controls	Forward integration into distribution, sales and services	–	Manufacturing, case study, two cases/firms
Heirati *et al.* (2024)	X		Organization architectures for servitization, and how firms align them for high financial performance	Organization architecture	Firm performance (perceived financial performance)	Manufacturing, survey, $N = 161$ firms
Karatzas *et al.* (2023)	X		Relationship between servitization and individual employee-level outcomes	Level of service infusion	Alternative outcome (front-/back-end employee satisfaction)	Manufacturing, secondary data, $N = 201$ firms
Chen *et al.* (2021)	X	X	Changes in the business model for digital servitization	Business model change	–	Manufacturing, single case study
Hsuan *et al.* (2021)	X	X	Strategic trajectories of product–service–software configurations	Digital servitization trajectories	–	Manufacturing, case study, 15 cases/firms
Struyf *et al.* (2021)	X	X	Reasons for struggles with digital servitization	Digital servitization obstacles	–	Manufacturing, case study, two cases/firms
Momeni *et al.* (2023)	X	X	Operational capability development mechanisms to facilitate digital servitization	Operational capabilities	–	Manufacturing, interviews, respondents from 15 firms
Kowalkowski and Ulaga (2024)	X	X	How firms can leverage the potential of subscriptions for growth	Subscription offers	–	Manufacturing and other industries, interviews, $N = 15$ firms
Heirati *et al.* (2025)	X	X	Interplay between servitization, org. capabilities, contextual factors, and performance	Advanced servitization	Firm performance (perceived financial performance)	Manufacturing, survey, $N = 151$
This study	X	X	How digital service orientation can be induced within service operations and sales units' organizational routines	Digital service orientation	Alternative outcome	Manufacturing, survey, $N = 534$ respondents (270 in service operations and 264 in service sales)

Source(s): Created by the authors

Despite growing research on higher-level aspects of digital services (Hsuan *et al.*, 2021; Kowalkowski and Ulaga, 2024), limited attention has been paid to how organizations can adjust "the everyday activity of organizing" (Feldman and Orlikowski, 2011, p. 1240) for successful implementation. This is especially critical for CFUs, such as service operations and sales, which directly engage with numerous stakeholders in the customer organization throughout the different stages of the customer's purchasing and usage journey (Witell *et al.*, 2020).

A traditional view assumes that operations and sales are distinct, including at the individual level of field engineers versus salespeople. As Ulaga and Reinartz (2011) exemplify, the former routinely installs equipment, provides maintenance and repair, and supplies spare parts, among other tasks. For the latter, in contrast, everyday activities often include interacting with customer-side decision makers across hierarchical levels, with the focus on negotiating, networking, and communicating value (Ulaga and Reinartz, 2011). Overall, service operations and sales typically have different roles within a manufacturing firm. As a result, many studies investigate each function separately (e.g. Salonen *et al.*, 2021a; Reinartz and Ulaga, 2008; Gebauer *et al.*, 2010). However, both CFUs are central to servitization efforts (Baines and Lightfoot, 2014; Karatzas *et al.*, 2023; Raja *et al.*, 2018).

Digital service contexts rely more on digitally enabled customer insights at the expense of face-to-face customer interactions, and such large-scale shifts may appear challenging for many CFU employees because of difficulties in reconciling the requirements around services (Bigdeli *et al.*, 2021; Karatzas *et al.*, 2023; Pemer, 2021). Thus, routines provide organizational stability (through consistency) and change (through variations and adaptations). Adjusting organizational routines focuses on "the doing involved in the creating of both performative and ostensive aspects" (Feldman, 2016, p. 39), by actively shaping the actions during performance of routines (performative aspects) and the broader framework guiding those actions (ostensive aspects). Research on organizational routines posits that performative (behavioral) and ostensive (cognitive) aspects of routines are entwined (Becker, 2004). Ostensive principles guide performative actions, but actions are over time capable of modifying ostensive aspects of routines (Feldman and Orlikowski, 2011; Feldman and Pentland, 2003). Consequently, frontline employees are not passive executors of ostensive aspects of routines but actively adapt routines based on specific contexts, goals, and challenges.

While routines provide structure and stability to employees' daily activities, they can also hinder change when new strategic directions are introduced (Bucher and Langley, 2016), especially in uncertain B2B settings where adaptability is crucial (Gross, 2014). For example, sales representatives often resist selling services, favoring traditional product-based approaches (Reinartz and Ulaga, 2008; Salonen *et al.*, 2021a; Struyf *et al.*, 2021). Similarly, field service employees struggle to balance efficiency with effectiveness in service delivery (Tuli *et al.*, 2007; Ulaga and Reinartz, 2011). The introduction of digital technologies increases these challenges, often leading to resistance as frontline employees navigate new workflows and expectations (Kowalkowski and Ulaga, 2017). For instance, marketing research shows that even B2B service salespeople frequently struggle to sell new digital services (Guenzi and Nijssen, 2024). While digital data and improved data sharing can benefit service operations and sales, acting on data often demands changes to established routines, which some employees may resist (Struyf *et al.*, 2021).

Inducing digital service orientation within CFUs' routines demands coordinated service and digital efforts, as organizations must adapt to specific operational and market conditions (cf. Gebauer *et al.*, 2010; Hsuan *et al.*, 2021). This underscores the importance of a tailored managerial approach to ensure CFUs align with the firm's digital service strategy. Although flexible and well-designed routines are essential for managing inconsistent or competing priorities (Yu *et al.*, 2023), not all existing routines are suited to rapid, widespread change (Secchi *et al.*, 2020). Hence, inducing digital service orientation can be a significant managerial challenge, particularly in fast-evolving digital environments (cf. D'Adderio, 2011;

D'Adderio and Pollock, 2020). It necessitates attention to the interdependent actions of frontline employees, which form repetitive and recognizable patterns that underpin organizational routines (Feldman and Pentland, 2003).

2.2 Inducing digital service orientation

Drawing on prior studies in servitization, marketing, management, and organizational routines, we propose a conceptual framework outlined in Figure 1. This framework includes six routine elements: technology foresight, customer focus, adaptability, agility, problem-solving, and rule-bending. The complex interplay among the routine elements, manifested in their possible configurations, is expected to induce digital service orientation. Consequently, we adopt a configurational approach (e.g. Fang *et al.*, 2025; Heirati *et al.*, 2025; Salonen *et al.*, 2021a) to understand how digital service orientation can be induced within service operations and sales units' organizational routines.

Our definition of *digital service orientation* builds on Gebauer *et al.*'s (2010) holistic view of service orientation, which emphasizes embedding service-focused principles throughout a firm's operations. Incorporating the ostensive aspects of service orientation, it highlights shared principles, understandings shaped by norms, and formal and informal rules (Dionysiou and Tsoukas, 2013). Accordingly, we define digital service orientation as a firm's collective recognition of the strategic potential of digitally enabled services for innovation and competitive advantage. We propose that inducing digital service orientation requires a combination of ostensive aspects of routines—mainly reflecting the routine elements of technology foresight and customer focus—and performative aspects of routines—primarily emphasizing the routine elements of adaptability, agility, problem-solving, and rule-bending. These routine elements stem from the perceived value of adopting and utilizing digital technologies in service provision.

Technology foresight reflects a firm's commitment to identifying, developing, and adopting emerging technological innovations to enhance service operations and influence organizational routines. This forward-looking mindset positions technology as a key driver of operational efficiency and strategic success, emphasizing continuous adaptation to next-generation advancements (Bortolotti *et al.*, 2015; Naor *et al.*, 2010). Research on routines emphasizes the importance of such a focus on technology in increasingly digital environments, for example, when allocating resources to new technologies (e.g. Volberda *et al.*, 2021). Traditionally, successful manufacturers have routines that strongly focus on cutting-edge technological innovations (Huikkola *et al.*, 2022b). With novel digital technologies

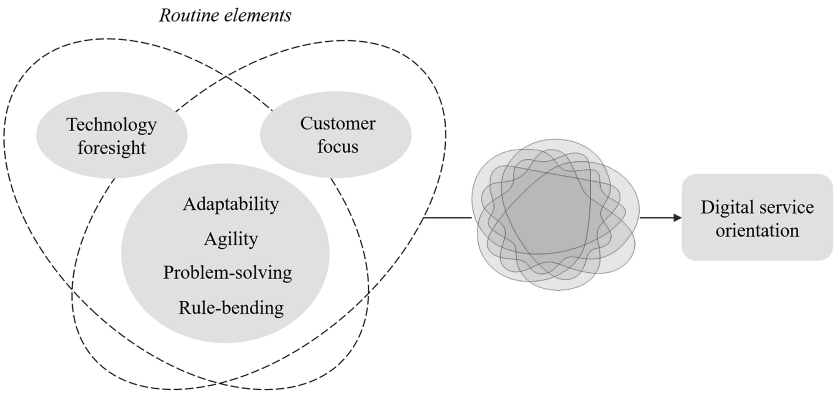

Figure 1. Conceptual framework. **Source(s):** Created by the authors

continuously transforming service provision, manufacturers require more adoptive and innovative routines to benefit from emerging advancements (Huikkola *et al.*, 2022a).

While technology foresight is important, servitization and marketing literature also emphasize that successful service provision requires *customer focus*, which prioritizes understanding and addressing customers' specific needs through active support and dialogue (e.g. Donavan *et al.*, 2004). Research on routines supports the importance of a broad customer focus within service provision (e.g. Secchi *et al.*, 2020). For manufacturers, customer-focused routines are especially critical in digital servitization (Huikkola *et al.*, 2022a), where routines centered on customer productivity become particularly advantageous (Huikkola *et al.*, 2022b). Customer-oriented firms recognize each business customer's unique needs (Andersen and Bering, 2023; Heirati *et al.*, 2025) and actively assist them in achieving performance improvements (Ulaga and Reinartz, 2011). Customer focus underscores the importance of tailored, relationship-based approaches to fulfilling evolving customer needs.

Beyond these two foundational routine elements that are more directed toward ostensive aspects, we identify four routine elements that are more directed toward performative actions. These four elements require customer-facing employees to adjust their everyday actions and processes to address external changes, respond swiftly to emerging issues, and, when necessary, circumvent established guidelines and procedures.

Adaptability implies that customer-facing employees are willing to move beyond preserving ostensive aspects of routines (Fey and Denison, 2003) by effectively responding to external demands, such as competitor actions or market changes, and developing new competencies (Kalra *et al.*, 2021). Enabling employees to embed changes into ostensive aspects of routines while performing them is often advantageous, particularly for leveraging digital technologies (Momeni *et al.*, 2023; Struyf *et al.*, 2021). Adaptability creates variations in performance and provides feedback for modifying ostensive aspects of routines to align with long-term environmental or organizational changes (cf. Frangeskou *et al.*, 2020; Pavlov and Bourne, 2011; Yu *et al.*, 2023).

Agility refers to the ability to quickly change priorities and make decisions in response to, for example, unforeseen customer issues or disruptions arising from new technologies (Bastl *et al.*, 2025; Homburg *et al.*, 2020; Kalaignanam *et al.*, 2021; Pemer, 2021; Zheng *et al.*, 2025). Research on routines highlights the importance of performative real-time adjustments to accommodate rapidly changing customer requests, particularly in uncertain environments (Secchi *et al.*, 2020). Agility enables customer-facing employees to make quick, autonomous, and efficient decisions when engaging with customers (Kalaignanam *et al.*, 2021; Kalra *et al.*, 2021), while operating within the current ostensive aspects (cf. Homburg *et al.*, 2020; Secchi *et al.*, 2020; Struyf *et al.*, 2021).

Problem-solving emphasizes that customer-facing employees can effectively and efficiently address customer issues through reliable, high-quality service delivery and by preserving customer relationships (Kalra *et al.*, 2021; Momeni *et al.*, 2023; van der Heijden *et al.*, 2013). It is integral to performative aspects of routines, where actors encounter and address unanticipated obstacles, which often require creative, on-the-spot thinking (Andersen and Bering, 2023) to meet customer expectations (Struyf *et al.*, 2021; Ulaga and Kohli, 2018). Research suggests that leveraging existing routines enhances problem-solving efficiency (Knol *et al.*, 2018), while creatively recombining performative aspects of routines offers advantages, particularly for ad-hoc solutions to novel customer challenges (Gross, 2014).

Finally, *rule-bending* refers to customer-facing employees' efforts to meet customer requirements while aligning with management expectations during service or sales activities. This can create tensions or ambiguities, potentially necessitating deviations from established guidelines (e.g. Forkmann *et al.*, 2022; King and Garey, 1997; Schepers *et al.*, 2016; van der Heijden *et al.*, 2013). These deviations can occur when formalized routines are in place, or during their modifications or creation (Frangeskou *et al.*, 2020; Gross, 2014; Knol *et al.*, 2022). Research on routines highlights the importance of such deviations in achieving beneficial outcomes and in adjusting or reinterpreting existing rules to fit specific contexts (Galeazzo *et al.*, 2021; Secchi *et al.*, 2020).

3. Method

3.1 Sample selection and data collection

To explore how digital service orientation can be induced within service operations and sales units' organizational routines, we initiated a research collaboration with a market-leading manufacturing firm headquartered in Northern Europe. The firm employs approximately 20,000 people and reports annual revenues exceeding US$5bn. Its products serve global industrial markets, including power generation, mining, industrial waste treatment and recycling, shipbuilding, and pharmaceutical production.

During the study, the firm implemented remote access to its products and developed and launched its first fully digital service offerings. It introduced digital tools across its global service operations, enabling what it calls "remote service." This service includes preventive maintenance, calibration, condition monitoring, and equipment control. The core activities involve providing remote technical advice, customer guidance, troubleshooting, and problem-solving. As a result, logged remote service hours grew from nearly zero to tens of thousands, and the firm's service business outpaced overall sales growth quarterly.

To design, develop, and evaluate our study, we conducted 24 meetings and workshops with managers involved in the firm's digital service strategy, including service operations and sales managers, service portfolio managers, competence managers, digital experience managers, and training specialists. These discussions provided crucial empirical insights, essential for adopting the configurational approach (Furnari *et al.*, 2021). It was decided to focus on customer-facing units (CFUs) of service operations and service sales, as these were deemed critical for studying how digital service orientation can be induced. Following prior configurational studies (e.g. Salonen *et al.*, 2021b), we conducted a survey.

The survey constructs and items were based on existing scales adapted from previous studies on servitization, broader service research, and organizational change (Table 2). To ensure relevance and construct validity, each item was co-designed, tested, and validated through more than 10 meetings with company representatives (primarily service operations and sales managers involved in the digital service strategy). The wording was occasionally tailored for respondents; for example, "remote services" was the internal term for the new digital service offerings within CFUs, while externally, the firm used "digital services".

Survey items were measured on a five-point Likert scale (1 = "strongly disagree," 5 = "strongly agree"), a format familiar to respondents from prior internal surveys. Several items were adapted to the customer-facing function, such as modifying a service operations item from "We always aim to be on the leading edge of *new technology for service operations*" to "*. . . of selling new technology.*" The survey was distributed through the firm's internal system to 574 service operations employees and 681 service sales employees, yielding 305 and 299 responses, respectively. After eliminating cases with missing data, the final sample comprised 270 responses from service operations and 264 from service sales, totaling 534 responses (Supplementary materials). To ensure confidentiality, the firm and respondents were anonymized. The data prove robust in terms of construct validity and reliability (cf. Salonen *et al.*, 2021a): each item exhibited significant factor loadings, and the Cronbach's alpha (0.70), composite reliability (0.70), and average variance extracted (0.50) all meet the recommended threshold values (Table 2). We summed the validated scales for the subsequent analysis.

The survey results were empirically validated through five meetings and workshops with managers closely involved in the digital service strategy. During these discussions, managers confirmed that our findings aligned with their understanding of how digital service orientation may be induced. Given that our study examined service operations and sales, managers consistently emphasized the need for better alignment between these CFUs. The survey results were considered a "cornerstone" for internal development, serving as the foundation for training programs aimed at developing relevant competencies, as well as attracting and retaining skilled employees.

Table 2. Construct items

Constructs and corresponding items	FL SO	FL SS
Technology foresight (CA = 0.90/0.88; CR = 0.91/0.88; AVE = 0.71/0.65; adapted from Bortolotti *et al.* (2015), Naor *et al.* (2010))		
We always . . .		
Aim to be on the leading edge of new technology for service operations. (SS: . . . of selling new technology)	0.75	0.77
Plan ahead, in order to develop technical skills for the future. (SS: . . . technical skills to sell services)	0.80	0.77
Think of the next generation of technology. (SS: . . . technology to sell)	0.91	0.82
Make an effort to predict the potential of new technology. (SS: . . . sales potential of new technology)	0.91	0.87
Customer focus (CA = 0.85/0.75; CR = 0.85/0.75; AVE = 0.66/0.50; based on Donavan *et al.* (2004), Ulaga and Reinartz (2011))		
We always . . .		
Actively help our customers achieve performance improvements	0.84	0.68
Have the necessary understanding of each customer's specific needs	0.81	0.78
Have close dialogue with our customers	0.78	0.65
Adaptability (CA = 0.85/0.85; CR = 0.86/0.86; AVE = 0.68/0.67; adapted from Fey and Denison (2003))		
We always . . .		
Respond well to competitors' actions	0.85	0.80
Respond well to changes in the market	0.89	0.87
Adopt new ways to do work	0.72	0.79
Agility (CA = 0.80/0.75; CR = 0.79/0.76; AVE = 0.56/0.51; based on Kalaignanam *et al.* (2021), Homburg *et al.* (2020))		
We always . . .		
Have the ability to quickly change priorities	0.73	0.71
Easily make decisions when dealing with customers	0.76	0.73
Quickly deal with unhappy customers	0.76	0.69
Problem-solving (CA = 0.84/0.79; CR = 0.84/0.79; AVE = 0.56/0.50; based on van der Heijden *et al.* (2013))		
We always . . .		
Respond quickly to customer problems	0.70	0.73
Solve a lot of problems on the spot	0.72	0.63
Solve the problems together to find a solution ("brainstorming")	0.75	0.69
Find new ways of solving problems ("thinking outside the box")	0.82	0.74
Rule-bending (CA = 0.88/0.91; CR = 0.88/0.92; AVE = 0.71/0.78; adapted from King and Garey (1997))		
We often have to go around internal guidelines/procedures in order to . . .		
Carry out our service operations. (SS: . . . our sales activities)	0.81	0.94
Meet management's expectations	0.84	0.85
Meet customers' expectations	0.88	0.86
Digital service orientation (CA = 0.86/0.83; CR = 0.86/0.83; AVE = 0.61/0.56; adapted from Gebauer *et al.* (2010))		
We see great potential in Remote services. (SS: . . . in selling Remote services)	0.73	0.71
Management is actively promoting our Remote services. (SS: . . . us to sell Remote services)	0.78	0.77
We want to grow our Remote services business	0.84	0.81
We look forward to implement the latest connectivity technology. (SS: . . . sell the latest connectivity technology)	0.78	0.69

Note(s): FL = factor loading (standardized); SO = service operations; SS = service sales; CA = Cronbach's alpha; CR = composite reliability; AVE = average variance extracted. Service operations' values appear before the slash (/), service sales' values appear after it. All items were assessed on five-point Likert scales (1 = "strongly disagree," 5 = "strongly agree"). All factor loadings are significant

Source(s): Created by the authors

3.2 Analysis design

To analyze the collected data, we employed fuzzy-set qualitative comparative analysis (fsQCA; e.g. Salonen *et al.*, 2021a, b; Heirati *et al.*, 2024, 2025). In line with the configurational approach, fsQCA captures its central notion, causal complexity, in terms of *conjunction*, such that an outcome results from a combination of causes instead of one; *equifinality*, in that different combinations may be linked to the same outcome; and *asymmetry*, when combinations linked to the outcome's presence typically do not mirror those linked to its absence (Schneider and Wagemann, 2012). In the configurational approach's terminology, individual causes are referred to as "conditions" (represented by the six routine elements in our study) and their combinations are referred to as "configurations". The configurational approach also distinguishes between *necessary* and *sufficient* conditions. A condition is necessary if it must be present for the outcome to occur; in turn, a condition is sufficient if, whenever present, it produces the outcome (Schneider and Wagemann, 2012).

As a set-theoretic method, fsQCA treats conditions and outcomes as sets, such as one set of cases that all display technology foresight and another with cases that display customer focus. Membership in multiple sets can occur, such as if a case simultaneously displays technology foresight and customer focus. For testing the theorized complex interplay of routine elements, fsQCA allows for more fine-grained, "fuzzy-set" membership—that is, capturing not only whether a case is a member of a set but also the degree of such membership (fuzzy-set scores range between 0 and 1).

Prior to the analysis, we calibrated the data (Duşa, 2019). To preserve the qualitative information from the Likert scales, we used the endpoints of 5.0 and 1.0 as thresholds for full membership (fuzzy-set score of 0.95) and non-membership (score of 0.05). The crossover point (score of 0.50) was set to 3.9 (Lexutt, 2020)—that is, cases that agree or fully agree (4 or 5 on the Likert scale) are more in the set than out, whereas cases that fully disagree, disagree, or neither agree nor disagree (1, 2 or 3 on the Likert scale) are more out of the set. After the calibration, we assessed necessity by identifying conditions that were above consistency values of 0.90 and achieved high coverage and relevance scores (Schneider and Wagemann, 2012; Duşa, 2019). The analysis suggests no necessary conditions.

For the sufficiency analysis, we constructed separate truth tables for service operations and service sales (Supplementary materials), then analyzed each table with the QCA package in R (Duşa, 2019) by applying the following cut-off values: frequency of 3 (minimum number of cases in a table row), raw consistency of 0.85 (table row is considered sufficient), and proportional reduction in inconsistency of 0.56 (table row is a subset of only the outcome, but not of its absence). Each sufficient configuration for the outcome is characterized by consistency (how much the cases sharing it agree in displaying the outcome), raw coverage (how much of the outcome it covers), and unique coverage (raw coverage minus any overlap with other configurations). When derived from the same truth table, the configurations constitute a solution that is also characterized by consistency and coverage (Schneider and Wagemann, 2012).

We interpret the results using parsimonious and intermediate solutions (Schneider and Wagemann, 2012). The parsimonious solutions (one per truth table) include all logical remainders except for contradictory simplifying assumptions, while excluding simultaneous subset relations between configurations (Duşa, 2019). The intermediate solutions then add directional expectations for how each condition should contribute to the presence of an outcome (Duşa, 2019). These two types of solutions distinguish between "core" conditions, more essential to the configuration, and "peripheral" conditions, less essential to each configuration. Core conditions appear in parsimonious and intermediate solutions; peripheral conditions appear only in the latter but reinforce core conditions in the configuration (cf. Heirati *et al.*, 2025).

4. Results

4.1 Configurations for digital service orientation

Three sufficient configurations for digital service orientation are identified in service operations and four in service sales (Table 3). Each configuration's unique coverage is greater than 0, indicating empirical relevance in inducing digital service orientation. The solution coverage is high (0.73 for service operations, 0.71 for service sales), such that most of the membership in the outcome is explained. Solution consistency is also high (0.91 for service operations, 0.88 for service sales).

For service operations, Configuration 1 demonstrates that technology foresight, adaptability, and agility are core, essential routine elements; problem-solving is peripheral—that is, it reinforces the core ones (customer focus and rule-bending are irrelevant and can be present or absent). For Configuration 2, technology foresight, adaptability, problem-solving, and rule-bending are core routine elements; customer focus is peripheral (agility is irrelevant). Finally, Configuration 3 contains technology foresight, customer focus, agility, and rule-bending as core routine elements; problem-solving is peripheral (adaptability is irrelevant).

Among service sales in Configuration 4, technology foresight, adaptability, and agility are core routine elements; customer focus is peripheral (problem-solving and rule-bending are irrelevant). Although Configuration 5 is like Configuration 4, it distinctly features rule-bending as core and agility as irrelevant. Configuration 6 has technology foresight, agility, and rule-bending as core routine elements; customer focus and problem-solving are peripheral (adaptability is irrelevant). Finally, Configuration 7 is the only one with explicitly *absent* problem-solving and rule-bending. Otherwise, it is identical to Configuration 6.

Three insights emerge when examining the routine elements across service operations and service sales. First, technology foresight is always core, thereby crucial for inducing digital service orientation. Second, customer focus is present in all but one configuration, frequently as peripheral (which is always the case for service sales). This finding suggests that customer focus plays an indispensable but typically reinforcing role in inducing digital service orientation. Third, adaptability, agility, and rule-bending are always core, if present, whereas problem-solving is predominantly peripheral, if present (and always appears for service operations).

Table 3. Configurations sufficient for digital service orientation

	Configurations						
	Service operations			Service sales			
Routine elements	1	2	3	4	5	6	7
Technology foresight	●	●	●	●	●	●	●
Customer focus		•	●	•	•	•	•
Adaptability	●	●		●	●		
Agility	●		●	●		●	●
Problem-solving	•	●	•			•	⊗
Rule-bending		●	●		●	●	⊗
Raw coverage	0.68	0.64	0.64	0.65	0.59	0.57	0.47
Unique coverage	0.07	0.02	0.02	0.04	0.03	0.01	0.01
Consistency	0.93	0.93	0.93	0.90	0.90	0.92	0.95
Solution coverage	0.73			0.71			
Solution consistency	0.91			0.88			

Note(s): Filled circles indicate the presence of routine elements, either as core (large circles) or peripheral (small circles). Crossed circles indicate absence, and blanks indicate irrelevance (can be either present or absent)
Source(s): Created by the authors

4.2 Cross-functional patterns

The analysis reveals no identical configurations of routine elements across service operations and service sales (Table 3). However, we identify three distinct cross-functional patterns that induce digital service orientation: the *assertive pattern* underscores adaptability and agility; the *responsive pattern* highlights adaptability and rule-bending, and the *nimble pattern* stresses agility and rule-bending. The three cross-functional patterns are illustrated in Figure 2.

In the assertive pattern (Configurations 1 and 4), service operations and sales share technology foresight, adaptability, and agility as core routine elements, which collectively induce digital service orientation. Technology foresight is fundamental to service strategies enabled by digital technologies, adaptability has also been revealed to positively leverage digital technologies in response to external pressures (e.g. Pemer, 2021), and agility is critical for capturing emerging opportunities and enhancing customer interactions (e.g. Homburg *et al.*, 2020; Kalaignanam *et al.*, 2021; Zheng *et al.*, 2025). While technology foresight appears in other patterns too, the assertive pattern is uniquely characterized by adaptability and agility. The concurrent presence of these two routine elements embodies assertiveness as agility enables customer-facing employees to make quick, autonomous, and efficient decisions when engaging with customers, while adaptability enables these performative variations to feedback into modifications of ostensive aspects of routines. The importance of serving customers in the assertive pattern is further stressed by service operations having problem-solving as peripheral and service sales having customer focus. The assertive pattern of inducing digital service orientation requires employees with strong technological competencies, agility in assisting customers, and an organizational framework that allows employees to adapt these best practices into rules.

As for the responsive pattern (Configurations 2 and 5), service operations and sales share technology foresight, adaptability, and rule-bending as core routine elements. Unlike the assertive pattern, where agility enables rapid prioritization and customer support (thereby a focus on performative aspects of routines), the responsive pattern focuses on navigating internal guidelines (representing ostensive aspects of routines) to meet customer and managerial expectations. Customer-facing employees in this pattern perceive existing ostensive aspects as obstacles and actively work to modify them through feedback. This pattern also highlights problem-solving as a core routine element in service operations, and

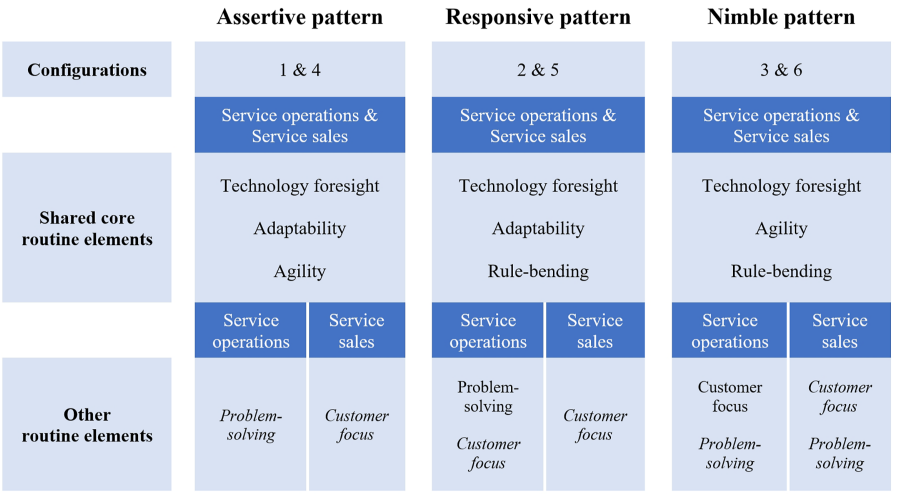

Figure 2. Inducing digital service orientation: cross-functional patterns. **Note(s):** Configurations 1–6 appear in Table 3. Italics indicate peripheral routine elements. **Source(s):** Created by the authors

customer focus as a peripheral element in service operations and sales. The responsive pattern of inducing digital service orientation requires an environment that encourages feedback from customer-facing employees to adapt formal and informal rules to evolving customer needs and operational demands.

Finally, in the nimble pattern (Configurations 3 and 6), service operations and sales share technology foresight, agility, and rule-bending as core routine elements. This combination fosters nimbleness, enabling customer-facing employees to bend the current formal and informal rules and make quick, autonomous decisions when engaging with customers. Service operations emphasize customer focus as a core routine element, while service sales treat it as peripheral, with problem-solving remaining peripheral to both. The nimble pattern of inducing digital service orientation requires employees who can rapidly shift priorities to assist customers and a corporate culture that permits flexibility in established guidelines and procedures to enhance customer service.

Unlike with the above cross-functional patterns, there is no cross-functional counterpart for Configuration 7 (Table 3). Here, service sales exhibit technology foresight and agility as core routine elements, whereas customer focus is peripheral. This configuration also uniquely features *absent* routine elements: problem-solving and rule-bending cannot appear if digital service orientation is to be induced. As the sales force often requires strong problem-solving capacity (Ulaga and Kohli, 2018), we posit this configuration might indicate that when such capacity is weak, digital service orientation is induced from expectations of compensatory benefits from technology-driven services. In turn, the absence of rule-bending may suggest the adequacy of internal rules, aligned requirements from customers and management, or low levels of bureaucracy and standardization, such that they do not inhibit novel, technology-driven ways of doing business.

Complementing the main findings with additional analyses allowed by fsQCA, we examine which configurations of the six routine elements are sufficient for the *absence* of digital service orientation. Three configurations are identified in service operations and three in service sales, although there are no distinct cross-functional patterns (Supplementary materials). We also conduct robustness tests to evaluate the sensitivity of our main findings to changes in the model parameters and calibration. The main findings are substantively unchanged with most of the tested alternative specifications (Supplementary materials).

5. Implications

5.1 Theoretical implications

By leveraging survey data from a market-leading manufacturer, we explore how digital service orientation can be induced within service operations and sales units' organizational routines. In so doing, our exploratory study adds novel insights to the growing stream of research on frontline employees and CFUs concerning strategy implementation (e.g. Andersen and Bering, 2023; Johnson and Sohi, 2017; Karatzas *et al.*, 2023; Raja *et al.*, 2018; Salonen *et al.*, 2021a). By examining the complex interplay of technology foresight, customer focus, adaptability, agility, problem-solving, and rule-bending, we uncover alternative patterns of routine elements that induce digital service orientation. In line with the notions of conjunction, equifinality, and asymmetry (e.g. Salonen *et al.*, 2021b), our results emphasize the need to acknowledge that inducing digital service orientation in CFUs is a complex phenomenon. In turn, our research provides three theoretical contributions.

First, we contribute to servitization research (e.g. Heirati *et al.*, 2025; Hsuan *et al.*, 2021; Momeni *et al.*, 2023; Struyf *et al.*, 2021) where our findings establish homogeneity between the CFU types in inducing digital service orientation. We do that by uncovering recognizable patterns of routine elements in service operations and service sales, which are interconnected customer-facing functions (Andersen and Bering, 2023; de Ruyter *et al.*, 2020; Raja *et al.*, 2018; Tuli *et al.*, 2007). Both service operations and service sales are critical for succeeding with digital services, but assumptions that service engineers and salespeople differ

fundamentally have driven many studies to focus on only one of the functions (e.g. Baines and Lightfoot, 2014; Gebauer *et al.*, 2010; Salonen *et al.*, 2021a; Reinartz and Ulaga, 2008). By utilizing fsQCA, we found and formulated three between-type, cross-functional patterns (Figure 2): assertive, responsive, and nimble. Each pattern is unique in its combination of routine elements that induces digital service orientation. To explain the homogeneity between service operations and sales, we note that we specifically analyze *service* sales. As Ulaga and Loveland (2014) show, B2B product sales and service sales differ not only in terms of processes and proficiencies but also in the individual differences across salespeople (e.g. learning and teamwork). This explanation may be plausible for firms with strong engineering and technology leadership traditions (cf., identity boundaries; Bigdeli *et al.*, 2021), whose service employees are likely receptive to the potential opportunities of new digital technologies.

Second, our findings partially challenge conventional assumptions about customer focus. While customer focus is typically considered essential for service strategies, our results suggest a secondary role in inducing digital service orientation. Specifically, we find that technology foresight is more critical. However, this does not imply that customer focus is becoming less important when providing digital services. Prior research highlights that deeper customer insights, cocreation, and performance improvements become increasingly crucial as firms advance in their servitization efforts (Kowalkowski and Ulaga, 2017; Ulaga and Reinartz, 2011). The digital services examined in this study align with Baines and Lightfoot's (2014) concept of intermediate services—focused on maintaining product condition through monitoring, diagnostics, predictive maintenance, and remote support—rather than advanced services with direct performance outcomes. Since intermediate services often form the foundation of digital service initiatives and generate substantial digital service revenues, manufacturers must align CFU adjustments in customer focus and technology foresight based on service type (Baines and Lightfoot, 2014) when inducing digital service orientation.

Third, we highlight the role of rule-bending: as depicted in Figure 2, the responsive and nimble patterns illustrate how customer-facing employees go around established rules, guidelines, and procedures to better serve customers. Company executives acknowledged that existing internal protocols had not fully adapted to accommodate digital service initiatives, indicating the need for some degree of flexibility in ostensive aspects of routines (cf. Feldman and Pentland, 2003). Formal and informal rules can constrain employees' ability to make independent decisions, limiting their adaptability in dynamic environments (Gross, 2014; Johnson and Sohi, 2017; King and Garey, 1997; Secchi *et al.*, 2020). These challenges stem from difficulties in reconciling internal processes with external requirements for new services (Bigdeli *et al.*, 2021; Karatzas *et al.*, 2023; Raja *et al.*, 2018; Schepers *et al.*, 2016), and are particularly pronounced in complex, unpredictable, and digitalized settings (Pemer, 2021). Prior organization and servitization research highlighted strict rules and standard operating procedures (e.g. Visnjic *et al.*, 2022). Our findings show that employees may circumvent such rules (cf. Forkmann *et al.*, 2022), suggesting that certain routine elements require flexibility or openness to adjustments. If CFUs are expected to bridge conflicting demands, some ostensive aspects of organizational routines should be loosely defined (cf. autonomy; Andersen and Bering, 2023; Kalra *et al.*, 2021; Karatzas *et al.*, 2023). Thus, rule-bending functions as an adaptive mechanism to address gaps in ostensive aspects of routines through customer-facing employees' performative activities. Our findings align with prior literature showing the importance of reconciling misalignment between customer requirements and managerial expectations (e.g. van der Heijden *et al.*, 2013; Forkmann *et al.*, 2022; Schepers *et al.*, 2016), addressing inadequate service strategy guidelines (e.g. Johnson and Sohi, 2017; Karatzas *et al.*, 2023), and overcoming bureaucratic constraints that hinder innovation and technology-driven business practices (Wei *et al.*, 2014).

5.2 Managerial implications

This study offers several managerial implications for manufacturers implementing digital service strategies. First, digital service orientation is induced by the complex interplay of multiple routine elements. We identify three cross-functional patterns between service operations and sales (Figure 2). Together, these patterns provide managers with a broad set of tactics for reorganizing CFU activities to induce digital service orientation. Managers should apply these patterns contextually, as the impact of routine elements depends on their interaction. For example, while technology foresight is crucial in all patterns, it is insufficient on its own. Managers should instead focus on the right combination of key routine elements. Leveraging these synergies can enhance cross-functional collaboration between service operations and service sales. For instance, service operations often have deeper customer knowledge and are more trusted by customers than service salespeople (Ulaga and Reinartz, 2011), potentially generating additional sales leads. However, while research recognizes that field service employees can function as a "secondary sales force" for cross-selling and upselling (Berkmann *et al.*, 2024), such initiatives may backfire, undermining customer trust and causing employee discomfort. Since employees in service operations units are primarily technical experts, efforts to enhance their cross-functional routines should be targeted and limited to specific sales situations (Classen and Friedli, 2022; Pereira *et al.*, 2018). These patterns can also be adapted to fit the specific needs of each CFU. For example, within the same pattern (e.g. the assertive pattern in Figure 2), service sales may require greater emphasis on customer focus, while service operations may benefit from a stronger focus on problem-solving.

Second, our study presents a counterintuitive finding regarding customer focus. While generally considered fundamental to service success, our study suggests its secondary role (with one exception; see Table 3). Managers at the firm indicate that customer focus might already be embedded in CFUs as performative aspects of routines, neglecting the need for additional adjustment when inducing digital service orientation. Another explanation is in the nature of the digital services examined in this study, which are classified as intermediate, primarily focused on maintaining product condition, rather than advanced offerings with a clear outcome orientation (Baines and Lightfoot, 2014). For managers, this finding underscores the importance of balancing customer focus and technology foresight based on service type.

Third, we emphasize the strategic role of rule-bending. Ideally, firms aim to minimize rule-bending by ensuring that guidelines, procedures, and processes remain relevant. However, as firms advance in servitization, ostensive aspects of routines may lag behind performative activities, creating friction. Rule-bending can indicate underlying inefficiencies, such as outdated guidelines or bureaucratic barriers that require managerial attention. Managers should recognize these behaviors, assess their causes, and determine which rule-bending activities should be formalized into updated ostensive aspects of routines. However, to ensure alignment with the firm's long-term strategic and organizational changes, management should actively regulate which performative rule-bending activities are permitted to evolve into formalized ostensive aspects. Table 4 presents the key managerial insights structured around guidelines for managers.

6. Limitations and further research

This exploratory study has limitations that also offer promising avenues for research. As we examine how digital service orientation can be induced at a collective level by studying CFUs, a broadened firm-level focus could reveal valuable cross-organizational insights from firms without standalone CFUs (e.g. small firms) or those that do not separate their service operations and service sales into two functions. In these organizational structures, digital service orientation may be induced by other routine elements, expanding the variety of options available to managers. Alternatively, an individual-level analysis could reveal the

Table 4. Managerial implications

Key insight	Guidelines for managers
Digital service orientation is induced by different combinations of routine elements	Focus on the full picture, not just one aspect: • No single routine element drives success alone—it is their *combination* that matters • The role of each behavior may differ depending on the team or function • Invest in technology foresight—this is consistently critical • Do not overemphasize customer focus at the early stages—it tends to play a secondary role in inducing digital service orientation
Service operations and service sales show similar cross-functional patterns	Use proven patterns to guide change: • There is more than one way to succeed—three distinct patterns can all induce digital service orientation • Teams lacking one key routine element can often compensate by leaning into another • Help teams recognize and strengthen the shared patterns between sales and operations to drive alignment
Rule-bending (workaround behaviors) plays a major role in many teams	Handle rule-bending with care: • It can help teams move forward when formal processes fall short—especially if agility or adaptability is missing • Too much reliance on bending rules may reveal deeper problems: unclear processes, outdated policies, or barriers to innovation • Use it as a signal—then ask: is the system helping or hindering progress?

Source(s): Created by the authors

micro-foundations of the identified patterns. Doing so for service operations and service sales would offer complementary perspectives on the identified cross-functional patterns.

Future research could also investigate whether our three patterns apply when the service line becomes the unit of analysis, which could be divided into basic, intermediate, and advanced services (Baines and Lightfoot, 2014). A theoretical anchoring for that research could be linked to existing research on capabilities, which suggests varying degrees of capability requirements across service types (e.g. product/process oriented or input/outcome oriented; Ulaga and Reinartz, 2011). This could potentially unravel an evolutionary aspect, which was not addressed in this study and represents its limitation, as some patterns might be influenced by the stage of a firm's digital service transition. A similar limitation concerns potential distinctions across geographies and industries, which are suggested as fruitful opportunities for future research.

Just as digital service orientation is crucial for strategy implementation, we anticipate that it may be essential for firm performance. While providing some insights into how digital service orientation can be induced, we encourage scholars to go further and examine their performance implications. In this regard, and like other studies that focus on constructs other than firm performance (e.g. Karatzas *et al.*, 2023; Salonen *et al.*, 2021a; see also Table 1) or that utilize perceived performance measures (e.g. Heirati *et al.*, 2024, 2025), we join in calls to account for objectively measured performance. Longitudinal research might shed light on dynamic outcomes as well. Although our fsQCA method is well-suited for cross-sectional analysis, its applications to temporal dimensions are under development. We suggest using alternative methods for longitudinal research, even if they lack fsQCA's ability to capture conjunction, equifinality, and asymmetry.

Finally, investigating rule-bending further appears pertinent. If circumventing guidelines and procedures is considered appropriate within a customer-facing unit, managerial control might be limited, which would have far-reaching consequences for practitioners (cf. Andersen and Bering, 2023; Bigdeli *et al.*, 2021; Forkmann *et al.*, 2022). We thus call for a better theoretical and empirical understanding of rule-bending. Similarly, we complement our findings with an analysis of the absence of digital service orientation, and this distinct phenomenon could also benefit from a broader perspective. Scholars might determine whether and how it corresponds with core rigidities within a firm. For managers working to implement digital service strategies, such a study could offer valuable insights into the obstacles they are likely to face.

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Supplementary material
The supplementary material for this article can be found online.

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Digital service orientation: unlocking servitization in service operations and service sales

Supplementary materials

Supplementary material A. Sample characteristics

Service operations			Service sales		
Criterion	**Frequency**	**Percentage**	**Criterion**	**Frequency**	**Percentage**
Age			***Age***		
18-24	4	1.5	18-24	1	0.4
25-34	75	27.8	25-34	58	22.0
35-44	103	38.1	35-44	104	39.4
45-54	62	23.0	45-54	73	27.7
55+	26	9.6	55+	28	10.6
Total	*270*	*100.0*	*Total*	*264*	*100.0*
Role			***Role***		
Field service engineer	238	88.1	Field sales	124	47.0
Service manager	32	11.9	Sales manager	80	30.3
Total	*270*	*100.0*	Inside sales	38	14.4
			Divisional manager	22	8.3
			Total	*264*	*100.0*
Years in the role			***Years in the role***		
Under 1 year	17	6.3	Under 1 year	34	12.9
1-3 years	33	12.2	1-3 years	62	23.5
4-7 years	52	19.3	4-7 years	73	27.7
8-15 years	79	29.3	8-15 years	58	22.0
More than 15 years	63	23.3	More than 15 years	34	12.9
Missing	26	9.6	Missing	3	1.1
Total	*270*	*100.0*	*Total*	*264*	*100.0*
Years at the firm			***Years at the firm***		
Under 1 year	29	10.7	Under 1 year	27	10.2
1-3 years	38	14.1	1-3 years	49	18.6
4-7 years	67	24.8	4-7 years	65	24.6
8-15 years	79	29.3	8-15 years	65	24.6
More than 15 years	48	17.8	More than 15 years	58	22.0
Missing	9	3.3	*Total*	*264*	*100.0*
Total	*270*	*100.0*			

Source(s): Created by the authors

Supplementary material B. Reduced truth tables

Service operations

Tech. fores.	Adapta bility	Agility	Problem-solving	Rule-bending	Cust. focus	Number of cases	Raw consistency	PRI	Outcome
1	1	1	1	1	0	4	0.96	0.57	1
1	1	1	1	0	1	5	0.94	0.58	1
1	1	1	1	1	1	31	0.94	0.76	1
1	0	1	1	1	1	5	0.94	0.60	1
1	1	0	1	1	1	7	0.94	0.59	1
1	1	0	0	1	0	4	0.95	0.46	0
1	0	1	1	0	1	3	0.94	0.52	0
1	1	0	1	0	1	4	0.94	0.43	0
1	0	0	1	1	0	3	0.94	0.41	0
1	0	0	0	1	0	3	0.93	0.34	0
1	0	0	1	1	1	6	0.93	0.48	0
1	0	0	0	0	0	6	0.92	0.27	0
0	1	0	1	1	1	4	0.90	0.33	0
0	1	1	1	1	1	7	0.90	0.32	0
0	0	1	0	1	1	3	0.90	0.29	0
0	0	1	1	1	1	7	0.89	0.32	0
0	0	0	1	1	1	6	0.88	0.31	0
0	1	1	1	0	1	14	0.88	0.29	0
0	0	1	0	0	1	7	0.87	0.23	0
0	0	0	0	1	1	10	0.87	0.24	0
0	0	1	1	0	1	11	0.85	0.27	0
0	0	0	0	1	0	12	0.84	0.21	0
0	0	0	1	0	1	11	0.84	0.22	0
0	0	0	0	0	1	11	0.84	0.22	0
0	0	0	1	0	0	7	0.84	0.19	0
0	0	0	0	0	0	57	0.70	0.12	0

Note(s): Tech. fores.—technology foresight. Cust. focus—customer focus. PRI—proportional reduction in inconsistency.
Source(s): Created by the authors

Service sales									
Tech. fores.	Adaptability	Agility	Problem-solving	Rule-bending	Cust. focus	Number of cases	Raw consistency	PRI	Outcome
1	1	1	0	1	1	4	0.96	0.67	1
1	1	0	0	1	1	3	0.95	0.59	1
1	0	1	0	0	1	3	0.95	0.59	1
1	0	1	1	1	1	3	0.94	0.58	1
1	1	0	1	1	1	3	0.94	0.60	1
1	1	1	1	0	1	14	0.93	0.66	1
1	1	1	1	1	1	32	0.93	0.68	1
0	1	0	0	1	1	3	0.94	0.49	0
0	1	1	1	1	1	5	0.94	0.54	0
1	1	0	1	0	1	6	0.93	0.55	0
1	0	0	1	1	1	3	0.93	0.51	0
1	0	1	1	0	1	5	0.93	0.55	0
0	1	0	1	1	1	4	0.93	0.46	0
0	0	1	0	1	1	3	0.93	0.46	0
0	1	1	1	0	1	5	0.92	0.51	0
0	0	1	0	1	0	6	0.92	0.49	0
0	0	1	0	0	1	3	0.91	0.43	0
0	0	1	1	1	1	10	0.91	0.43	0
0	0	1	0	0	0	3	0.90	0.40	0
0	0	0	0	1	1	9	0.90	0.38	0
0	0	0	1	1	1	4	0.90	0.35	0
0	0	1	1	0	1	10	0.88	0.38	0
0	0	0	0	0	1	19	0.88	0.38	0
0	0	0	1	1	0	5	0.88	0.32	0
0	0	0	1	0	1	7	0.88	0.34	0
0	0	0	0	1	0	13	0.87	0.33	0
0	0	0	1	0	0	8	0.86	0.29	0
0	0	0	0	0	0	35	0.80	0.25	0

Note(s): Tech. fores.—technology foresight. Cust. focus—customer focus. PRI—proportional reduction in inconsistency.
Source(s): Created by the authors

Supplementary material C. Additional analyses: absence of digital service orientation

Complementing the main findings with additional analyses allowed by fsQCA, we examine which configurations of the six routine elements are sufficient for the *absence* of digital service orientation. Again, we conduct separate analyses for service operations and service sales, each yielding three configurations (see below). Since the interplay of the six routine elements in our conceptual framework induces digital service orientation, we do not expect their presence also for the latter's absence. The results are in line with this expectation: we find no present routine elements for the absence of digital service orientation (except for problem-solving in one configuration). However, no configuration here is the inverse of any configuration from the main findings (Table 3). For example, *absent* technology foresight is sufficient for the absence of digital service orientation in one configuration, but *present* technology foresight alone is never sufficient for digital service orientation. Moreover, unlike in our main results, we observe no distinct cross-functional patterns. These findings reflect the notion of asymmetry, in that configurations for an outcome's presence do not typically mirror those for its absence. Digital service orientation and its absence are not simply two sides of the same coin. Instead, these distinct, heterogeneous phenomena are induced by non-mirroring configurations of routine elements.

	Configurations					
	Service operations			Service sales		
Routine elements	**A1**	**A2**	**A3**	**A4**	**A5**	**A6**
Technology foresight	⊗			⊗	⊗	⊗
Customer focus			⊗			
Adaptability			⊗	⊗	⊗	⊗
Agility		⊗	⊗	⊗		
Problem-solving					•	
Rule-bending		⊗				⊗
Raw coverage	0.88	0.69	0.64	0.70	0.63	0.68
Unique coverage	0.19	0.01	0.01	0.03	0.02	0.01
Consistency	0.86	0.92	0.92	0.89	0.90	0.88
Solution coverage		0.92			0.78	
Solution consistency		0.85			0.87	

Note(s): Filled circles indicate the presence of routine elements, either as core (large circles) or peripheral (small circles). Crossed circles indicate absence, and blanks indicate irrelevance (can be either present or absent).
Source(s): Created by the authors

Supplementary material D. Additional analyses: robustness tests

We conduct robustness tests to evaluate the sensitivity of the main findings to changes in the model parameters and calibration. These tests include alternative cut-off values for raw consistency and frequency, as well as alternative threshold values for full membership and non-membership. The results of these tests (see below) indicate low sensitivity of our main findings to the performed changes: changing the cut-off value for raw consistency results in configurations identical to those in Table 3, whereas changing the cut-off value for frequency indicates differences only in several originally peripheral and irrelevant routine elements. Similarly, setting an alternative threshold value for full non-membership results in only one core routine element turning peripheral (problem-solving in the original Configuration 2). Higher sensitivity is demonstrated only with an alternative threshold value for full membership: the original Configuration 7 no longer appears, while most of the remaining configurations remain similar. The robustness tests indicate that our main findings are substantively unchanged with most of the tested alternative specifications.

Configuration chart for robustness test No. 1: Consistency cut-off at 0.75

	Configurations						
	Service operations			**Service sales**			
Routine elements	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Technology foresight	●	●	●	●	●	●	●
Customer focus		•	●	•	•	•	•
Adaptability	●	●		●	●		
Agility	●		●	●		●	●
Problem-solving	•	●	•			•	⊗
Rule-bending		●	●		●	●	⊗
Raw coverage	0.68	0.64	0.64	0.65	0.59	0.57	0.47
Unique coverage	0.07	0.02	0.02	0.04	0.03	0.01	0.01
Consistency	0.93	0.93	0.93	0.90	0.90	0.92	0.95
Solution coverage		0.73			0.71		
Solution consistency		0.91			0.88		

Notes(s): Filled circles indicate the presence of routine elements, either as core (large circles) or peripheral (small circles). Crossed circles indicate absence, and blanks indicate irrelevance (can be either present or absent).
Source(s): Created by the authors

Configuration chart for robustness test No. 2: Consistency cut-off at 0.89

	Configurations						
	Service operations			**Service sales**			
Routine elements	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Technology foresight	●	●	●	●	●	●	●
Customer focus		•	●	•	•	•	•
Adaptability	●	●		●	●		
Agility	●		●	●		●	●
Problem-solving	•	●	•			•	⊗
Rule-bending		●	●		●	●	⊗
Raw coverage	0.68	0.64	0.64	0.65	0.59	0.57	0.47
Unique coverage	0.07	0.02	0.02	0.04	0.03	0.01	0.01
Consistency	0.93	0.93	0.93	0.90	0.90	0.92	0.95
Solution coverage		0.73			0.71		
Solution consistency		0.91			0.88		

Notes(s): Filled circles indicate the presence of routine elements, either as core (large circles) or peripheral (small circles). Crossed circles indicate absence, and blanks indicate irrelevance (can be either present or absent).
Source(s): Created by the authors

Configuration chart for robustness test No. 3: Frequency cut-off at two cases

	Configurations						
	Service operations			**Service sales**			
Routine elements	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Technology foresight	●	●	●	●	●	●	●
Customer focus	•	•	●		•	•	●
Adaptability	●	●		●	●		
Agility	●		●	●		●	●
Problem-solving		●	•	●			⊗
Rule-bending		●	●		●	●	
Raw coverage	0.68	0.64	0.64	0.64	0.59	0.59	0.51
Unique coverage	0.06	0.02	0.02	0.04	0.03	0.01	0.01
Consistency	0.93	0.93	0.93	0.90	0.90	0.91	0.94
Solution coverage		0.73			0.72		
Solution consistency		0.91			0.88		

Notes(s): Filled circles indicate the presence of routine elements, either as core (large circles) or peripheral (small circles). Crossed circles indicate absence, and blanks indicate irrelevance (can be either present or absent).
Source(s): Created by the authors

Configuration chart for robustness test No. 4: Cut-off for full non-membership at 1.1

	Configurations						
	Service operations			**Service sales**			
Routine elements	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Technology foresight	●	●	●	●	●	●	●
Customer focus	●	●	●	•	•	•	•
Adaptability	●	●		●	●		
Agility	●		●	●		●	●
Problem-solving	•	•	•			•	⊗
Rule-bending		●	●		●	●	⊗
Raw coverage	0.67	0.63	0.63	0.64	0.58	0.57	0.47
Unique coverage	0.06	0.03	0.02	0.04	0.03	0.01	0.02
Consistency	0.93	0.93	0.93	0.90	0.90	0.91	0.94
Solution coverage		0.71			0.71		
Solution consistency		0.91			0.88		

Notes(s): Filled circles indicate the presence of routine elements, either as core (large circles) or peripheral (small circles). Crossed circles indicate absence, and blanks indicate irrelevance (can be either present or absent).
Source(s): Created by the authors

Configuration chart for robustness test No. 5: Cut-off for full membership at 4.9

	Configurations						
	Service operations			**Service sales**			
Routine elements	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Technology foresight	●	●	●	●		●	-
Customer focus		•	●	●	•	•	-
Adaptability	●	●		●	●		-
Agility	●		●		●	●	-
Problem-solving	•	●	•		•	•	-
Rule-bending		●	●		●		-
Raw coverage	0.68	0.64	0.63	0.68	0.57	0.67	-
Unique coverage	0.07	0.02	0.02	0.04	0.03	0.01	-
Consistency	0.93	0.93	0.93	0.87	0.91	0.90	-
Solution coverage		0.73			0.75		
Solution consistency		0.91			0.86		

Notes(s): Filled circles indicate the presence of routine elements, either as core (large circles) or peripheral (small circles). Crossed circles indicate absence, and blanks indicate irrelevance (can be either present or absent).
Source(s): Created by the authors