Transformational change through digital servitization

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, theory in-use approach, and 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. Using depth interviews with senior executives and managers in a global market leader, the authors identify three interconnected shifts that a firm and its network need to accomplish in their digital transformation: (1) from certainty to discover, (2) from authority to partnership, and (3) from scarcity to abundance. In this transformation, the mechanisms of innovation, collaboration, and dematerialization play a key role. For managers, our study suggests a comprehensive set of strategic initiatives that is needed for a firm to become digitally servitized.

Keywords: Digitalization, servitization, strategic shift, innovation, collaboration, dematerialization
1. Introduction

Digital servitization refers to the utilization of digital technologies for the transformational processes whereby a company shifts from a product-centric to a service-centric business model (Coreynen, MatthysSENS, & Van Bockhaven, 2017; Rapaccini & Gaiardelli, 2015; Vendrell-Herrero, Bustinza, Parry, & Georgantzis, 2017). Technical developments, in particular technologies like Internet-of-Things, ‘big data,’ cloud computing platforms, and other cyber-physical systems reform the business market landscapes (Cenamor, Rönnberg Sjödin, & Parida, 2017; Ng & Wakenshaw, 2017; Rymaszewska, Helo, & Gunasekaran, 2017), making space for such transformation. Rust and Huang (2014) argue that fast evolving digital technologies present opportunities for developing customized value propositions, with higher quality services and deeper customer relationships. While digitalization is enabling firms to innovate new services in order to stay competitive, migrating from a product-centric to a (digital) service-centric model (Adrodegari & Saccani, 2017; Ardolino et al., 2018), it is also posing challenges to many firms and networks (Ng & Wakenshaw, 2017).

Servitization has generally been conceptualized as a largely incremental and emergent process (Kowalkowski, Kindström, Brashear Alejandro, Brege, & Biggemann, 2012; Palo, Åkesson, & Löfberg, 2018). However, the changes that digital technologies have on how firms operate, interact, configure, and create value can be fast paced and potentially disruptive (Nagy, Scheussler, & Dubinsky, 2016; Simmons, Palmer, & Truong, 2013). Digitalization can shift industry boundaries and fundamentally change firms’ business models and means to create and capture value (Ng and Wakenshaw, 2017). In particular, this can pose a challenge to incumbent firms operating in well-established industries; previous literature generally contends that industry incumbents are less successful utilizing digital technologies than new market entrants (Christensen, 1997, Henderson, 2006). Recent industrial marketing research has nuanced this view, finding that established inter-organizational networks can act both to enable and delay disruptive technologies (Hynes & Elwell, 2016). Further, as customers tend to trust their close suppliers, incumbent firms can be in a better position than new entrants to diffuse such technologies (Obal, 2013). In order to seize novel opportunities for servitization, however, Fischer, Gebauer, Gregory, Ren, and Fleisch (2010) found that an entrepreneurial mindset—in contrast to the mindset prevailing in command-hierarchy organizations—is required. Such mindset facilitates the internal and external change processes needed for a proactive, market-driving service strategy. While prior servitization research has explored organizational and strategic change (e.g., Fischer, Gebauer, & Fleisch, 2012; MatthysSENS & Vandenbempt, 2008; Raja, Chakkol, Johnson, & Beltagui, 2018), research addressing strategic change for digital servitization is scarce. A systematic review by Paschou, Adrodegari, Perona, and Saccani (2018, p. 158) confirms this observation, stating that “the links between digital technologies and servitization transformation” is still under-investigated, and Parida, Sjödin, and Reim (2019, p. 14) highlight the importance of better understanding the transformation: “For many engineering-intensive manufacturing companies, it has been problematic to mentally shift from selling equipment and aftersales service to selling digital solutions. A deeper understanding of how a digitalization culture can be instilled across the firm’s delivery network is a necessity.”

Against this backdrop, the aim of this paper is to examine the strategic organizational shifts that underpin digital servitization. Drawing on the study of a global market leader undertaking such change, this article makes three contributions to extend the understanding of
digital transformation processes. First, we identify three strategic shifts that a firm and its network need to accomplish in its digital transformation process and discuss their importance. Second, we highlight the dynamics of the process, showing that the three shifts are intertwined and necessary to accomplish in the transformation to become digitally servitized. Finally, we shed light on how the transformation requires a change in mindset in the firm from being reactive to creative and change from a mindset of scarcity, certainty and authority to mindset of abundance, discovery and partnership. The rest of the article is organized as follows. We begin with a brief description of digital servitization before a detailed explanation of the qualitative methods used. Then, the findings of digital transformation are displayed and further elaborated upon in the discussion. Finally, we provide theoretical and practical implication as well as suggesting further research.

2. Conceptual background
A growing number of studies within management and marketing literature focus on digitization, which Ng and Wakenshaw (2017, p. 3) define as “the conversion of analog information in any form such as text, images, sound or physical attributes to a digital format so that the information can be processed, stored, and transmitted through digital circuits, devices, and networks”. While digitization has facilitated servitization for decades, such as software systems for inventory handling and sensors for condition monitoring (Anderson & Narus, 1998; Macdonald, Kleinaltenkamp, & Wilson, 2016), digital technology alone is insufficient for creating new opportunities for value creation and capture (Paschou, et al., 2018). To succeed with digital servitization, a firm needs to manage digitalization, which includes the socio-technical processes that accompany digitization (Lusch & Nambisan, 2015). The relationship between digitization and digitalization hence resembles that between resources and capabilities; as Ulaga and Reinartz (2011) show, resources per se do not confer competitive advantage unless they are transformed into capabilities. Coreynen et al. (2017) argue that digital servitization can be viewed from two organizational perspectives. First, from a back-end perspective, the firm applies new technology to enhance operational efficiency and increase resource allocation and transparency for better-informed decision-making. Second, from a front-end perspective, it allows for new types of customer interaction and closer integration.

The extant literature recognizes that digital servitization is a complex process of organizational change (Vendrell-Herrero et al., 2017). Many firms struggle to implement a servitization strategy (Benedettini, Swink, & Neely, 2017) or do so as a defensive stance in reaction to deteriorating performance in their product business (Böhm, Eggert, & Thiesbrummel, 2017). Furthermore, prevailing mindsets, structures, practices, and strategies tend to inhibit rather than support such change, especially if it is of more disruptive character (Fischer et al., 2010). We argue that basing firm competitiveness on the idea of resource constraints and that value is created in silos within the firm’s hierarchical organization has been a long-standing concern with regard to business exchange (Akaka, Vargo, & Lusch, 2013). For example, has the resource-based view of the firm (e.g., Wernerfelt, 1984), put forward the idea that revenue can be generated by firms from the possession and protection of scarce and difficult-to-imitate resources. Therefore, much attention has focused on the characteristics of advantage-creating resources, where Barney (1991) proposes that these resources must be
valuable, rare, inimitability and non-substitutability. Based on these scarce resources, possessed by the firm, they produce goods and add value within the organization. Consequently, managers in incumbent firms have frequently organized their firm based upon keeping resources inhouse to enhance and secure competitive advantages. The implications of this model for firm performance, as highlighted by Normann (2001) and Ramírez (1999), is that the firm takes-it-for-granted that markets are somewhat constant and that the management are focusing on the firms hierarchical and in-house value adding activities, emphasizing incremental strategic changes.

Following Parida et al.’s (2019) call for research on the digital side of servitization, we are interested in analyzing the transforming shifts, and underlying mindset, required. While a growing stream of servitization research is exploring opportunities with digital technologies, these insights mainly focus on digitization as a driver for servitization (e.g., Kowalkowski, Kindström, & Gebauer, 2013; Vendrell-Herrero et al., 2017) rather than the larger-scale socio-technical processes of digitalization. Alternatively, as in the case of Coreynen et al. (2017), insights are based on case data from companies that have not yet achieved high levels of both back-end and front-end digitization. In order to better understand the abilities for firms to conduct the actual shift, there is a need to complement these insights with a managerial perspective to allow for further theory building.

We are particularly interested in disentangling the organization-wide transformation that exploits opportunities for digital service growth. Rather than focusing on new technologies (e.g., digitization) and resources per se (e.g., product usage and process data; Ulaga & Reinartz, 2011), we seek to understand how industrial incumbents in traditional industries can establish competitive advantage through such strategy. As prior research has shown, incumbents frequently fail to understand or articulate the complexity and intangibility of novel service opportunities. In a study of digital service initiatives, Perks, Kowalkowski, Witell, and Gustafsson (2017) find that the industrial firms in the sample were most likely to lack the ability to—internally and externally—envision and legitimize the new strategic initiative. Typically, they have a product of technical focus of the new value proposition, and adhere to pre-existing network members and roles, and firm-centric assessment of resources and capabilities of network members. Against this backdrop, we develop insights into the transforming shifts required for incumbent firms that venture into the digital service space.

3. Research Method

3.1 Research setting

To understand the ability of firms and networks to digitalize their service operations, we adopted a discovery-oriented, theory in-use approach (Tuli, Kohli, & Bharadwaj, 2007; Ulaga & Reinartz, 2011) to carry out a longitudinal in-depth single case study (Yin, 2009) spanning over twelve years. The case firm and its network were actively studied over 1.5 years, while the preceding events were examined exclusively through secondary data. Importantly, digital servitization was actively progressing throughout the explored time period (2006-2017), with profound effects for the involved actors. Hence, a qualitative approach with a focus on insights from managers allowed transparent observations (Yin, 2009) of a revelatory case (Bryman &
Bell, 2015). Directly applicable to the studied case of digital servitization, such an approach also enabled a context-specific understanding of the processual nature of an organizational transformation (Canato, Ravasi, & Phillips, 2013) and of the “underlying dynamics of phenomena that play out over time” (Siggelkow, 2007).

We utilized a theoretical sampling approach for case selection based on three criteria: (1) to acquire data for theory building, we chose a firm that had been undergoing a strategic move toward digitalization and service-led growth; (2) to avoid speculative future-oriented insights, we selected a firm that was actively and strategically investing into digital servitization; (3) we chose a case that would provide access to both real-time and retrospective data (Pettigrew, 1990) through key informants across functions and hierarchical levels, as well as through secondary sources. The selected case firm (anonymized to preserve confidentiality) is a leading provider of maritime solutions for large multinational vessel owners and operators.

3.2 Data collection and analysis

Discussions around data collection began in December 2015 when we requested permission to investigate digital servitization at the case firm. In total, depth interviews with 33 respondents were conducted between May 2016 and December 2017, with interview spanning 0.5-3.5 hours. The respondents were selected through snowball sampling (Coleman, 1958) and social network sites such as LinkedIn. Key informants were interviewed on more than one occasion if additional questions emerged, resulted in 11 interviews. With the semi-structured interview guide, we aimed to obtain a comprehensive understanding of the digital servitization transformation. Appendix 1 provides details of the collected interview data. In addition, primary sources comprised meeting observations and visits to digital service centers, while secondary sources included annual reports and internal documentation, as well as company magazines, business press and websites. Data collection was concluded at saturation, when no new insights emerged.

Both primary and secondary data were read and coded to identify key issues and themes. For independent parallel analysis and triangulation (Bryman & Bell, 2015), all the researchers involved in data collection also participated in coding. The process started by establishing first-order codes (Raja et al., 2018) based on three main criteria (Tuli et al., 2007; Ulaga & Reinartz, 2011): (1) whether an insight could be considered applicable beyond a specific context; (2) whether an insight was provided by several informants; (3) whether an insight concerned not just “obvious” but also interesting and useful information. The initial 170 categories were then re-coded to reduce the number of codes, yielding 36 first-order categories. We subsequently formulated seven second-order themes, which then were arranged into three aggregate themes. The final coding structure is shown in Figure 1.
### 4. Findings

Whereas the majority of maritime industry’s players started their digital transformation only in recent years, Navarch’s digital servitization spanned over a decade. Previously a product supplier, the firm transformed itself over the course of 2006-2009 to become a systems integrator, with the focus on obtaining knowledge of customer operations. The latter became a key enabler for developing the firm’s first digital services, when Navarch concentrated its R&D efforts on both the service and technology aspects of novel offerings. Simultaneously, the firm began hiring employees who would be more “open” towards new technology, such as statisticians and business analytics, thus further enabling digital servitization. Developed specifically for Navarch’s installed base, the first digital services were closely connected to the hardware of the firm and its partners. In 2010, Navarch started to extend its offerings towards

![Coding Structure](image_url)
third-party hardware, which resulted in a significant competitive advantage over the subsequent years. In parallel, the firm initiated the change of back-office processes to support digital servitization: for example, a global case management system was implemented for a more efficient handling of customer interactions.

Around 2014, when digitalization became prominent in the previously conservative maritime industry (e.g., customers began viewing data ownership as a critical issue), Navarch launched a comprehensive digital servitization initiative. The initiative—a so-called integrated operations program—was introduced via an internal white paper co-authored by the firm’s opinion leaders. With this program, Navarch was emphasizing the interconnected nature of its service business resulting from digital servitization:

“When we started with integrated operations, we said that all service is going to 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 you can actually call 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 separated software-related businesses, and large-scale hiring of employees with skills in digitalization. Subsequently, Navarch began promoting the program to its customers, further improving collaboration for digital servitization. Figure 2 provides an overview of the described transformation’s key events.

Figure 2. Digital servitization timeline.

4.1 Innovation

Widely seen as successful in its industry, Navarch’s transformation heavily relied upon fostering innovation that manifested itself in three major ways. First, as a pioneer among other industry players to carry out digital servitization, the firm employed novel and unprecedented measures to achieve legitimacy with key stakeholders. Second, the employees’ entrepreneurial mindset enabled Navarch to respond to the critical need for agility brought by digital servitization. Third, Navarch radically changed its identity by relying upon novel technologies to the extent of being described as a digital technology firm. Together, changes in these three areas constitute the innovation-related aspects of Navarch’s transformation towards digital servitization.
Legitimization, refers to mechanisms for justifying and promoting digital servitization toward the stakeholders. Since no other firm in the maritime industry had successfully carried out digital servitization in a broad sense, Navarch had to independently create and fostering a frame of reference—a vision—in order to legitimize the transformation to both internal and external key stakeholders. The vision outlined how the firm and its customers would be operating in the future, with the latter group closely involved in the transformation. For example, Navarch was continuously inviting customers to visit its digital service centers in order to showcase novel offerings, discuss internal processes, and visualize how digital solutions would improve service experience. With this first-hand experience of digital servitization, customers would ultimately “get mature enough to start thinking about this way of working”. Similar results were achieved internally, which overall helped legitimizing digital servitization:

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

Although setting a vision was essential to legitimize digital servitization, it was also critical to have individuals who would champion the transformation in order to maintain the vision. Such individuals were described as “change agents” who exhibited a key characteristic—“the drive to be resilient and not give up until transmitting the message”. Since “most decisions are taken by consensus”, interacting with employees across positions and hierarchical levels became the change agents’ most important job, being “all about soft, social skills”. Despite their extensive efforts to achieve the vision’s universal acceptance, some key individuals in Navarch were still lacking commitment towards the transformation. It was of importance for the legitimation of the transformation to convince these key individuals in order to foster digital innovations. Interestingly, the change agents overcame this challenge by writing an internal white paper that was “used like a contract” and became “one of the key mechanisms of change”:

“We asked for co-authors to get on board for the white paper, so that it is not only us who writes it, because then it is only our idea, and in change management you should win as many people to your side as possible. (...) And then it became a test for you, because when you co-author, it means that 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 you ‘hey, you were saying all the time that this is wrong, so why do you support this now?’ (...) So nobody could say ‘no’, and if they did, we really had a good way to discuss their disagreement (...) And in the end it became so many people as co-authors, that it became the firm’s paper and the firm’s strategy.” (Senior Vice President, Integrated Operations)
"Mindset, refers to elements of organizational culture and practices that are associated with digital servitization. In addition to achieving legitimacy with key stakeholders, another goal of the change agents was to transform the mindset within Navarch. Before digital servitization, the firm already exhibited “innovative approach and customer focus” that were prominent compared to competitors. In addition, the management was described as “engaged and involved” and well-connected to both internal and external stakeholders and decision makers. Importantly, with “no stiffness in procedures” and a “strong service culture”, Navarch was highly agile due to an inherently entrepreneurial, start-up mindset—a key enabler for maintaining the digital servitization during the transformation’s initial years. Another key enabler was the mindset of productizing services through formalization and standardization of customer-specific solutions, which subsequently helped Navarch to also productize the “digital setup for service”:

“At this digital side you cannot do the strategy and processes as you did when you had a 5-year strategy and you had a goal in the end—it is never going to work this way now. Because 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 the direction of where you are going. It does not have to be entirely new, but you have to be agile, make small changes here and there. And you have to create opportunities and understand them on the way.” (Senior Vice President, Information & Control)

Simultaneously agile and able to formalize service offerings, the firm also emphasized a notion of “discipline in management structures,” which became a major enabler for maintaining the changed mindset and thereby foster digital innovations. Critical for achieving such discipline was the “focus on management practices that are going to stick”, which allowed changing “the operating model, the way the firm operates” and ultimately resulted in digital servitization transforming “the business itself”.

Identity, refers to the firm’s self-perception of its core business and operations in view of digital servitization. Digital- and service-related changes were closely interconnected during the transformation. Offering integrated systems and digital services around such systems, the firm had to utilize both digital and service innovations and also develop both services and the underlying technology. However, a major challenge concerned employees who were “not that very open to new technology”, which prompted the firm to search for individuals who would be more “compatible” with digital servitization. Resulted in large-scale hiring of “newly educated people” and altering positions of the extant employees, this rather radical decision greatly contributed to the promotion and development of digital technology. An unintended outcome of the changed employee structure was the firm’s transformed identity into a “digital technology company”, when the employees started to perceive Navarch as “completely dependent on constantly developing new 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 to maintain it throughout the lifecycle and at the pace of development as you have in the IT world, and not in the electrical world
where you change the drive every 10 years. And the customer demands it as well, so from the cyber security point of view you need to do that. People often do not understand how much effort it is to maintain, and upgrade, and actually keep all this kind of IT infrastructure on board and keep that business and data flying.” (Product Manager)

4.2 Collaboration

As part of its digital servitization efforts, Navarch extensively relied upon fostering collaboration. First, interactions between the firm and its customers and partners were further reinforced by the digital services and underlying digital infrastructure, which resulted in various co-creation activities between the actors. Second, Navarch started leveraging its in-depth customer knowledge to offer relevant value propositions, with the digital services becoming key to this process. Overall, changes in these two areas constitute the collaborative aspects of Navarch’s transformation towards digital servitization.

Multi-actor coupling, refers to joint activities towards digital servitization between (individual and collective) actors in the firm’s network. Since digital services no longer required physical presence of service engineers on vessels, customers were initially “worried that the skill level on-board could 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 Navarch. This form of collaborative learning improved the technical knowledge and skills of crewmembers. Whereas Navarch was closely interacting with the crewmembers already before the transformation, the so-called integrated operations program enabled a novel form of collaboration—with the customers’ top management. Since the program was being promoted to customers as “a way to do business”, working together with newly established companies proved to be particularly successful in this regard:

“New companies are very interesting for us because we can actually try to help them to set up a company that will match the services that we are providing, instead of trying to implement something in an organization that has been working for decades in the more traditional way. We were talking with this one company that is building ships now, they are very much interested in adapting the way of working that we established here in our operational center.” (Vice President, Head of Global Services)

Beyond a closer collaboration with customers, digital servitization necessitated Navarch to have partnerships with various external firms. While Navarch’s internal focus was on “domain” and “core” knowledge around digital services in the maritime industry, external collaboration was initiated when lacking other types of knowledge. For example, Navarch was working together with the corporate-wide research centers to develop digital services that were “very research-demanding in mathematics” and thus could not be developed internally “on a large scale”. Another example concerned development of cloud applications, which required “a very generic skill” and was thus delegated to a general software developer external to the firm. Universities were another novel type of partners in Navarch’s collaboration for digital servitization. As part of joint R&D projects around digital services, the academic counterparts would typically act as third-party auditors, with the main task to validate the firm’s data. In
turn, Navarch would assist the universities in “developing and improving certain algorithms”, which later became “productized” and used in the firm’s “software solutions”. For instance in a navigation tool that can predict the sea by combine sea charts, historical route data, and weather forecasts which combined help decrease a ships energy usage.

Importantly, external partners also allowed Navarch to expand its digital offerings’ scope. Whereas most competitors “stay close” to the manufactured or integrated equipment and “have a very product-centric mindset”, Navarch was aiming to “look more into the operational side”—beyond the specific maintenance services connected to the firm’s installed base. For instance, a partner’s expertise in cloud computing provided Navarch with “the ability to offer complete digital services for any vessel type”, and not only for vessels with the firm’s equipment. This, for the industry, radical innovation allowed monitoring operations of entire ships, resulting in a significant competitive advantage for Navarch. However, to commercialize this invention Navarch had to work closely with external shipyards, ship designers and fleet owners to enable coupling of the software behind the digital services:

“With our software, we interface it with everything and we store data all in the same format. And our competitors say ‘ok, if you want a new interface, then we should talk to programmers’, and they make a completely new program, or they say, ‘no we can't do it’. And we always say that ‘it doesn't matter, we can interface it with everything’. Building this kind of network with different interfaces, which actually are custom made during the years—we are unique there. And you need almost a unique combination of knowledge within support, being able to identify it, and develop it that you have this experience that you're able to do it.” (Analyst, Customer Service)

Value proposition, refers to the firm’s core offerings as communicated internally and externally, which are associated with digital servitization. Another key enabler of digital servitization concerned customer benefits brought by digital services. Initially, some of Navarch’s senior managers had exhibited “great resistance” by believing that digital offerings would “cannibalize other services”. As a result of the aforementioned efforts aimed at legitimizing digital servitization and changing the employee mindset, the same managers later started perceiving these offerings as “good business” as long as the focus was on “value created for the customer”. To avoid creation of “limited” value, obtaining in-depth knowledge of customer’s business was of particular importance for Navarch. With the aim to “bring core information to the right people”, the firm crafted “different value propositions” for each key group of individual actors at the customer side. To this end, Navarch found it critical to adapt to “digital maturity” of each customer:

“We had always been building vessel-type-specific portfolio but that does not work anymore, because now it is more about maturity of the customer. This digital part [of the offerings] is for the customer, they want information to take decisions. And of course, we can add our services along to that—anlytics, support, dashboard building, or center building—but in the end, it is about maturity of the customer. That is why we are now focusing on
In line with the new focus on value creation, Navarch realized that “whatever is good for the customers is also good for the firm” and made “investments into operational excellence that saves money”—thus extending more common digital offerings aimed only at “maximizing customer revenues” through high “availability and reliability”. To make this new approach feasible, Navarch had to “be able to measure” the relevant key indicators and thus obtaining data from the vessels became critical. Subsequently, the received data were used to decrease operating costs for both the firm and its customers: for example, the latter could now “reduce the crew on board”, which then led to “an advantage of cheaper operations”.

In addition, Navarch differentiated its offerings around “what it is possible to do on data, and how it can be integrated into customer systems”. For instance, one of the unique selling points now involved data analytics: as one of the senior managers explained, Navarch “do not sell the data—we sell the outcome, the output to the algorithms.” In line with this approach, the firm’s core value proposition became “supporting the vessel from the shore side” and providing information on decision support to customers—with the ultimate goal of “completing customer’s picture”. In turn, on-board maintenance-related services were now seen as add-ons that are offered as “fully modular” services to ships with Navarch equipment.

Another important benefit brought by digital servitization concerned increased customer trust: for example, customers visiting Navarch’s digital service centers would “feel in good hands” while the firm was “taking control of their fleet”. With transparency of operations being another aspect that customers were increasingly demanding, Navarch introduced new systems to improve its customer service:

“We now have a requirement that everything be included in the support case management system, so that we can always see: how do you handle the customer? What is your response time to the customer? What kind 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 the same. So, it is clear that the support case management system has been useful to make service more transparent too. You cannot any longer sit and hold on to a customer and do the service in your own way.” (Vice President, Head of Global Services)

4.3 Dematerialization

Fostering dematerialization was the third major change that is present in our findings on Navarch’s digital servitization. Dematerialization refers to the separation of data and information from their physical manifestations that are fundamental for digital servitization. First, the firm became increasingly focused on the data that is underlying digital services, which overall corresponds to the transformation towards liquification of resources. Second, Navarch concentrated its efforts on sensing opportunities connected to data-related issues—the latter being of growing concern to the maritime industry at large. Together, changes in these two areas constitute the dematerialization-related aspects of Navarch’s transformation.
Liquification, refers to the data-enabled properties, mechanisms, and activities that are associated with digital servitization. Whereas Navarch and other firms in the maritime industry used to compete around electrical equipment (for example, to make it “better and more reliable”), digitalization shifted the competition to become “more and more focused on data”. With data increasingly not connected to any specific equipment—and thus liquefied—the ability to recombine it as part of novel service offerings became critical to achieve competitive advantage. To this end, Navarch fostering their service employees to combine their technical skills with new digital abilities as employees needed a vastly different skill set. However, an outcome of the liquification was that new types of employees were to be hired, that would enable handling previously unparalleled amounts of data:

“We have to hire people who have skills in data collection and data analysis, because at the moment we have received so much data (...). We have never had that before and it is completely different skills than we have had in our industry. Their task is to start work with the data and see what we can use it for, or we get a job from a customer who wants to solve a problem. Our computer scientists then try to figure it out based on the data we have. If they are able to solve the customer's problem, we might want to generate the solution as a new service, insert some algorithms so things happen automatically. It is more and more common that the customer comes to us and wants to know something and then we do an analysis on it and give them a result.” (Vice President, Customer Segment)

Growing industry concerns about cyber security issues was another major driver behind Navarch’s hiring employees with radically different knowledge and skills. In the aftermath of 2017 large-scale cyberattack (“NotPetya”) on Maersk—one of the maritime industry key players, Navarch relied upon its newly acquired data-related competences to launch a large cyber security program. Digital services created as part of this program allowed the firm to analyze vessels “from the cyber security, operational point of view”. With the novel offerings often purchased by customers who had otherwise “nothing to do” with Navarch, the cyber security digital services exemplified Navarch’s novel competitive advantage grounded in data liquefication.

To further enable the liquefication of data, Navarch was closely working with hardware, as exemplified by a strategic decision to pre-install the hardware underlying digital services on under-construction vessels. Regardless of whether any service contracts had been signed, Navarch would offer its digital services to all customers free of charge during the so-called warranty period. This strategy allowed 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 to sign service contracts after the warranty period. Overall, the described strategy was seen as “an important success factor in relation to the competitors” and for the digital servitization efforts in general.

Opportunity sensing, refers to the firm’s ability to discern favorable data-related circumstances, internal or through collaboration with other partners, which arise during digital servitization. The issues of data ownership became highly prominent in the maritime industry
when a growing number of customers started to be concerned about “who owns the data”. In the past, when “only the most advanced ship operators” were aware of benefits of digital services, the data ownership issues “were not in the news”. Although this situation changed and such issues later turned into “a big question” within the industry, there was still no “good case anywhere” regarding the “standard for data ownership”. As a result, whereas Navarch had business models for its core areas of operations (including most of those related to digitalization), data-related business models were seen as an important opportunity that was yet to be seized:

“We do not have [clear business models] when it comes to new areas to use the data, it is not yet defined. As for example, when the 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)

Another opportunity concerned the quality of big data: “thousand signals” were now arriving from a vast array of hardware, whereas earlier the data appeared only from “three different sensors from three different suppliers”. Since manual handling of the vast amounts of data represented potential issues in terms of errors, Navarch sensed opportunities linked to the need to “monitor bulk data” and “make analysis fully automated”. Software scalability was seen as a critical element of seizing this opportunity, which was of major importance also since “how scalable the IT technologies are makes all the difference for the customers”:

“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 it does not happen like that in industrial business. So, the big risk is that major stakeholders might have unrealistic expectations of what kind of growth is to be expected from the pure revenue of these digital solutions. All the software service companies, they aim to develop something scalable, and we did the same. It took a while to understand that it is not that scalable in the same way, but once we understood that, we took our development needs differently.” (Senior Vice President, Integrated Operations)

5. Discussion

Our data analysis identified three aggregated themes which manifest the transformational shifts a firm has to undertake when pursuing digital servitization. Each shift could then be divided into two or three second order themes which was then further elaborated on in the findings. Together these themes contribute to a better understanding of the challenges a transforming firm has to cope with. The shifts especially illustrate the need to rethink an internal way to create novel value, instead our data show that collaboration through digitalization form what we refer to as ‘digital servitized offerings,’ such as performance management solutions, advisory services, and 24/7 remote diagnostics. Our findings show that the transformations toward digitalization occur within these overarching themes. Hence, these themes are the strategic areas which represent shifts in the way a firm and all their stakeholders
are to be acting when fostering digital innovations, collaborations and dematerialization, which taken together transform a firm toward digital servitization. Inherent in each shift are key challenges that require the firm and their stakeholders to act, including a changed mindset in order for the digital servitization to occur and to proceed. The three shifts are further elaborated on, next and are illustrated in Figure 3.

![Figure 3: Digital servitization and the transforming shifts.](image)

### 5.1 From certainty to discovery: fostering innovation

The firm orchestrated the change towards a more discovery-based innovation process by establish structures with the aim of fostering cultural openness to use digital technology in novel ways. The data illustrate two specific manifestations; change agents and digital service centers. A direct outcome of these manifestations was the white paper signed by all key stakeholders within the firm, also by those who initially were reluctant to the transformation. This white paper legitimized the transformation which had a profound impact on the whole organization’s mindset toward digitalization. Another manifestation of how the firm fostered the transformation to become more discovery based regarding digital innovations can be found in the search to actively attract and hire a different set of people with the aim to gain a diverse competence base. In an industry that was known for its homogeneous workforce and established way of working, this was to embrace the unknown; there were few if any reference companies in the industry to benchmark against. With this diverse competence pool the firm could promote creative collisions through brainstorming with the aim of discover (and seize) new digital servitized innovations. Taken together new recruited employees with a data background and the signed white paper fostered a new identity which was in line with what the top management had hoped for regarding digital servitization. This discovery view of fostering innovation created novel and, which it turned out to be, useful ways of using technology to enable transformation beyond a focus on digitization.

However, to foster this change the transformation needed a genuine concern not only from internal but also external key stakeholders. As a case in point, Navarch invited different network partners (customers such as shipyards, ship designers, and fleet owners) to test their digital service centers. This illustrates how decision makers recognized the importance of the transformation with the notion to externally legitimize it (e.g., Gebert Persson, Lundberg, &
Andresen, 2011). As well as to create a mindset within the business network that the industry should transform its identity from focusing on the hardware to gain a digital focus. This changed mindset can be seen in the increase of creative collaborations, such as with academia. This dual focus—internal and external—became the fundament that broke the path of an inherent traditional and restricted attitude of (product-centric) innovation within the firm and the industry as a whole. Despite operating on many cyclical markets, overall, the industry had an inherent focus on certainty, long-term planning, and incremental innovations, based on well-established processes and routines. Navarach broke with this notion and instead fostered a broader, discovery-based mindset toward innovation (e.g., Christensen, Raynor & McDonald, 2015). By legitimizing an identity of discovery mainly within the firm but also, still on a lesser degree, within the industry, this incumbent firm managed to foster an enlarged attitude of service innovation based on discovery and exploration of digitalization. Vargo, Wieland, and Akaka (2015) refer to such change as market innovation, in contrast to purely technological innovation (e.g., digitization), highlighting the emergence and institutionalization of new value propositions, which is driven by the generation and integration of technologies and the interaction among multiple stakeholders. Taken together, these managerial activities aiming both towards internal and external actors was important to facilitate the shift from certainty to discovery and thus fostering innovation.

5.2 From authority to partnership: fostering collaboration

Incumbent firms, like most other firms, are traditionally organized in siloes based on a reactive mentality of hierarchy and authority. Change agents in Navarach realized that this mentality was a hindrance for harnessing the business potential of digitalization and even more troublesome for the creation of service-centric value propositions based on customers’ actual needs. In order to create these service-centric value propositions based on data from the ships that provided novel benefits both for the firm and its customers, our findings show that closer collaboration between front-end service engineers, back-end service operations, and service sales, as well as with general management and the new digital entity of the firm, was needed. Hence, supporting and facilitating the possibilities of digitalization required the breaking of the silo mentality and instead focus on multi-actor coupling. Silo busting is typically considered a largely internal activity, although Gulati (2007) also points at the importance of focusing attention beyond the firm’s boundaries. In our case, it was evident that not enough to transcend internal silos; Navarch also engaged in working closely with several important stakeholders worldwide, such as shipyards, ship designers, and fleet owners. This multi-actor coupling helped connecting the digital service between the different stakeholders (e.g., Nambisan, Lytytinen, Majchrzak and Song, 2017). Although digitalization within the industry was low (as a long-time industry expert said: “Shipping is really, I think, 20-30 years behind”), this coupling helped creating what Raddats and Easingwood (2010) refer to as a ‘vendor agnostic’ position; that is, provision of services related to its own as well as other companies’ products. These value propositions, in the form of digital service offerings (e.g., predictive maintenance and navigation forecasting) were created with the help from key customers, both directly through active collaboration and knowledge exchange and indirectly through data obtained from fleets of ships that could be used to tailor forthcoming service offerings.
A troublesome and potential hindering of the transformation and expansion of digital servitization relates to ownership of data. Trust and accountability between Navarach and their customers was essential for allowing to collect real-time and historical data from the specific customers and tailor offerings based on the analyses. The complexity of creating value propositions that are unique and relevant for the specific customer required more extensive, and potentially new forms of, collaboration. In such cases, Navarach can know more about the customers’ fleets than they know themselves. Utilizing this knowledge, for instance by creating a value proposition based on the data towards the customer’s competitors, could immediately harm not only the business relationship but also the customer’s competitive situation. Although short-sighted, such value propositions could be very lucrative for a supplier. For traditional innovation and development projects, as in the automotive industry (Brandes et al., 2007), such knowledge transfer between a lead supplier and competing customers may have been formalized and regulated for decades. With digitalization, however, new issues concerning data generation, collection, utilization, and ownership become central (Zwitter, 2014). Here the heritage of Navarach within the industry, in the form of built up trust and reputation, was of importance for the transformation (e.g., Dowell, Morrison & Heffernan, 2015). Consequently, in a positive way digitalization is built on and foster trust and accountability within multi-actor collaborations, but can easily be diminishable. In order for trust to grow, and thereby the transformation to occur, our findings show that it requires an interdepartmental communication within the firm and an open communication among network partners, including customers. An important part of the dialogue was related to the in-depth knowledge to customers’ need with new value propositions based on service modules fitting the maturity of customers. In the case of Navarch, this entailed an integrative organization that focused on open dialogue and teamwork. Our findings illustrate that digital servitization enforces changes in the competitive landscape and that new digital initiatives, if correctly implemented and accepted by the relevant stakeholders, can align the different actors to improve coordination and collaboration. Hence, our data show that fostering novel value propositions in the form of new digital services relies on collaboration opportunities among a diverse set of actors in the business network.

5.3 From scarcity to abundance: fostering dematerialization

Before the digital transformation Navarach, like a majority of firms in the industry, they considered real performance data as a scarce resource that was hard to get hold of, and if gained, important to keep within the firm. This resulted in strategic restrictions and a mindset that clearly hindered sharing information, knowledge, and other types of resources with other network partners. Similarly, sharing between the organizational silos within the firm was often perceived as negative. However, since digitalization required new forms of collaboration between internal and external actors in order to create service-centric value propositions, a different mindset was needed. Digitalization also creates a separation between data and the physical manifestations, such as machines and interfaces; what Normann (2001) refers to as liquidization. This insight was the driver of a fundamental shift—the transformation from resources of scarcity to the resources of abundance.

As a growing number of decision makers and employees gained this insight, it changed the way the firm organized its business. Initially, this dematerialization of resources somewhat surprised managers as they found themselves in a situation where they had more data than they
could handle in any given situation. With better software systems and sensors, and cheaper and more reliable transmission, data from the digital connections with customer vessels kept flowing in, which created a situation of abundance. When realizing that data was an unlimited resource, a creative attitude was formed within Navarach. With the help of the newly recruited data-savvy employees, management deliberately tried to sense new opportunities. For instance, instead of keeping data as a resource within the firm, they recognized that raw data easily could be elaborated on with trusted stakeholders in the network. The creation of a value proposition for energy savings based on data from sea charts, historical route data, and weather forecasts is a typical example of this. Hence, advanced algorithms based on processed data from the real-time behavior of vessels became the fundament for developing new value propositions and a foundation for future competitiveness. This dematerialization of information and data from the specific equipment where it is generated, enabled Navarach to come closer to its connected customers, both operationally and strategically.

6. Implications

6.1 Theoretical implications
The study contributes to the extant servitization literature by presenting a theoretical underpinning of the strategic organizational shifts for digital servitization. Our findings make three main contributions to literature on service growth in business-to-business markets and, more broadly, on digitalization and service strategy. Taken together these implications contribute to a better understanding of the sets of activities that an organization has to undertake in order to become digital servitized.

First, we identify three strategic shifts that a firm need to accomplish in its digital transformation process. These empirically derived transformations illustrate the need to rethink how to create value, how to collaborate, and how to servitize the market offering—all through digitalization. We argue that digital transformations happened within these overarching, strategic areas, which represent shifts in the way the firm and network partners are fostering innovation, collaboration, and dematerialization respectively. These three shifts are cornerstones for the firm to manage digital servitization. Each shift required a different focus as well as a changed mindset to drive the change. The first shift fosters innovation; how to rethink and take advantage of the commercial opportunities of digitalization, challenging the firm to facilitate a change by establishing innovative structures and cultural openness to use technology in novel ways. The second shift fosters collaboration; moving from a siloed command hierarchy towards multi-actor collaboration underpinned by common agreements, trust, and accountability. An important part of this collaboration is closer dialogue and in-depth knowledge of customers’ overarching needs where the value propositions is fitted to the maturity of the individual customer. This approach entails an integrative organization that focuses on teamwork and more open conversations also about strategic issues. The third transformation shift entails dematerialization where information becomes separated from the physical world (Normann, 2001). The separation generates plenty—even an abundance—of data. This shift makes data mining and analytics an important resource because it becomes vital for developing advanced algorithms and thus knowledge of behavior where the ability to manage
this abundance of data, for example by feeding it into machine learning systems to generate further insights, becomes key for future competitiveness.

Second, we argue that firms cannot harness the power of the transformative technology and pursue digital servitization with only one of these shifts; they have to cope with all three shifts in parallel. This insight highlights the dynamics of the process, showing that the three shifts are intertwined and necessary to accomplish in the shift to become digitally servitized. However, as the transformation to digital servitization is conditioned by dematerialization, this shift seems extra vital to accomplish. The dematerialization allows data to be captured, used, and remanifested in a myriad of different ways, which seems to lead to knowledge dispersal. Further, it opens up novel opportunities for innovation and intra-firm and inter-firm collaboration.

Third, we shed light on how digital servitization requires changes in the firm’s business logic; from a mentality of scarcity, certainty, and authority to a mentality of abundance, discovery, and partnership. Our data shows that a firm needs to make a reactive-to-creative shift in how they view and innovate, collaborate among multiple internal and external partners, and dematerialize the core service to match customer needs. The new digital landscape forces firms and networks to create and use digital services in order to stay competitive, and thus change to a digital servitized mindset. For a firm to achieve digital servitization, it requires more than incremental, reactive change; as we have outlined, it entails a systematic effort that goes beyond changes in the service organization of the firm.

6.2 Managerial Implications

By shedding light on the organizational shifts needed for digital servitization, our study provides several implications for managers. First, top management leaders need to develop the ability to condense a clear, shared, and convincing digital vision not only for the firm but the entire network. Rather than the traditional executive-team exercise, discussions both within and outside the firm must be leveraged in order to formulate the purpose and vision that are fitting the firm’s digitalized backbone. On a similar note, front-end leaders need to develop the ability to shape a new type of culture across the organization, based on the creative mindsets of discovery, partnership, and abundance. Given the higher degree of openness, transparency, and freedom that is often enabled by digitalization, culture arguably plays an even more important role in digitalized rather than traditional organizations. To this end, leaders must learn how to undertake a multifaceted culture-transformation effort that leverages the firm’s inherent abilities and practices.

Second, managers need new skills to handle the changing organizational design. A traditional organization often represents a relatively concentrated, static system that comprises one or a very limited number of major businesses, each with a long-established business model, typically coexisting somewhat uneasily with a set of corporate functions. While most leaders of traditional firms have a well-honed skill set that is appropriate for such an organizational design, a different set of skills is needed in view of digital servitization. With radically novel demands for how value is created and how firms should organize and collaborate, managers must learn to design the organization as a distributed, continually evolving ecosystem—and as such harmonize the network comprising of smaller empowered units, with fewer layers, greater
transparency, and leaner governance than before. Specifically, leaders require knowledge on how to disaggregate existing large businesses into a more granular portfolio; transform corporate functions into a digitalization-enabling backbone; and attract a wider range of network partners for collaboration.

Third, the data-related aspects of digital servitization necessitate vastly different knowledge and competences developed within a firm. While the competitive advantage could be previously achieved through a superior expertise in the core area of the firm’s operations, the situation has radically changed across industries. With data becoming the focal point of competition, a growing number of incumbent firms find themselves in a desperate need of employees with data-related skills (for example, in data collection and analysis). As we observed in the case of Navarch, demands of digital servitization resulted in the firm’s unprecedented efforts to acquire such knowledge and competences, essentially turning Navarch into a “digital technology company”. A related critical point concerns determining the right scalability of the data-based offerings: our findings suggest that software behind digital services might scale differently in industrial versus consumer markets. As a result, managers driving digital servitization should adjust the expectations regarding relevant financial outcomes—otherwise, there is a risk that measurements of the transformation’s success might be misinterpreted by the key stakeholders.

7. Limitations and further research
The present paper has several limitations that open avenues for future studies. First, while the studied case focuses on a single actor in its network, which assists in theory development (Halinen & Törnroos, 2005), collecting data from additional actors would be beneficial. Complementary insights regarding the network evolution under digital servitization could be achieved if such data collection is carried out over an extended time period. On a similar note, future studies could evaluate the interaction between network characteristics and the shifts that underpin digital servitization. Second, as the growing number of incumbent firms embarks on the digital servitization journey, quantitative research methods could help in assessing the contingency factors behind the identified strategic shifts (e.g., effects of heterogeneities across industries and countries). In particular, future studies could explore whether and how digital maturity within a specific industry is associated with the scope of each shift. Third, by conducting further research at the interface of the marketing and related disciplines, it will become possible to address critical questions raised by digitalization (Ng & Wakenshaw, 2017). For example, such interdisciplinary research would be of use to examine how the disappearing boundaries between humans and technology (Breidbach et al, 2018) affect the continued transformation of digitally servitized firms.
References


APPENDIX. Details of primary data collection: Conducted interviews

<table>
<thead>
<tr>
<th>Position of the informant</th>
<th>Duration of the interview(s), hours &amp; minutes</th>
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<tbody>
<tr>
<td>Analytics &amp; Customer Service and Support (two individuals)</td>
<td>01:12 02:08</td>
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<tr>
<td>Business Development, Global Service</td>
<td>00:30 01:00</td>
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<tr>
<td>Executive Business Unit Manager</td>
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<tr>
<td>Global Product &amp; Portfolio Manager (Digital Solutions)</td>
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<tr>
<td>Global Sales &amp; Business Development</td>
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<tr>
<td>Global Technical Support Manager</td>
<td>01:30 01:00</td>
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<tr>
<td>Global Technical Support Manager</td>
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<tr>
<td>Information Manager &amp; Global Product Manager</td>
<td>02:33</td>
</tr>
<tr>
<td>Integrated Operations Program Manager</td>
<td>01:28</td>
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<tr>
<td>New Energy Efficiency Manager</td>
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<tr>
<td>Product Manager</td>
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</tr>
<tr>
<td>Project Manager</td>
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<tr>
<td>Project Manager</td>
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<tr>
<td>Sales Engineer (IT)</td>
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</tr>
<tr>
<td>Senior Vice President (Collaborative Operations)</td>
<td>01:08 01:27 03:30 00:30</td>
</tr>
<tr>
<td>Senior Vice President (Customer Segment)</td>
<td>01:54</td>
</tr>
<tr>
<td>Senior Vice President (Global Operations)</td>
<td>01:39</td>
</tr>
<tr>
<td>Senior Vice President (Information &amp; Control)</td>
<td>01:24</td>
</tr>
<tr>
<td>Service Manager</td>
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<tr>
<td>Service Manager (Local Region)</td>
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<tr>
<td>Service Sales Manager Merchant</td>
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<td>Technical Advisor</td>
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<td>Technology Manager</td>
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<tr>
<td>Vice President (Customer Segment)</td>
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<td>Vice President (Digital Services)</td>
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<tr>
<td>Vice President (Head of Global Services)</td>
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<tr>
<td>Vice President (Local Region)</td>
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<tr>
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<tr>
<td>Embedded Systems Coordinator</td>
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<td>Project Manager, Corporate Research</td>
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<tr>
<td>Senior Scientist, Industrial Software System</td>
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<tr>
<td>User Experience &amp; Industrial Design</td>
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