Research paper

Transformational shifts through digital servitization

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ABSTRACT

Manufacturers increasingly look to digitalization to drive service growth. However, success is far from guaranteed, and many firms focus too much on technology. Adopting a discovery-oriented, theories-in-use approach, this study examines the strategic organizational shifts that underpin digital servitization. Notwithstanding strong managerial and academic interest, this link between digitalization and servitization is still under-investigated. Depth interviews with senior executives and managers from a global market leader revealed that to achieve digital service-led growth, a firm and its network need to make three interconnected shifts: (1) from planning to discovery, (2) from scarcity to abundance, and (3) from hierarchy to partnership. Organizational identity, dematerialization, and collaboration play a key role in this transformation. For managers, the study identifies a comprehensive set of strategic change initiatives needed to ensure successful digital servitization.

1. Introduction

The digital wave, including the Internet of things, big data, cloud computing platforms, and other cyber-physical systems, has fundamentally altered how equipment is built and maintained and, consequently, how organizations are structured, and how they collaborate and think. This disruption and changed mindset drives *digital servitization*: the deployment of digital technologies to support the transformation from a product-centric to a service-centric business model (Ardolino et al., 2018; Coreynen, Matthyssens, & Van Bockhaven, 2017). In seeking to exploit these new technological and market opportunities, firms undergo a process of profound change that reconfigures their business structure (Sklyar, Kowalkowski, Tronvoll, & Sörhammar, 2019). However, there is little available guidance on *how* manufacturing firms can harness digital technologies to develop new offerings and business models, and Raddats, Kowalkowski, Benedettini, Burton, and Gebauer (2019) argued that bridging this knowledge gap should be a priority for servitization research. In this regard, the struggles that many manufacturers face are well illustrated by General Electric's faltering GE Digital initiative; in 2015, former CEO Jeffrey Immelt declared that this would make the firm "a top 10 software company" by 2020 (Krauskopf, 2015). However, the multi-billion-dollar initiative was undermined by technical complexity and

organizational resistance among market actors, leading the company to spin it off (Lohr, 2018).

A systematic review of prior research on digital servitization highlights two research gaps that have significant theoretical and practical implications. First, "the links between digital technologies and servitization" remain under-investigated (Paschou, Adrodegari, Perona, & Saccani, 2018, p. 158). Servitization is recognized as multifaceted and as an incremental and emergent process (Kowalkowski, Kindström, Brashear Alejandro, Brege, & Biggemann, 2012), changing how firms operate and create value in ways that are fast-paced and potentially disruptive (Nagy, Schuessler, & Dubinsky, 2016; Simmons, Palmer, & Truong, 2013). Among the consequences are fundamentally altered business models, as well as challenged industry boundaries and organizational identities (Ng & Wakenshaw, 2017; Svahn, Mathiassen, & Lindgren, 2017). Second, exploiting the growth opportunities enabled by digital technologies has proved challenging, even for service-oriented manufacturers, and many find it problematic to shift "from selling equipment and aftersales service to selling digital solutions" (Parida, Sjödin, & Reim, 2019, p. 14). A recent survey of 215 European service executives in manufacturing firms confirmed that the biggest challenge posed by this transformation is the integration of new technologies and the subsequent design of new service business models (Copperberg, 2019). Thus, the critical issue of how to harness this

potential to drive servitization remains to be researched, concerning changes such as those to organizational identity and culture (Kohtamäki, Parida, Oghazi, Gebauer, & Baines, 2019; Parida et al., 2019).

Against this backdrop, the present paper aims to examine the transformational shifts that underpin digital servitization. To address this sparsely investigated issue, we adopt a discovery-oriented, theories-in-use approach (Zeithaml et al., 2020) to explore how a global market leader approached this transformation. In so doing, we make three main theoretical contributions. First, we identify and discuss three fundamental shifts—from planning to discovery, from scarcity to abundance, and from hierarchy to partnership—which are needed to ensure a successful digital servitization transformation. Organizational identity, dematerialization, and collaboration are central to this transformation. Second, the shifts are further clarified from a systems perspective. We suggest that to move toward digital servitization, not only the focal firm but also other actors need to transform, requiring the changes in the entire network. Third, we articulate the changes in business logic demanded by digitalization. Specifically, a need for an agile mindset and ways of working was found to be more imperative for digital servitization compared with "traditional" servitization. The rest of the article is organized as follows. After outlining the conceptual background of the present study, the employed qualitative methods are described in detail. The observed transformation processes are then described and discussed. The paper concludes by discussing the theoretical and practical implications and directions for further research.

2. Conceptual background

Although manufacturing firms increasingly combine servitization and digitalization, academic research in this domain is relatively recent (Beverungen, Breidbach, Poeppelbuss, & Tuunainen, 2019; Raddats et al., 2019). Existing studies have commonly focused on service-specific growth opportunities and the specificities of managing a service business within a manufacturing context, without specifically analyzing the role of technology. Many firms struggle to implement a servitization strategy (Benedettini, Swink, & Neely, 2017) or do so as a defensive response to deteriorating performance in their product business (Böhm, Eggert, & Thiesbrummel, 2017). Prevailing mindsets, structures, practices, and strategies tend to inhibit rather than support such change, especially when it is disruptive (Fischer, Gebauer, Gregory, Ren, & Fleisch, 2010).

In their seminal study of successful servitization strategies, Oliva and Kallenberg (2003) reported that many firms struggle to sell remote monitoring for their products. To be successful, a manufacturing firm must develop service-specific resources and organizational arrangements; this echoes Bowen, Siehl, and Schneider's (1989) account of the differences between the prototypical characteristics of manufacturing and service. In their study of why manufacturers fail to exploit the benefits of servitization, Gebauer, Fleisch, and Friedli (2005) identified several critical success factors, which include establishing a decentralized service organization with profit-and-loss responsibility and creating a culture that maintains a symbiotic relationship between manufacturing and service-oriented values. To secure the interests of both functions, firms need to balance product and service-related assets, and tensions between the two are common (see also Gebauer & Friedli, 2005). Kindström, Kowalkowski, and Sandberg (2013) noted that transformation depends on the development of a comprehensive service-oriented mindset. This is crucial but challenging, as it demands both learning and the ability and willingness to unlearn and abandon obsolete (product-related) routines in favor of more effective behaviors (Matthyssens, Vandenbempt, & Berghman, 2006; Storbacka & Nenonen, 2015). While exploitation of new digital technologies is seen as an important capability, this is considered less important than other structural and offering-related issues.

Recent academic interest in how digital technologies drive transformation to service centricity reflects the emergence of major technological innovations such as predictive maintenance and remote control systems (Sklyar, Kowalkowski, Tronvoll, & Sörhammar, 2019), which have prompted significant strategic investment in Industry 4.0, industrial internet of things and related initiatives (Ustundag & Cevikcan, 2018). Some earlier studies of servitization focused on *digitization*, which Ng and Wakenshaw (2017, p. 3) defined as "the conversion of analog information…to a digital format so that the information can be processed, stored, and transmitted through digital circuits, devices, and networks." Digitization has facilitated servitization for decades, as in software systems for inventory handling and networks for condition monitoring (Anderson & Narus, 1998; Gebauer, Paiola, & Saccani, 2013; Macdonald, Kleinaltenkamp, & Wilson, 2016; Neu & Brown, 2005; Oliva & Kallenberg, 2003; Saccani, Visintin, & Rapaccini, 2014). However, successful digital servitization depends on *digitalization*, which refers to the use of new digital technologies to enable major business improvements (Svahn et al., 2017) and includes socio-technical structures that extend beyond technical processes (Hinings, Gegenhuber, & Greenwood, 2018; Lindman & Saarikko, 2019; Lusch & Nambisan, 2015). The core of digitalization—the transferability of any object as data—is both enabled and constrained by human actions (Hinings et al., 2018).

The transferability of data distinguishes digitalization from other new technologies (Klötzer & Pflaum, 2017), as the adoption process must permeate the whole organization (Westerman, 2019). To achieve this, manufacturing firms must address a number of specific issues, the first of which is competency traps (Svahn et al., 2017). To harness the potential of digitalization, the organization must recruit employees with the required skillset (Henfridsson & Yoo, 2014). Employees with other competences may perceive this as a threat, which can create tensions within the organization. A second concern is the lack of external focus during the transformation process. As digital transformation entails boundary-spanning activities (e.g., Selander, Henfridsson, & Svahn, 2013) such as collaboration with external actors, a balance must be struck between internal and external focus. Finally, digital transformation requires the transferability of digital objects and boundary spanning activities, which leads to new forms of partnership, both internal and external. This conflicts with traditional authority structures (Eaton, Elaluf-Calderwood, Sørensen, & Yoo, 2015).

Like digitalization, digital servitization is commonly seen to involve a complex process of organizational change (e.g., Boldosova, 2019; Paiola, 2018; Vendrell-Herrero, Bustinza, Parry, & Georgantzis, 2017). According to Coreynen et al. (2017), digital servitization can be viewed from two organizational perspectives. From a back-end perspective, the application of new technologies enhances operational efficiency, resource allocation, and transparency in support of better decision making. From a front-end perspective, digital servitization facilitates new types of customer interaction and closer integration. The integration of digital technologies affords opportunities for developing customized value propositions based on higher-quality services and relationships (Rust & Huang, 2014). Manufacturing firms can use digital data streams to provide integrated customer support, to increase the automation of support processes, facilitating a shift from a reactive break-and-fix approach to a proactive service culture and ultimately enabling customers to solve their own problems (Bilgeri, Fleisch, Gebauer, & Wortmann, 2019; Sklyar, Kowalkowski, Sörhammar, & Tronvoll, 2019).

Ulaga and Reinartz (2011) reported that service-related data processing and interpretation is a critical capability for manufacturers pursuing servitization, whether for differentiation or cost leadership advantage. However, the impact of the change will depend on the firm's service strategy and its capacity to exploit digital technology as a catalyst for servitization (Jovanovic, Raja, Visnjic, & Wiengarten, 2019; Kowalkowski, Kindström, & Gebauer, 2013). For example, new output-based asset efficiency services such as remote monitoring and software customization depend crucially on data analytics (Ulaga & Reinartz,

2011) and on exploiting field data such as product location, condition, and use (Baines & Lightfoot, 2013). Furthermore, integration of digital technologies supports customer relationships (Penttinen & Palmer, 2007; Ulaga & Reinartz, 2011) and raises the importance of managing both front-end and back-end integration (Coreynen et al., 2017). As services require local presence and a higher degree of customer interaction than a product-based business, it is important to establish a decentralized service organization, with the decentralization of decision-making authority to lower-level managers (Eggert, Hogreve, Ulaga, & Muenkhoff, 2014; Gebauer et al., 2005; Neu & Brown, 2005). On the other hand, when digitalization drives the servitization initiative, there is a need for increased centralization and control (Sklyar, Kowalkowski, Tronvoll, & Sörhammar, 2019), and the firm must make greater use of back-end units to improve cost efficiency and service quality (Fischer, Gebauer, & Fleisch, 2012; Kowalkowski et al., 2013).

3. Method

3.1. Research setting

Following calls for more research on the digital aspects of servitization (Parida et al., 2019; Raddats et al., 2019), the present study analyzes how manufacturers can harness digital technologies to shift from a product-centric to a service-centric business. While servitization research increasingly explores the opportunities afforded by digital technologies, these focus mainly on digitization (e.g., Kowalkowski et al., 2013; Vendrell-Herrero et al., 2017) rather than on the wider socio-technical processes of digitalization. Alternatively, case data refer to firms that have not yet achieved high levels of back-end and front-end digitalization (see for example Coreynen et al., 2017). To better understand the abilities needed for successful digital servitization and to support further theory building, it seems important to develop a complementary managerial perspective. As a first step, it seems useful to clarify the organization-wide transformation needed to exploit opportunities for digital service growth. Rather than focusing on new technologies and resources per se (e.g., product usage and process data) (see Ulaga & Reinartz, 2011), the present study investigates how industrial incumbents in traditional industries can employ such strategies to gain competitive advantage.

Previous studies have shown that incumbent firms frequently fail to understand or articulate the complexity and intangibility of novel service opportunities. For example, Perks, Kowalkowski, Witell, and Gustafsson (2017) found that the industrial firms in their sample commonly could not envision and legitimize the new strategic initiative, both internally and externally. Typically, this is a consequence of the new value proposition's technical focus and adherence to pre-existing networks and roles, which are based on a firm-centric assessment of resources and capabilities. Against this backdrop, the present study explores the shifts required of incumbent firms that venture into the digital service space. To that end, we adopted a discovery-oriented, theories-in-use approach (e.g., Glaser & Strauss, 1999; Zaltman, LeMasters, & Heffring, 1982) to conduct a longitudinal, in-depth, single case study (Yin, 2009) over twelve years (2006–2017). The case firm and its network were actively studied for 1.5 years, and preceding events were examined retrospectively. Importantly, digital servitization actively progressed throughout the study period, with profound consequences for the actors involved.

As digital servitization research is at an early stage, the single case study approach was appropriate in addressing a complex and little-studied phenomenon and to advance theoretical understanding. This approach also served to contextualize the processual nature of organizational transformation (Canato, Ravasi, & Phillips, 2013) and the "underlying dynamics of phenomena that play out over time" (Siggelkow, 2007, p. 22), which were of immediate relevance. In general, the longitudinal design was appropriate for its revelatory potential in this context (Yin, 2009). In selecting the case, we utilized a theoretical sampling approach based on three criteria that support this logic. First, to acquire data for theory building, we chose a firm that was already pursuing a strategic move to digitalization and service-led growth. Second, to avoid speculative future-oriented insights, we selected a firm that was actively and strategically investing in digital servitization. Third, the chosen case provided access to both real-time and retrospective data (Pettigrew, 1990) from key informants across functions and organizational levels, as well as from secondary sources. The case firm "Navarch" (anonymized to preserve confidentiality) is a leading provider of maritime solutions for owners and operators of large multinational vessels.

3.2. Data collection and quality

Discussions around data collection began in December 2015, when we requested permission to investigate digital servitization at the case firm. In total, we conducted depth interviews ranging from 0.5 to 3.5 h with 33 respondents between May 2016 and December 2017. Respondents were selected by snowball sampling (Coleman, 1958); the process began with the vice president in charge of the digital servitization initiative, who suggested further suitable informants. For triangulation purposes, we also employed social network sites such as LinkedIn to identify additional relevant respondents beyond those suggested by interviewees. If supplementary questions emerged, key informants were interviewed on more than one occasion, resulting in 11 additional interviews (see Appendix A for details).

The semi-structured interview guide was designed to acquire a comprehensive understanding of the digital servitization process. Although specific questions were adapted to reflect each informant's position and knowledge, the overall focus was on the respondents' experiences of the transformation and/or its management, both within the firm and across its network. For example, the guide included questions about the roles of various organizational units in digital servitization, as well as those of their internal and external partners and customers. Respondents were also encouraged to provide additional information throughout the interviews. When exploring real-time events, we also raised retrospective questions to facilitate comparison over time. In addition to the interview data, other primary sources included observations of meetings and visits to digital service centers. As these direct observations were casual in nature, no formal protocol was necessary (Yin, 2009); instead, they were captured as field notes. To reduce observer bias and increase confidence in the findings (Voss, Johnson, & Godsell, 2016), observations were performed by several team members. Each researcher then reviewed the field notes of the others, followed by a joint review by the entire research team toward convergence of observations. Secondary sources included annual reports and internal documentation, as well as company magazines and business publications and websites. Data collection ceased at saturation when no new insights emerged.

All the collected evidence from different sources was reviewed and analyzed for convergence—for example, the observational data were used to triangulate the interview data. As recommended for industrial marketing case studies (Batt, 2012; Beverland & Lindgreen, 2010; Dubois & Gibbert, 2010; Goffin, Åhlström, Bianchi, & Richtnér, 2019), the issue of research quality was addressed by assessing construct validity, internal validity, external validity, and reliability (see Table 1). Quality was further assured by maintaining the chain of evidence (Beverland & Lindgreen, 2010) by (1) using a rich set of interview quotes to illustrate and support key findings; (2) preserving the circumstances of data collection in the case study database (Yin, 2009); and (3) ensuring that these circumstances were consistent with the study's initial aim. Finally, although people rarely forget significant events (Denzin & Lincoln, 2017), we sought to avoid the pitfalls of inaccurate recall and post-rationalization (Voss et al., 2016) by cross-referencing the interviewees' accounts for subsequent comparison with other sources (e.g., secondary data). This retrospective account of

Table 1
Quality of the research process.

Criterion	Measures
Construct validity	• Data triangulation (e.g., interviews conducted with multiple respondents across organizational levels and functions) • Methodological triangulation (e.g., multiple data collection strategies and sources such as secondary data) • Investigator triangulation (several researchers analyzed the data)
Internal validity	• Comparison of situations arising at different points in time • Suggested explanations for interrelationships between constructs
External validity	• Analytical generalization providing "a clear rationale for the case study selection," enabling readers to "appreciate the researchers' sampling choices" (Dubois & Gibbert, 2010, p. 132) • Secondary data extending beyond the case firm
Reliability	• Case study database built using NVivo software and utilized for subsequent data analysis

events that occurred before data collection also allowed key informants to check for any inaccuracies.

3.3. Data analysis

To begin, both primary data (e.g., interview transcripts and field notes) and secondary data were read and coded to identify key issues and themes. For independent parallel analysis and triangulation (Bryman & Bell, 2015), all of the researchers involved in data collection also participated in coding, following guidelines formulated by Ulaga and Reinartz (2011), Tuli, Kohli, and Bharadwaj (2007), Raja, Chakkol, Johnson, and Beltagui (2018), and Gioia, Corley, and Hamilton (2013). The initial first-order codes were based on three main criteria: (1) whether an insight could be considered applicable beyond a specific context; (2) whether several informants provided an insight; and (3) whether an insight provided information that was not just "obvious" but also interesting and useful. Based on these criteria, the initial analysis yielded 170 categories, and these were compared to identify similarities and differences. The process of re-coding to reduce the number of codes yielded 33 first-order categories; each of these was assigned a label in the form of a phrase or sentence, retaining the terminology used by informants wherever possible. Next, the first-order categories were examined to identify more abstract second-order themes. In this stage, the goal was to identify themes that adequately captured the phenomena observed in the first-order categories and to assign an appropriate label to each emerging theme. This process yielded six second-order themes: Legitimization, Agility, Data-centricity, Data-related opportunities, Multi-actor coupling, and Reciprocal value proposition. To describe the data at a still higher level of abstraction, themes were arranged into three aggregate themes, labeled Identity, Dematerialization, and Collaboration, to capture the underlying second-order themes. The final coding structure is shown in Fig. 1.

4. Findings

4.1. Key transformation events

In contrast to the more recent efforts of most maritime industry players, Navarch's commitment to digital servitization extended over a decade. Previously a product supplier, the firm transformed itself between 2006 and 2009 to become a systems integrator. Informed by knowledge of customer operations, this was a key enabler in developing the firm's first digital services, with R&D efforts addressing both service and technology issues. To further enable digital servitization, the firm simultaneously began to recruit employees who were more open to new technologies, including statisticians and business analysts. Navarch's first digital service offerings were developed specifically for its installed base and the hardware used by the firm and its partners; for example, remote diagnostics were developed to monitor and troubleshoot the firm's equipment.

In 2010, Navarch began to extend its offerings to third-party hardware, which provided a significant competitive advantage in

subsequent years. As well as upgrading existing digital services, new offerings were introduced; for example, a digital energy efficiency service monitored fuel and energy consumption for optimization of vessel energy flows, and an operations monitoring service used motion forecasts to support decision-making under changing navigational conditions (e.g., weather). In parallel with this extension of its digital service portfolio, the firm-initiated changes in back-office processes to support digital servitization; for example, a global case management system was implemented for more efficient handling of customer interactions.

Around 2014, when digitalization became prominent in the previously conservative maritime industry—in part because customers began to see data ownership as a critical issue—Navarch launched a comprehensive digital servitization initiative. This so-called integrated operations program was introduced in an internal white paper co-authored by the firm's opinion leaders. In so doing, the firm sought to emphasize how digital servitization revealed the interconnected nature of its service business:

"When we embarked on integrated operations, we said that all services would become integrated operations and that we are in the business of integrated operations. Of course, we manufacture things, and we install them, and we help, and we analyze; but the whole thing can actually be described as integrated operations." (Senior Vice President, Integrated Operations).

The wide-ranging integrated operations program involved establishing digital service centers to integrate critical infrastructure, productizing digital services as modular offerings, unifying the previously separate software-related businesses, and hiring employees with digitalization skills. While existing digital services were further upgraded as part of the program, new offerings were also made available; for example, a digital service for condition-based monitoring offered maintenance advice and prediction of potential failures for both the firm and third-party equipment; on-demand analytics offered analysis of customer data in a range of areas (e.g., voyage analytics) at the level of equipment, systems, vessels, and entire fleets; and cybersecurity services addressed potential data loss, cyberattacks, and system errors. Navarch subsequently began to promote the integrated operation program to its customers, so enhancing collaboration in digital servitization. Fig. 2 provides an overview of the key events in this transformation.

Based on the key findings manifested in the coding structure (see Fig. 1), we discuss these by aggregate theme, using informant quotes to illustrate the first-order categories underlying each theme.

4.2. Identity

Widely acknowledged as a leader in its industry, Navarch's digital servitization transformation entailed a radical change in the firm's identity and self-perception of its core business and operations. This transformation positioned the firm as a "digital technology company," and employees began to perceive the firm as "completely dependent on constantly developing new digital technology," which manifested in
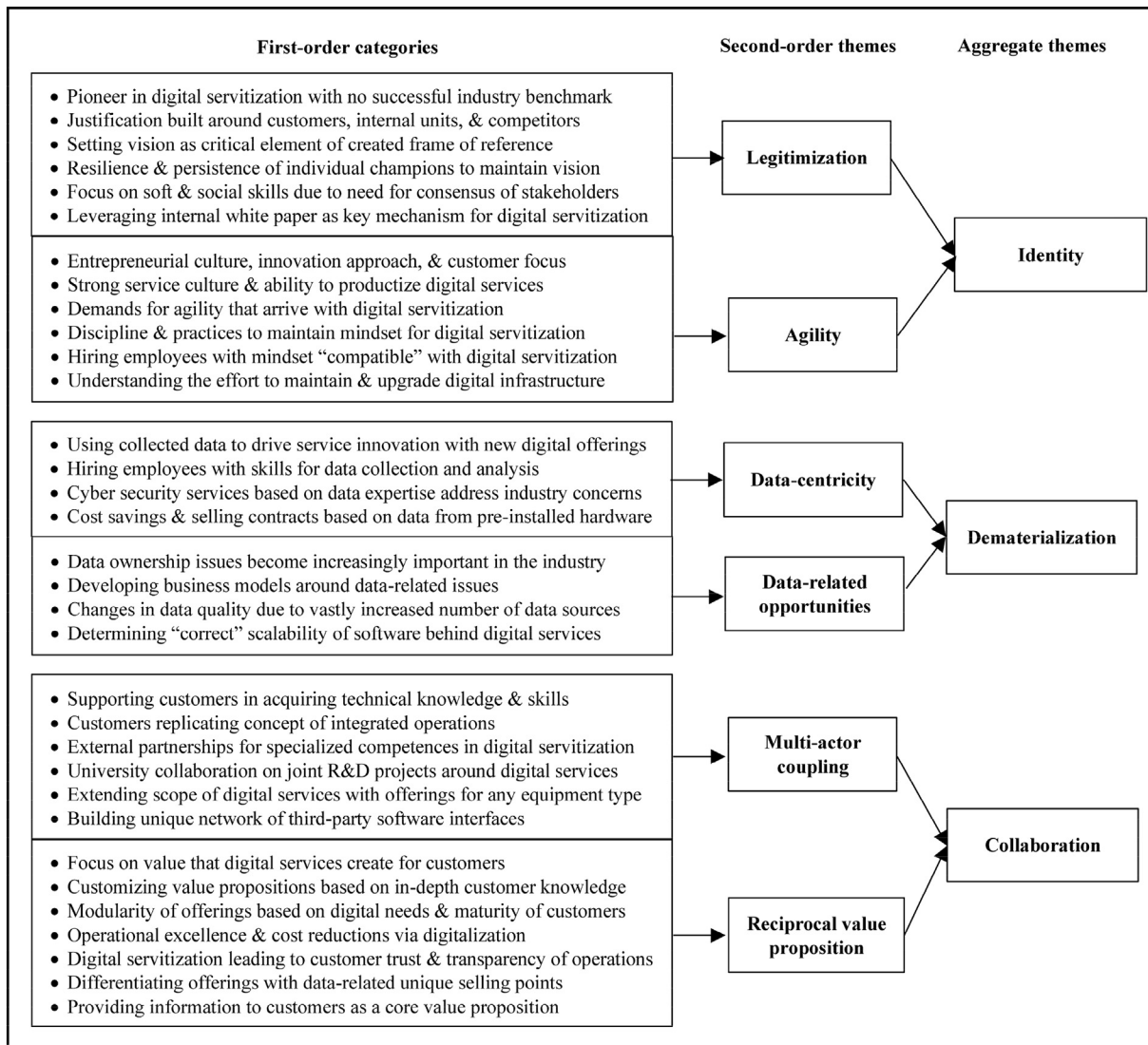
Fig. 1. Coding structure.

Fig. 2. Digital servitization timeline.

two principal ways. First, as an industry pioneer in digital servitization, the firm went to great lengths to ensure its legitimacy with key stakeholders. Second, the entrepreneurial mindset of its employees enabled Navarch to meet the key digital servitization requirement of agility. Changes in these two areas constituted the identity-related elements of the firm's transformation.

Legitimization mechanisms served to justify digital servitization to key internal and external stakeholders. As no other firm in the maritime sector had successfully achieved this, Navarch had to create a frame of reference—a vision—to legitimize the transformation by setting out how the firm and its customers would operate in the future, with the latter group's close involvement. For example, the firm invited customers to visit its digital service centers to review novel offerings, to discuss internal processes, and to visualize how digital solutions would improve the service experience. With this first-hand experience of digital servitization, it was hoped that customers would ultimately become "mature enough to start thinking about this way of working". Similar results were achieved internally, helping to legitimize digital servitization:

"And [a digital service center] brings another culture change; if you work in a concrete way with these new tools and with the software, doing things in a different way, you experience first-hand what digitalization means. You are then able to explain it to others, and the culture change scales up, as so many more people understand digital because they experienced it first-hand." (Senior Vice President, Integrated Operations).

While introducing a vision was essential in legitimizing digital servitization, it was also critical that certain individuals would champion the transformation in order to maintain that vision. These individuals were the "change agents," who exhibited a key characteristic: "the drive to be resilient, refusing to give up until they had transmitted the message." As "most decisions are taken by consensus," interacting with employees across positions and organizational levels became the change agents' most important job, which was "all about soft, social skills." Despite the extensive efforts to achieve the vision's universal acceptance, some key individuals in Navarch were still lacking commitment toward the transformation. Interestingly, the change agents overcame this challenge by writing an internal white paper that was "used as a contract" and became "one of the key mechanisms of change."

"We asked for co-authors to come on board for the white paper so that we were not the only authors—because then it would only be our idea, and change management means winning over as many people as possible. (…) And then it becomes a test for you, because when you co-author, you really have to show your colors—do you support this or not? And if other people see your name on this white paper, they might ask 'Hey, you were saying all along that this is wrong, so why do you support this now?' (…) So nobody could say 'no,' and if they did, we had a really good means of discussing their disagreement (…) And in the end, there were so many co-authors that it became the firm's paper and the firm's strategy." (Senior Vice President, Integrated Operations).

In addition to achieving legitimacy with key stakeholders, another goal of the change agents was to meet the demands of *agility* brought by digital servitization, which concerned relevant practices and elements of organizational culture. More than its competitors, the firm was already known for its "innovative approach and customer focus" long before this process began. In addition, management was seen to be "engaged and involved," with good links to both internal and external stakeholders and decision-makers. Importantly, the absence of any "stiffness in procedures" and the "strong service culture" and inherently entrepreneurial start-up mindset meant that Navarch was highly agile—a key enabler for maintaining digital servitization during the transformation's initial years. This mindset included productizing services through formalization and standardization of customer-specific solutions—another key enabler that helped the firm to productize the "digital setup for service."

"On that digital side, the strategy and processes are not the same as when you had a five-year strategy with a goal at the end—it no longer works that way. Now, you have to develop things faster, pilot things faster, so you have to be very agile—half a year or a year, and you have to be able to switch direction. It does not have to be entirely new, but you have to be agile—make small changes here and there. You have to create opportunities and understand them on the way." (Senior Vice President, Information & Control).

As well as being agile and able to formalize service offerings, the firm also emphasized "disciplined management structures" as a key enabler for maintaining the changed mindset. In this regard, a critical enabler was the "focus on management practices that are going to stick," facilitating changes to "the operating model, the way the firm operates," leading ultimately to transforming "the business itself" through digital servitization. However, employees who were "not that very open to new technology" posed a major challenge, prompting the firm to search for individuals who would be more "compatible" with digital servitization. This led to large-scale recruitment of "newly educated people" and altered roles for extant employees. This somewhat radical decision helped to promote and develop the adoption of digital technology.

"You need to scale your organization with people who are able to further develop IT systems and maintain them—because in the service contract you promise the customer maintenance throughout the lifecycle and at the pace of development in the IT world, not in the electrical world, where you change the drive every 10 years. And the customer demands it as well, so from the cybersecurity point of view, you need to do that. People often do not understand how much effort it takes to maintain and upgrade—to keep all this IT infrastructure on board and keep that business and data flying." (Product Manager).

4.3. Dematerialization

Fostering dematerialization was the second major change we identified in Navarch's digital servitization. Dematerialization refers to the increasing role of data and information (as opposed to physical products and equipment), which is fundamental to digital servitization. First, management focused increasingly on the data that underpin digital services, corresponding to migration toward data-centricity. Second, management concentrated on the data-related opportunities and issues—the latter a source of increasing concern for the maritime industry.

Data-centricity refers to the data-enabled properties, mechanisms, and activities that are critical for digital servitization. Previously, Navarch and its rivals competed around electrical equipment (for example, to make it "better and more reliable"), but with digitalization, competitive advantage became "more and more focused on data." With the diminishing dependence on any specific equipment, the ability to recombine data as an element of novel service offerings became critical for competitive advantage. To that end, the firm supported its service employees to combine technical skills with new digital abilities, as a very different skill set was needed. However, the outcome of this data-centricity was that new types of employees were recruited to handle the unprecedented amounts of data.

"We have to hire people who have skills in data collection and analysis to cope with the increasing volume of data (…). We have never had that before, and it requires completely different skills than in our industry. Their task is to work with the data to see what we can use it for, or to help a customer who wants to solve a problem. Our computer scientists then try to figure it out on the basis of the available data. If they can solve the customer's problem, we may want to offer the solution as a new service or insert some algorithms so that things happen automatically. It is increasingly common for the customer to come to us, wanting to know something; then we do the analysis and provide them with a result." (Vice President, Customer Segment).

Growing industry concerns about cybersecurity issues was another

major driver of Navarch's decision to recruit employees with radically different knowledge and skills. In the aftermath of the large-scale 2017 cyberattack ("NotPetya") on A.P. Møller-Mærsk, one of the maritime industry's key players, the firm deployed its newly acquired data competences to launch an extensive cybersecurity program. Digital services created as part of this program enabled the firm to analyze vessels "from the cybersecurity, operational point of view." Increasing purchases of novel offerings by customers who otherwise had "nothing to do" with the firm confirmed data-centricity as a novel source of competitive advantage.

To further enable the focus on data, Navarch made a strategic decision to pre-install the hardware underpinning digital services on vessels under construction. Regardless of any service contracts, the firm offered digital services free of charge to all customers during the so-called "warranty period." This strategy enabled Navarch to collect highly valuable data from vessels, which "saved a lot of costs" for the firm. Importantly, "in the vast majority of cases," customers opted to continue using the digital services and signed service contracts at the end of the warranty period. This strategy was seen as "an important success factor in relation to competitors" and for digital servitization efforts in general.

Data-related opportunities refer to the firm's ability to discern favorable circumstances associated with digital servitization. When a growing number of customers became concerned about "who owns the data," the maritime industry began to take note of data ownership issues. These issues "were not in the news" in the past, when "only the most advanced ship operators" were aware of the benefits of digital services. Although this situation changed and such issues later turned into "a big question" within the industry, there was still no "good case anywhere" regarding "standards for data ownership". As a result, whereas Navarch had business models for its core areas of operations, the potential of data-centric business models had yet to be seized.

"We do not have [clear business models] regarding new areas for data use; it is not yet defined. So, for example, when a customer asks, 'Can you send me all the data you have collected on us to one of your competitors?'—what is the business model there? Maybe we should say, 'Yes, we can, but it will cost you two million', or something? Those things are not in place." (Vice President, Head of Global Services).

The quality of big data afforded another opportunity; while data had previously arrived from "three different sensors from three different suppliers," "thousands of signals" were now arriving from a vast array of hardware. As manual handling of these vast amounts of data was prone to human error, Navarch identified opportunities to "monitor bulk data" and "make analysis fully automated." The firm also started to recognize that business-critical data were arriving "milliseconds before hardware breaks down." Such data were especially valuable if coming from the hardware that was "rarely breaking down," for which Navarch—unlike most of its competitors at the time—had been collecting data points for over ten years. Whereas initially largely unutilized, such "real-world" longitudinal data were recognized as highly valuable after the firm had found only very limited use in the data from computer-simulated hardware failures. Based on the developed algorithms, the collected longitudinal data points were then monetized and used to improve existing and enable new digital services; Navarch thus began leveraging such data toward competitive advantage. The described changes were also connected to software scalability—the ability to handle the increasing volume of data generated by a rapidly growing number of users—which was seen as a critical enabler, especially as "scalable IT technologies make all the difference for the customer."

"People who are now interested in [digital servitization] believe that the software scales in the same way as it does in the consumer industry. But as it does not happen like that in industrial business, the big risk is that major stakeholders might have unrealistic expectations about pure revenue growth from these digital solutions. All the software service companies aim to develop scalable [solutions], and we did the

same. It took a while to understand that this was not scalable in the same way, but once we understood that, we addressed our development needs differently." (Senior Vice President, Integrated Operations).

4.4. Collaboration

Navarch's approach to digital servitization relied extensively on collaboration. First, interactions between the firm and its customers and partners were further reinforced by the digital services and underlying digital infrastructure, facilitating a range of co-creation activities. Second, the firm began to leverage its in-depth customer knowledge to offer relevant value propositions, and again, digital services were central to this process.

Multi-actor coupling refers to the joint activities of (individual and collective) actors in the firm's network in the transition to digital servitization. As digital services no longer required the onboard physical presence of service engineers, customers were initially "worried that the onboard skill level would decrease because everything was done remotely." Despite these concerns, customers ultimately learned how to use and maintain the firm's equipment, with remote support from the firm. This form of collaborative learning improved crew members' technical knowledge and skills. Navarch was already interacting closely with crew members before the transformation, and the integrated operations program enabled collaboration with customers' top management. This novel collaboration typically related to strategic issues—for instance, when the program was being promoted to customers as "a way to do business." Interestingly, this proved particularly successful when working with newly established companies.

"New companies are very interesting for us because we can actually help them to set up a company that will match the services we provide rather than trying to implement something in an organization that has been working in the more traditional way for decades. We were talking with one company that is now building ships and was very interested in adopting the way of working that we established in our operational center." (Vice President, Head of Global Services).

Beyond closer collaboration with its customers, digital servitization required Navarch to build partnerships with various external firms. With an internal focus on core and domain knowledge of digital services in the maritime industry, the firm initiated external collaboration to secure other types of knowledge. For example, corporate-wide research centers helped to develop digital services that required mathematical research that could not be developed "on a large scale" internally. Similarly, the development of cloud applications required "a very generic skill" and was delegated to an external general software developer. Universities also became partners in the firm's digital servitization process. In joint R&D projects around digital services, academics would typically serve as third-party auditors whose main task was to validate the firm's data. In turn, Navarch assisted the universities in "developing and improving certain algorithms" that later became "productized" for use in the firm's "software solutions" —for example, in an operations monitoring service that used motion forecasts to support decision-making under changing navigational conditions.

Importantly, external partners also allowed Navarch to expand the scope of its digital offerings. While most of its competitors had a "very product-centric mindset" and "stayed close" to the manufactured or integrated equipment, the firm sought to "look more into the operational side" beyond the specific maintenance services required by the firm's installed base. For instance, a partner's expertise in cloud computing provided "the ability to offer complete digital services for any vessel type" beyond vessels carrying the firm's equipment. This innovation (which was radical for the industry) enabled comprehensive monitoring of a ship's operations, giving the firm a significant competitive advantage. To commercialize this invention, the firm had to work closely with external shipyards, ship designers, and fleet owners to facilitate the coupling of the underlying software.

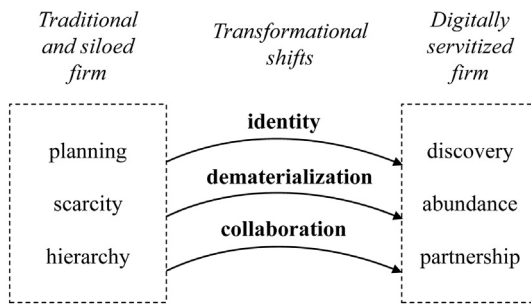"With our software, we could interface with everything, storing all

Fig. 3. Transformational shifts for digital servitization.

data in the same format. Our competitors would say 'ok, if you want a new interface, then we should talk to programmers,' and they would make a completely new program; or they would say 'no we can't do it.' But we always say that 'it doesn't matter, we can interface it with everything.' Building this kind of network with different interfaces—-which are actually custom made over the years—makes us unique. And you need an almost unique combination of support knowledge to be able to identify [the need], and … the experience to know that you can do it." (Analyst, Customer Service).

Another key enabler of digital servitization relates to customer benefits. *Reciprocal value proposition* refers to core offerings that are driven by customers. Initially, some of Navarch's senior managers had exhibited "great resistance," believing that digital offerings would "cannibalize other services." Subsequently, however, following the efforts described above to legitimize digital servitization and change employees' mindset, the same managers began to see these offerings as "good business," as long as the focus was on "value created for the customer." To avoid "limited" value creation, the firm placed particular emphasis on developing in-depth knowledge of customers' business. To "bring core information to the right people," the firm crafted "different value propositions" for each key group of individual actors on the customer side. To this end, it became critical to assess the "digital maturity" of each customer.

"We had always [focused on] building a vessel-specific portfolio, but that does not work anymore; now, it is more about customer maturity. This digital part [of the offerings] is for the customer—they want information to support decision making. And of course, we can add our services—analytics, support, dashboard building, or center building—but in the end, it is about customer maturity. That is why we now focus on modules; the software we choose to implement depends on what the customer needs." (Vice President, Digital Services).

In line with the new focus on value creation, Navarch made "investments in operational excellence that *save* money," so extending more common digital offerings aimed only at "maximizing customer revenues" through high "availability and reliability." To underpin this new approach, the firm had to "be able to measure" the relevant key indicators, and obtaining data from the vessels became critical. These data were used to reduce operating costs for both the firm and its customers; for example, customers could now "reduce the crew on board" to secure the "advantage of cheaper operations."

In addition, Navarch differentiated its offerings around "what it is possible to do with data, and how this can be integrated into customer systems." For instance, one unique selling point was data analytics; as a senior manager explained, the firm "does not sell the data; we sell the outcome—the output to the algorithms." In line with this approach, the firm's new core value proposition was "supporting the vessel from shore-side" and providing information for customer decision support, with the ultimate goal of "completing the customer's picture." In turn, onboard maintenance-related services were now seen as add-ons offered to ships with Navarch equipment as "fully modular" services.

Another important benefit of digital servitization was increased customer trust; for example, customers visiting the digital service

centers would "feel in good hands" while the firm was "taking control of their fleet." As customers were also increasingly demanding operational transparency, Navarch introduced new systems to improve customer service.

"We now require everything to be included in the support case management system, which means that we can always see how the customer was handled. What is your response time to the customer? What kinds of issues have you had? Are there any synergies here? We can now look at solutions that you have offered, for example, and see if we can use them. Clearly, this support case management system has also helped to make service more transparent. You can no longer sit with a customer and deliver the service in your own way." (Vice President, Head of Global Services).

5. Discussion

Our data analysis identified three aggregated themes—identity, dematerialization, and collaboration—reflecting the transformational shifts a firm must make when pursuing digital servitization. First, in a traditional and siloed firm, identity largely centers around planning; in a digitally servitized firm, identity centers around discovery. Second, dematerialization entails a shift from data scarcity to data abundance. As data can be replicated and distributed at a marginal cost, competitive advantage can be achieved by constructing new datasets that enable new services. Third, collaboration for a digitally servitized firm is increasingly based on partnership rather than hierarchy. All three of these shifts are strategically vital and entail key mechanisms that the firm and its stakeholders can employ to foster and progress digital servitization. The identified shifts are illustrated in Fig. 3 and are discussed in more detail below.

5.1. From planning to discovery: Fostering a digitally servitized identity

The first shift relates to the focal firm's identity—in other words, "who we are as an organization" (e.g., Gioia, Patvardhan, Hamilton, & Corley, 2013, p. 123). Navarch transformed from a planning-oriented identity to an identity that is more discovery-oriented by fostering cultural openness to digital technologies and ultimately by defining itself as a "digital technology company." Rather than refining and exploiting existing resources to improve overall efficiency, the firm was now focused on exploring novel ways of working facilitated by technology. Our findings indicate that this identity transformation shared some features of more "traditional" servitization journeys, as described in the literature. For instance, the firm legitimized its change of identity by defining and maintaining a vision for transformation (cf., Fischer et al., 2010). It is noteworthy that a critical legitimization mechanism was a white paper outlining the vision, which was signed by all key stakeholders within the firm, including those who were initially skeptical about digital servitization. An external legitimization (e.g., Gebert Persson, Lundberg, & Andresen, 2011; Hinings et al., 2018) complemented this process, when customers were invited to the firm's digital service centers to experience novel offerings at first hand. In both cases, this novel legitimization process ultimately contributed to trust-building, which is critical for digitalization (Bilgeri et al., 2019) and for the shift to a more discovery-oriented identity.

Navarch's identity transformation also manifested in a changing employee mindset to meet the digital servitization need for agility. Like other servitization processes, strong service culture and customer focus (Kindström et al., 2013; Story, Raddats, Burton, Zolkiewski, & Baines, 2017) were essential for the successful development and adoption of novel digital service offerings. Again, in line with the extant servitization literature (e.g., Fischer et al., 2010), the entrepreneurial and innovative mindset inside the firm helped to leverage radical change. Interestingly, our findings suggest that an agile mindset was key for coping with the fast-paced development life cycle of software and digital infrastructure. In this journey, Navarch's focus on agility resembles

experiences from other industries facing digitalization (Denning, 2018; Mero, Tarkiainen, & Tobon, 2019), as when the Dutch banking group ING developed an agile mindset by directly learning from "digital-native" firms such as Spotify, Netflix, and Google (Jacobs, Schlatmann, & Mahadevan, 2017; Rigby, Sutherland, & Noble, 2018). For Navarch, its employees' ability to adopt such novel ways of working became a crucial issue, prompting large-scale recruitment of individuals with a "compatible" mindset, further reflecting the shift toward a more discovery-oriented identity.

5.2. From scarcity to abundance: Fostering dematerialization

Traditionally, firms focused on the possession and protection of scarce, inimitable, and non-substitutable resources (e.g., Barney, 1991; Wernerfelt, 1984). For Navarch and most firms in its industry, real performance data had been seen as scarce. However, digitalization creates a separation between data and physical manifestations such as machines and interfaces (Normann, 2001), which makes it possible to transfer and multiply representations of any digital object (Hinings et al., 2018). When software systems and sensors were installed on customers' vessels, supporting cheaper and more reliable data transmission, the volume of data naturally increased. The ongoing dematerialization created a state of abundance, and data could no longer be regarded as scarce. Managers hence realized that a change of mindset was needed; rather than possession and protection, plentiful raw data invited sharing with trusted stakeholders in the network. This insight drove a fundamental shift from the state of scarcity to that of abundance.

As a growing number of decision-makers and employees acknowledged the described shift, a creative data-centered understanding was fostered. Importantly, the understanding alone was insufficient; rather, its combination with a new digitally servitized identity prompted employees to begin a search for data-related opportunities. Only then did the organization started to migrate toward data-centricity (e.g., Svahn et al., 2017). To grasp the data-related opportunities afforded by the real-time data from its customers' vessels, Navarch began to recruit digital-literate employees. By building a diverse competence pool, management could then transform its view on data and thus better steer the organization toward digital servitization. To achieve competitive advantage, the firm deployed its novel data competences to launch data-centered service offerings and extensive programs, and such a strategy proved to be a critical success factor in relation to the competitors. For example, Navarch—unlike most of its competitors—had been collecting vast amounts of longitudinal data for the equipment that rarely failed, which were then successfully monetized and used to improve existing and enable new digital services. Thus, for digital servitization, fostering dematerialization and the ability to manage the associated abundance of data were seen as a critical factor for competitive advantage.

5.3. From hierarchy to partnership: Fostering collaboration

Like many other firms, incumbents are traditionally organized in silos that reflect a reactive mentality based on hierarchy and authority. Our findings show that to support, facilitate, and act on data-related opportunities, Navarch needed to break the silo mentality and shift from hierarchy toward partnership. This required multi-actor coupling (Raja et al., 2018) between front-end service engineers, back-end service operations, and service sales, as well as general management and the firm's new digital entity. Silo busting is typically seen as a fundamental and mostly internal activity (Kowalkowski & Ulaga, 2017), but service transformation also depends on actions that extend beyond the firm's boundaries (Gulati, 2007): for example, Navarch extended multi-actor coupling to key stakeholders such as shipyards, ship designers, and fleet owners. The firm also depended on the trust accumulated during previous collaborations with its customers to be allowed to collect real-time and historical data; this trust, and the firm's reputation, was essential for successful transformation (e.g., Dowell, Morrison, & Heffernan, 2015). The vast amounts of data from installed equipment brought Navarch closer than ever to its customers, both operationally and strategically. In some cases, the firm knew more about its customers' fleets than they knew themselves (c.f., Zwitter, 2014).

One key outcome of multi-actor coupling was the creation of reciprocal value propositions based on data-related opportunities and customer needs. Our findings show that accepting reciprocal value propositions aligned relevant stakeholders and improved coordination and collaboration (e.g., Kowalkowski, Kindström, et al., 2012, Kowalkowski, Persson Ridell, et al., 2012; Nenonen, Storbacka, Sklyar, Frow, & Payne, 2019; Skålén, Gummerus, von Koskull, & Magnusson, 2015). The latter depended fundamentally on real-time data (e.g., Nambisan, Lyytinen, Majchrzak, & Song, 2017): for example, predictive maintenance and navigation forecasting were created through data exchange with the customers. Similarly, the energy efficiency digital service was based on data from customers' actual behavior, as well as sea charts, historical route data, and weather forecasts. Based on these data, new reciprocal value propositions were developed to enable competitiveness. In contrast with purely technological innovations of digitization, our findings highlight that the emergence of reciprocal value propositions was driven both by technological integration and the interaction of multiple stakeholders (e.g., Vargo, Wieland, & Akaka, 2015). This multi-actor coupling helped to create what Raddats and Easingwood (2010, p. 1338) described as a "vendor agnostic" position—that is, the provision of digital services related to other companies' products as well as its own, which also reflected the shift from hierarchy toward partnership.

6. Implications

6.1. Theoretical implications

The present study contributes to the extant servitization literature by advancing a theoretical account of the transformational shifts involved in digital servitization. Our findings make three main contributions to the literature on service growth in business-to-business markets and, more broadly, to the digitalization and service strategy literature. Taken together, these findings serve to clarify the activities that an organization must undertake to ensure the success of digital servitization.

First, the transformational shifts identified here illustrate overarching strategic areas related to organizational identity, dematerialization, and collaboration. The first shift fosters a new identity that is more entrepreneurial and is focused on discovery instead of planning, thus accommodating both service-centricity and technological innovation—two facets that are often difficult to reconcile (e.g., Perks et al., 2017). This shift includes rethinking competitive advantage by establishing innovative structures and cultural openness to novel uses of technology. The second shift concerns dematerialization, when data is separated from the physical world (Normann, 2001), ultimately transforming the state of scarcity into that of abundance. The ability to manage this abundance of data—for example, as input to machine learning systems—is crucial for competitiveness. The third shift fosters collaboration by moving from a silo-based hierarchy toward multi-actor partnership underpinned by trust and accountability. Closer dialogue and in-depth knowledge of customers' needs are further required to align value propositions to the maturity of each customer. We contend that to harness the power of transformative technology in pursuit of digital servitization, the firm must manage all three shifts. However, as the transformation to digital servitization is ultimately conditioned by dematerialization, the latter seems especially important. With the capture and use of data being increasingly enabled in myriad ways, dematerialization translates into knowledge dispersal, affording novel opportunities for intra-firm and inter-firm collaboration.

Table 2
Digital servitization: Managing transformational shifts.

Management initiatives	Key mechanisms underlying transformational shifts		
	Identity	Dematerialization	Collaboration
Changing employee structure	Large-scale recruitment of employees with a "compatible" mindset—for example, employing recent university graduates, who may be more open to digital technologies	Hiring employees with the necessary skills to work with large amounts of data (e.g., data analysts, computer scientists)	Breaking the silo mentality by hiring or training employees to work on projects or in other collaborative teams
Engaging internal and external stakeholders	Defining and maintaining a vision for digital servitization—for example, in a white paper that brings all key internal stakeholders on board	Engaging stakeholders to facilitate the separation of data from physical objects for use in new solutions	Establishing external partnerships for specialized competences (e.g., collaborating with universities to design algorithms that support digital services)
Cultivating agile ways of working	Adjusting strategic and operational targets around shorter timelines—for example, setting one-year rather than five-year goals around digital services	Developing and maintaining digital services at the pace required by digital businesses (e.g., ensuring software security through continuous updates)	Bringing employees from different departments together in teams in order to establish a more flexible mindset
Establishing digital service centers	Ensuring that employees and customers gain first-hand experience of digital servitization—for example, by demonstrating digital services in operation	Making real-time data simultaneously accessible throughout the organization	Improving customer trust in digital servitization (e.g., by visualizing the firm's digital capabilities and the resulting service experience)
Focusing on customer value	Enforcing an organizational identity that prioritizes customers' value creation	Using collected data to meet changing customer needs—for example, by developing cybersecurity services to address customer concerns	Customizing digital services based on deep customer knowledge (e.g., by creating modular offerings that take account of customers' varying maturity and digital needs)
Developing new business models	Enabling employees to identify opportunities related to real-time data, in order to find new ways of creating and capturing value	Resolving issues related to data ownership—for example, building business models that leverage rather than restrict the data-related potential	Ensuring compatibility of digital services with offerings from other firms (e.g., by creating interfaces with third-party software)

Second, the transformational shifts are further clarified from a systems perspective. Our findings suggest that it might not be possible for the focal firm to transform toward digital servitization on its own—other actors also need to undergo a similar transformation. In other words, digital servitization requires changes in the entire network (service ecosystem) as elaborated from the systems perspective (Vargo & Lusch, 2011), which emphasizes how social and economic actors co-create value in a specific context. Actors are shaped by norms and rules (i.e., institutions; North, 1990) that are embedded within the network, while actor-to-actor structures are being continuously re-created for mutual value creation. In line with the systems perspective on relationship dynamics (Vargo et al., 2015), changes in identity due to digital servitization can transform relationships and the associated service structures (cf. Edvardsson, Skålén, & Tronvoll, 2012). Such changes are therefore underpinning collaboration among multiple internal and external partners. In turn, dematerialization—which highlights the growing role of data and information as opposed to physical products and equipment—draws on increasingly available resources that arise from the interactions among network actors.

Third, the present findings also illuminate the changes in business logic demanded by digitalization, which addresses the call for greater clarity about how digital servitization changes organizational identity and culture (Kohtamäki et al., 2019; Parida et al., 2019). While previous studies typically focused on the obstacles associated with digital servitization, the present research illustrates empirically how a focal firm can successfully change its identity. Specifically, while the latter refers to the self-definition of "who we are as an organization," we reveal the mechanisms that enable the change to a digitally servitized identity. These include legitimization of the transformation for key stakeholders (both internal and external) and aligning employee mindset with the demands of digital servitization. Although our findings confirm certain similarities with "traditional" servitization in terms of issues such as vision and service culture (e.g., Fischer et al., 2010; Kowalkowski & Ulaga, 2017; Story et al., 2017), we also highlight that a need for an agile mindset is more imperative in case of digital servitization. Whereas previous research suggested the importance of agility for service infusion (e.g., "agile incrementalism"; Kowalkowski, Kindström, et al., 2012, Kowalkowski, Persson Ridell, et al., 2012), our

study indicates that digitalization introduces additional demands for an agile mindset. Such demands are due to the key role of software and digital infrastructure and its fast-paced development, thus mirroring the industry-spanning adoption of agile ways of working directly from digital firms (Denning, 2018; Rigby et al., 2018). Therefore, we contribute to the servitization literature with an empirical account of digitalization-induced requirements that become critical for digital servitization.

6.2. Managerial implications

By shedding light on the transformational shifts entailed in digital servitization, the present study has several implications for managers. First, top management must develop and advance a clear, shared, and convincing vision for both the firm and the entire network. Such a vision must be informed by discussion within and outside the firm if leaders are to promote a new mindset across the organization. The greater openness and transparency enabled by digitalization arguably makes this more critical than in traditional organizations, and leaders must learn how to leverage the firm's inherent abilities and practices to shape the new mindset. As the case of Navarch demonstrated, it also becomes crucial to foster an agile mindset, as digital services are largely conditioned by the lifecycles of software development and digital infrastructure.

Second, digital servitization requires radically different knowledge and competences. While competitive advantage may previously have depended on superior expertise in the firm's core business areas, incumbent firms increasingly resemble the IT industry in its needs for employee skills. As we observed, the demands of digital servitization prompted Navarch's unprecedented efforts to become a "digital technology company" and acquire relevant knowledge and competences. On a related point, it is important to ensure the appropriate scalability of data-based offerings, as industrial markets differ from consumer markets in terms of data volumes and the number of software users.

Third, replicated and (re)distributed at a marginal cost, new datasets enable novel services and ultimately enhance competitive advantage. However, issues related to the data generation, collection, utilization, and ownership may create new tensions between firms. For

instance, if a supplier is collecting large amounts of data generated by a customer, these can be processed and used to benefit the customer's competitors. For Navarch, a similar issue concerned data-centric business models when, in discussions with its customers, the firm recognized the challenges of sharing collected data with its competitors. As more industries become aware of these issues, it becomes critical to develop business models that allow exploiting data-related opportunities such as those of relevant data ownership standards. Table 2 summarizes key management initiatives in this context.

7. Limitations and further research

The present paper has several limitations that suggest directions for future work. First, while the focus on a single actor in its network assists theory development (Halinen & Törnroos, 2005), it would be useful to collect data from additional actors over an extended time period to track network evolution during digital servitization. Similarly, future studies should evaluate the interactions reported here between network characteristics and the shifts associated with digital servitization. Second, as a growing number of incumbent firms embark on digital servitization, quantitative methods could be used to assess the contingencies underlying the identified strategic shifts (e.g., heterogeneities across industries and countries). In particular, future studies should explore whether and how digital maturity within a specific industry relates to the scope of each shift. Finally, further research at the

intersection of marketing and related disciplines could address critical questions raised by digitalization (Ng & Wakenshaw, 2017) such as how the disappearing boundaries between humans and technology (Breidbach et al., 2018) affect the ongoing transformation of digitally servitized firms. Of particular interest here would be the transformation's "dark side," potentially explored by studying relevant tensions (cf. Tóth, Peters, Pressey, & Johnston, 2018). Due to the discussed complexity of digital servitization, we expect tensions to appear at both intra- and inter-firm levels. In addition to advancing the servitization research, such a study of the transformation-associated tensions would be of major relevance to practitioners who wish to mitigate risks of digital servitization initiatives—both for their firms and for the key stakeholders.

Declaration of Competing Interest

None.

Appendix A. Primary data collection: Interviews

Position of the informant	Duration of interview(s), hours & minutes			
Analytics & Customer Service and Support (two individuals)	01:12	02:08		
Business Development, Global Service	00:30	01:00		
Executive Business Unit Manager	00:54			
Global Product & Portfolio Manager (Digital Solutions)	01:28			
Global Sales & Business Development	01:42			
Global Technical Support Manager	01:30	01:00		
Global Technical Support Manager	01:49			
Information Manager & Global Product Manager	02:33			
Integrated Operations Program Manager	01:28			
New Energy Efficiency Manager	01:35			
Product Manager	00:53			
Project Manager	00:23			
Project Manager	01:47			
Sales Engineer (IT)	00:30			
Senior Vice President (Collaborative Operations)	01:08	01:27	03:30	00:30
Senior Vice President (Customer Segment)	01:54			
Senior Vice President (Global Operations)	01:39			
Senior Vice President (Information & Control)	01:24			
Service Manager	01:01	00:13		
Service Manager (Local Region)	01:26			
Service Sales Manager Merchant	00:30			
Technical Advisor	01:20			
Technology Manager	00:23			
Vice President (Customer Segment)	01:30	01:00		
Vice President (Digital Services)	01:08	01:00	03:20	
Vice President (Head of Global Services)	01:08	01:38		
Vice President (Local Region)	01:41			
Vice President (Service)	01:41			
Embedded Systems Coordinator	01:26			
Project Manager, Corporate Research	01:30			
Senior Scientist, Industrial Software System	01:30			
User Experience & Industrial Design Specialist	01:30			

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